Nigeria
Primary Maths
Grade 5
Teacher’s guide
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The New General Mathematics Primary 5 Pupil’s Book (PB) consists of 34 units. Each unit starts with a list of objectives, or commonly known as performance objectives (as listed in NERDC, 2013), that will be covered in each unit. In addition, the exercises in the PB have been carefully developed to ensure integration of the performance objectives from the curriculum, and a steady progression of skills throughout the year. It is important that you follow the order of the units, especially for related sub-topics, as units build on the knowledge and skills acquired in preceding units.

The units follow a ‘teach and practise’ approach:
• New concepts are explained and given context in their meaning.
• Worked-through examples show pupils how to approach problem solving.
• Exercises allow pupils to practise on their own.
• Revision exercises round off each unit as a mixed exercise covering all the problems addressed in the unit.

Summative assessment activities are provided at the end of every term in the form of Term assessments, along with a term project. These assessments test pupils on all the knowledge and skills they have gained in each term, and the projects enable the pupils to apply the work they have learnt in practice.

Additional features include:
• Key words: Key terminology is highlighted for the pupils. Definitions are given in the PB and in the Teacher’s Guide (TG).
• Puzzles: Additional problems, usual in a real-life context to help grow an appreciation of mathematics in everyday life.
• Challenges: extension problems for stronger pupils to attempt. These exercises generally extend the scope of content covered in each unit.
• Teaching notes: advice and ideas for teachers in dealing with the content on each page.

Features of the Teacher’s Guide
This New General Mathematics Primary 5 TG is lesson-based. The units of the PB are organised into a series of lessons. Units include most of the following features:
• The performance objectives from the curriculum that are covered in the unit.
• A list of suggested resources you will need
• Definitions for the key words in the PB, as well as some additional key words and their descriptions
• Frequently asked questions relating to teaching the unit’s content (not always applicable)
• Common errors pupils make (not always applicable)
• An evaluation guide showing the key learning milestones.

Each lesson includes the following:
• Preparation for the lesson (all the suggested resources) – remember, these can be tailor-made to suit the requirements of your classroom situation
• A starter activity, which helps you focus on the topic, or revise previous required knowledge
• Lesson focus, which suggests how you should teach the lesson, and the main strategies you can incorporate
• Answers to all exercises, puzzles and challenges in the PB and Workbook (WB)
• Assessment guidance on how to effectively assess pupils in each lesson
• Extension activities (not always applicable)
• Suggestions for homework activities, where necessary.

Note: The lesson-based guidelines are suggestions only. You, as the teacher, will need to assess how much your pupils are able to cover in each lesson.
**Features of the Workbook**

The *New General Mathematics* Primary 5 WB provides a worksheet for every unit in the PB. Pupils use these worksheets to practise the specific mathematical skills and concepts covered in each unit. It forms as a consolidation of the pupils' understanding and is a useful resource for homework assignments.

Pupils can record their answers and calculations in the spaces provided on each of the worksheets.

The answers to these worksheets are all provided in the TG.

**Methodology**

Mathematics teaching and learning goes beyond reaching the correct answer. Many mathematical problems have a range of possible answers. Pupils need to understand that Mathematics is a tool for solving problems in the real world; not just about giving the correct answers.

The Mathematics classroom must therefore provide an environment in which problem-solving is seen as integral to the teaching programme, and where learning activities are designed to provide pupils with opportunities to think.

Working mathematically involves:
- questioning
- applying strategies
- communicating
- reasoning
- reflecting.

Pupils will require some, or all of the above processes, to make sense of any mathematical concept.

Problem-solving strategies include:
- trial and improvement
- acting it out
- making a model
- drawing a diagram or picture
- looking for patterns
- working backwards (inverse operations)
- using tables and data
- making a list.

Primary level 5 focuses on reinforcing the first five strategies listed above, and then builds on the other strategies. Alongside developing these problem-solving strategies, it is important for pupils to gain specific mathematical knowledge as tools for problem-solving. At Primary level 5, these tools include:
- counting, reading and writing whole numbers in thousands and millions
- identifying prime numbers from 1 to 100
- changing fractions to decimals and decimals to percentages
- finding the ratios between numbers
- adding and subtracting 3 or more digit numbers, mixed fractions and decimal fractions, and by using number lines
- multiplying 3-digit by 3-digit numbers, by 0 and 1
- calculating squares and roots
- dividing whole numbers and decimals by 100 and 200
- working with open sentences
- converting currencies
- finding the perimeter and the circumferences of circles
- working with time and temperature
- calculating the area of right-angled triangles
- working with volume and capacity (cubes, cuboids, litres and cubic centimetres)
- working with the structure of the earth
- identifying parallel and perpendicular lines, and stating the properties of equilateral, isosceles and equilateral triangles
- working with the properties of 3-D shapes
- identifying the radius, diameter, and circumference of a circle
- collecting data and presenting it (tallies, finding the mean and mode).
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**Theme 3: Algebraic processes**  
Sub-theme: Algebraic operations

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<th>1. Find the missing number in open sentences</th>
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<td>2. Use letters to represent boxes in open sentences</td>
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<td>3. Find the missing number that the letters represent</td>
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<td>4. Interpret each box in a mathematical statement represent a letter that could be found</td>
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<td>5. Use letters to represent the missing numbers in quantitative aptitude problems and find their values</td>
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**Theme 4: Mensuration and geometry**  
Sub-theme: Primary measures

<table>
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<th>1. Money</th>
<th>1. Compare Nigeria units of money with pounds sterling, American dollars and some West African countries</th>
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<td>2. Solve problems on profit and loss, simple interest, commission, discount and transactions in the post office, market, etc</td>
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<td>3. Solve quantitative reasoning problems on money</td>
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<td>2. Length</td>
<td>1. Find the perimeter of regular shapes, such as square, rectangle, trapezium and polygon</td>
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<td>2. Find circumference of a circle when the radius is given</td>
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<td>3. Establish the relationship between and find the circumference</td>
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<td>3. Weight</td>
<td>1. Solve word problems on weight</td>
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<td>2. Solve problems on quantitative aptitude involving weight</td>
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<td>4. Time</td>
<td>1. Calculate average speed of a moving object</td>
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<td>5. Temperature</td>
<td>1. Compare degrees of hotness of various objects and areas (locations) in degrees Celsius</td>
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<td>2. Identify the usefulness of temperature to our daily lives</td>
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**Theme 4: Mensuration and geometry**  
Sub-theme: Secondary measures

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<th>1. Calculate the area of a right angle triangle</th>
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<td>1. Use cubes to find the volume of cuboids and cubes</td>
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<td>2. Use formulae to find volume of cuboids</td>
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<td>3. Identify the difference between cubes and cuboids</td>
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<td>3. Capacity</td>
<td>1. Find the relationship between litres and cubic centimetres</td>
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<td>2. Identify the use of litre as a unit of capacity and the established relationship between litre and cm³</td>
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<td>4. Structure of Earth</td>
<td>1. Describe the shape of the Earth</td>
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<td>2. Compare volume of a sphere and cuboid</td>
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### Theme 4: Mensuration and geometry

#### Sub-theme: Shapes

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### Theme 5: Everyday statistics

#### Sub-theme: Data collection and presentation

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<td>5. Solve quantitative aptitude problems on mode and mean of data</td>
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<td>6. Calculate the mean of given data</td>
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<td>7. Appreciate the concept of mean of a set of data in daily activities</td>
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Objectives
By the end of this unit, pupils will be able to:
• Count in thousands and millions
• Determine place value of whole numbers
• Apply counting of large numbers to real life situations
• Solve problems using this type of quantitative reasoning.

Suggested resources
Place value cards (optional); Number lines that are marked, but not numbered, over the place value boundaries; Numbers written as words on large cards (optional); Abacus; Number chart

Key word definitions
digit: one figure in a number
interval: time, gap or space between
figure: symbol for a number
place value: the value of a digit determined by its position in a number
numeral: another word for number
units: single numbers from 0 to 9
tens: twin values: larger than 9 but less than 100
hundreds: three digit values larger than 99 but less than 1 000
thousands: four digit values larger than 999 but less than 10 000
ten thousands: five digit values larger than 9 999 but less than 100 000
hundred thousands: six digit values larger than 99 999 but less than a million
million: seven digit numbers larger than 999 999
compare: making distinction between 2 or more things by looking at similarities and differences
count: proceeding sequentially from one value to another higher value
more than: a number that is bigger in comparison to another
less than: a number that is lower in value than another

Frequently asked questions
Q  What prior knowledge should the pupil have?
A  Pupils should be able to count forwards and backwards in 1s, 5s, 10s and 100s from any given number. They should also have a thorough understanding of place value in four digit whole numbers, and be able to read and write whole numbers to four-digits in words.

Q  What is the difference between a digit and a number?
A  A number is made up of separate digits. For example, 23 456 is a number, that has 2, 3, 4, 5 and 6 as its digits.

Common errors that pupils make
Pupils sometimes have difficulty in crossing the place value bridges from 9 000 to 10 000 and from 10 000 to 100 000. Practise counting forwards and backwards from various starting points and in different multiples, for example in 3s and 4s, as well in the usual 5s and 10s. Use number lines as a support.

When writing numbers that include zeros, pupils often ignore the zero, so a four-digit number becomes a three-digit number: for example, they write five thousand and sixty as 5 60. They also sometimes write numbers with too many digits: for example, they write four thousand, six hundred and twenty-four as 400 060 024. Give the pupils plenty of practice in reading and writing numbers, especially ones that contain zeros. Ask them to use a place value table to help them. Reinforce the fact
that numbers with thousands have four-digits, and numbers with tens of thousands have five digits.

**Evaluation guide**

Pupils to:
1. Count in thousands and millions.
2. Read and write numbers in words and figures.
3. Quantitative aptitude related to thousands and millions.

**Lesson 1  Pupil’s Book page 8; Workbook page 5**

**Preparation**

You will need to have:
- Pupil’s Book
- Workbook
- Place value cards (optional)
- Number lines that are marked, but not numbered, over the place value boundaries
- Numbers written as words on large cards (optional)
- Number chart.

**Starter activity**

With the pupils, practise counting in 10s, starting from any two-digit number. Then count in 10s starting from any three-digit and then any four-digit number.

Repeat this activity, first counting in 5s, then in 100s, and finally in 1 000s. Make sure that the pupils are clear about what happens at the place value bridges (for example 99 to 100, 999 to 1 000, 9 999 to 10 000 and 99 999 to 100 000).

**Lesson focus**

Demonstrate counting forwards and backwards using a number line. Write 997 and 998 on the middle of the line. Then, count forwards with the pupils, writing down the numbers as they are said. Point out where the number of digits changes from three digits to four digits. Next, write the numbers 1 002 and 1 003 on the middle of the number line. This time, count backwards and point out where the number of digits changes from four digits to three digits. Repeat this activity for the 9 999 to 10 000 and 99 999 to 100 000 bridges. Now practise counting in 2s, 5s, 10s, 100s and 1 000s, starting at different points. Use the number line as support, and point to each mark as you count. Make sure the pupils can also count backwards over these bridges.

Write a number on the number line, for example 10 003, and ask the pupils if they know what 5 less than this number is. If necessary, count backwards together. Pupils can now do Exercise 1.1. In Question 7, the pupils will need to work out the interval between the 1st and 2nd numbers, and check that it is the same between the 2nd and 3rd numbers. In the Challenge, the pupils have to identify the rule of the sequence to complete the missing numbers. Before asking the pupils to do Exercise 1.2, draw an empty place value table on the board (as on page 11 of the PB) and ask a pupil to give you any four-digit number. Work out together where each of the digits should go and then use the headings to determine the value of each digit. Reinforce the pupils’ understanding with questions such as “What is the value of the 6 in this number?” Record the values as 4 000, 300 and so on. Repeat this for other four-digit numbers and then for some five-digit numbers. Pupils can now do Exercise 1.2.

**Answers**

**Exercise 1**

1. a–f Check pupil’s answers
2. a) One hundred ninety nine
   b) Two thousand and five
   c) Twenty-seven thousand, one hundred ninety four
   d) Six hundred fifty four thousand, nine hundred eighty seven
   e) Nine hundred eighty nine thousand, three hundred and twenty one
3. a) 758  
   b) 6 092  
   c) 800 500  
   d) 902 623

**Assessment**

Pupils should be able to recognise the place value of digits and identify tens, hundreds and thousands. Give extra practice in identifying number patterns if needed.
Extension activity
Start at random numbers e.g. 5000 and ask pupils to count up and down in 1000s. Do a few more examples for practice.

Homework activity
WB, Worksheet 1 page 5 Question 1.

Lesson 2 Pupil’s Book page 9

Preparation
You will need to have:
• Pupil’s Book
• Workbook.

Starter activity
Call out some numbers for the pupils to write down, for example twenty-three thousand, four hundred and seventy-six. Include numbers that have zeros in them, for example fourteen thousand and sixty-six. Play ‘guess my number’. You should think of a number, and the pupils have ten or twenty questions to identify the number. They can only ask questions to which the answer is either ‘yes’ or ‘no’, for example ‘Is its tens’ digit less than 5?’, ‘Does it have more than six hundreds?’ and ‘Is its thousands’ digit even?’ You can either let the pupils know how many digits the number has, or make the pupils guess that as well. You or they could keep track of what numbers are still left, using a number line or a number square.

Lesson focus
Demonstrate how to count forward and backward in millions. At first, concentrate on rounded values i.e., 1 000 000, 2 000 000, etc. Follow this by counting in the intermediate million values i.e. 1 100 000, 2 100 000, etc. Pupils should count forward and backward in these intermediate numbers. Work through Exercise 2 on page 10 in the PB and guide pupils in the counting exercises.

Answers
Exercise 2
1. Check pupil’s answers.
2. Check pupil’s answers.

Assessment
Check that pupils can count forwards and backwards in millions and do not get confused by the other digits.

Extension activity
Start at any given number and count up and down in millions e.g. start at 25 000 000 and count down from it. Do a few more examples that involve counting in both directions.

Homework activity
Worksheet 1 page 5 Question 2.

Lesson 3 Pupil’s Book page 10

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Copies of abacus sheets
• Place value tables.

Starter activity
Practise place values of numbers up to 100 000. Design photocopiable place value tables and give a copy to each pupil. Call out a few large numbers and have pupils write the numbers under their correct place values on their tables.

Lesson focus
Demonstrate that the pupil’s place value table can be extended to an extra place value for millions. Explain how the number 94 613 can be placed on the place value table by including the place holder, 0, for 100 000s and 1 000 000s. Refer to page 11 in the PB. Also point out that 94 613 is less than 100 000 and 1000 000.
Introduce the copies of the paper abacus (you might want to have printed copies of these for each pupil). Show how place values can be identified on the abacus by means of colouring the appropriate number of abacus beads. In particular, show the pupils how the abacus match the columns of the place value table.

_answers_

_exercise 3_

1. | HM | TM | M | HTh | TTh | Th | H | T | U |
   |----|----|---|-----|-----|---|---|---|---|
   a |   |   | 2 | 1   | 9  | 4 | 2 | 3 |
   b |   |   | 1 | 0   | 5  | 7 | 5 | 4 |
   c |   |   | 2 | 5   | 6  | 3 | 6 | 7 | 3 |
   d |   |   | 1 | 9   | 1  | 4 | 3 | 8 | 3 | 5 |
   e |   |   | 8 | 2   | 0  | 6 | 0 | 5 | 2 | 7 |
   f |   |   | 5 | 2   | 3  | 6 | 7 | 1 | 3 | 2 |
   g |   |   | 4 | 7   | 0  | 3 | 1 | 5 | 9 | 2 |
   h |   |   | 8 | 9   | 9  | 4 | 4 | 1 | 2 |
   i |   |   | 1 | 3   | 9  | 2 | 7 | 6 | 2 | 8 |

2. Check pupil’s answers

_assessment_

Pupils should be familiar with the use of an abacus to denote numbers in thousands, hundreds, tens and units. Some pupils may need extra practice at this, so provide an abacus and extra examples for pupils that need them. Assess if pupils can correctly identify the place value of a number in numbers in the millions.

_extension activity_

Write the place and value of each number that is underlined.

1. 21,816,835
2. 22,482,784
3. 17,293,640
4. 42,188,384
5. 96,742,974
6. 73,882,340
7. 58,598,513
8. 35,968,755
9. 18,887,558
10. 52,848,782

_homework activity_

Worksheet 1 page 5 Question 3.

_lesson 4_

_lesson focus_

The purpose of this lesson is to consolidate the previous three lessons by providing integrated exercises. Careful attention should be given to how pupils cope with the process of integrating knowledge and how effective they are in applying this knowledge. Pupils to complete Exercise 4, quantitative reasoning, page 12 and Revision exercise page 13.

_answers_

_exercise 4_

1. 1014897
   14897
   2014897

2. 1007354
   7354
   2007354

3. 1354678
   354678
   2354678

4. 4134209
   3134209
   5134209
5. a) 3 732 435
   b) 4 732 435

6. a) 25 762 296
   b) 24 762 296

Revision exercise
1. a) 1 019 047; b) 1 000 671; c) 1 829 996; d) 1 469 006; e) 24 568 293

2. |   | HM | TM | M | HTh | TTh | Th | H | T | U |
   |---|----|----|---|-----|-----|----|---|---|---|
   a | 54 316 |
   b | 827 304 |
   c | 70 832 |
   d | 8 456 731 |
   e | 2 001 001 |

3. a) 600; b) 600 000 and 6 000; c) 6 000; d) 6 000 000; e) 60

4. |   | HM | TM | M | HTh | TTh | Th | H | T | U |
   |---|----|----|---|-----|-----|----|---|---|---|
   a | 254 508 |
   b | 130 039 |
   c | 12 973 241 |
   d | 1 014 571 |
   e | 3 591 127 |

5. a) |   | TM | M | HTh | TTh | Th | H | T | U |
     | Abia | 1 | 4 | 3 | 0 | 2 | 9 | 8 |
     | Adamawa | 1 | 6 | 0 | 7 | 2 | 7 | 0 |
     | Anambra | 1 | 9 | 8 | 3 | 2 | 0 | 2 |
     | Kano | 4 | 9 | 4 | 7 | 9 | 5 | 2 |
     | Lagos | 4 | 7 | 1 | 9 | 1 | 2 | 5 |

b) Abia
   Kano
   Adamawa
   Lagos

Assessment
Use the Revision exercise to test pupil’s understanding of the work.

Extension activity
Challenge page 14.

Homework activity
Worksheet 1 page 6 Question 5.

Workbook answers Worksheet 1
1. a) 982 500, 980 500, 978 500
   b) 2 300 200, 2 400 200, 2 450 200
   c) 9 765 000, 6 765 000, 5 765 000, 4 756 000
   d) 725 555, 1 025 555, 1 325 555, 1 625 555
   e) 604 000, 474 000
   f) 2 222 100, 4 442 100, 6 662 100
2. a) four hundred thousands
   b) six thousands
   c) ten thousands
   d) millions
3. 69 million
4. a) Kano
   b) Abjuba
   c) Katsina
   d) 36 million
   e) 45.5
   f) 123.5 million
5. Answers will vary according to your specific town or village. Give pupils help in researching this question.
Objectives
By the end of this unit, pupils will be able to:
- Write large numbers in words
- Write large numbers in figures
- Compare and order large numbers
- Apply counting of large numbers to real-life situations
- Solve problems using quantitative reasoning.

Suggested resources
Copies of place value tables; Small objects as counters, such as buttons or seeds; Abacus; Number chart; Word wall of numbers from 1 to 20, then in tens, hundreds, thousands, hundred thousands and millions; Digit cards

Key word definitions
- placeholder: a digit in a number that keeps an empty place value position. In our number system we use the figure 0 (zero) as a placeholder
- ascending: from smallest to largest
- descending: from largest to smallest

Frequently asked questions
Q What prior knowledge should the pupil have?
A Pupils should be able to read, write, represent, order and compare large numbers. Pupils should also possess a level of linguistic proficiency in order to express numbers in words and vice versa.

Evaluation guide
Pupils to:
1. Read and write large numbers in words and figures.
2. Compare and order large numbers.
3. Apply counting of large numbers to real-life situations.
4. Solve problems on quantitative reasoning involving counting in thousands and millions.

Lesson 1 Pupil’s Book page 15

Preparation
You will need to have:
- Pupil’s Book

Suggested resources
- Workbook
- Copies of place value tables
- Word wall of numbers from 1 to 20, then in tens, hundreds, thousands, hundred thousands and millions
- Numbers written as words on large cards (optional)
- Digit cards.

Starter activity
Revise reading large numbers by, concentrating on the place values of digits.
Suggestion: Make a set of cards (enough for the every pupil in class) with different digits on them. Separate the class into groups of 6 or 7 and call out a large number for each group. The pupils have to arrange themselves in the order of the large number called out provided they have the necessary digits.

Lesson focus
Explain the concept of place values again and this time, emphasise the notion of a place holder and how it works. For example, explain that a number like 9008 contains only thousands and units – hundred and tens have no value in this particular number. Now explain how large numbers are put into words by reading the number from left to right e.g. 2 014 867 has 2 millions, 0 hundred thousands, 1 ten thousand, 4 thousands, 8 hundreds, 6 tens and 7 units. Therefore, it is written as “two million fourteen thousand eight hundred and sixty seven. Complete Exercise 1 page 16.
Answers

Exercise 1
1. a) Ninety nine thousand nine hundred and ninety nine
   b) Two hundred and forty five thousand and forty five
   c) One hundred and twenty eight thousand and fifty four
   d) One million one hundred seventy four thousand two hundred and ninety five
   e) Twenty three million eight hundred eighty eight thousand four hundred and eighty four
   f) Nine hundred ninety nine million nine hundred ninety nine thousand nine hundred and ninety nine
2. a) Four hundred seventy one thousand seven hundred and thirty four
   b) Eight million one hundred thirty four thousand and thirty
   c) Eighty million one thousand two hundred and thirty one
   d) Four hundred twelve million seventy nine thousand one hundred and eleven
   e) Nine hundred million nine hundred thousand nine hundred

Assessment
Pupils should understand the use of place holders in large numbers. Pupils should be able to write large numbers in words.

Extension activity
Pupils can work in pairs and write numbers for each other.

Homework activity
Worksheet 2 page 7 questions 1 & 2.

Lesson 2  Pupil’s Book page 16

Preparation
You will need to have:
- Pupil’s Book
- Workbook
- Number chart
- Digit cards.

Starter activity
Distribute the digit cards amongst the groups again and ask each group to use make the largest number possible from the cards available to them. Repeat the activity, but this time the groups must make the smallest number possible from all the cards available to the group.

Lesson focus
Pupils are now required to convert word numbers into figures. Revise with them how to identify the place values and show them how these are converted into words. E.g. Two hundred and thirty four thousand, seven hundred and fifty six. Separate the values in order from left to right:

\[200 000 + 30 000 + 4 000 + 700 + 50 + 6 = 234 756\]

Complete Exercise 2 page 16.

Answers

Exercise 2
1. a) 177 105; b) 600 001; c) 909 200; d) 2 900 600; e) 25 409 833
2. a) 202 546; b) 800 008; c) 789 089; d) 79 000 158; e) 999 900 909

Assessment
Make sure that pupils can count forwards or backwards. Give extra practice using objects as counters if needed.

Extension activity
Challenge page 19.

Homework activity
Worksheet 2 Question 3 page 8.
Starter activity
Follow up to the previous starter activity: Get the biggest number that each group created in the previous activity and ask them to hold up their number cards in display. Now ask them to rearrange their groups in a line so that the group with highest number is first and the smallest last. Repeat the activity for the smallest numbers created.

Lesson focus
In this lesson we want pupils to gain an intuitive understanding of how we can rank numbers in ascending and descending order. If the starter activity proved successful, it is an indication of pupils intuitive grasp of the concepts. If pupils were unsuccessful in the starter activity, the teacher will have to go through the steps outlined on page 17 of the PB.

Answers
Exercise 3
1. a) 1 699; 14 631; 42 361; 62 134; 67 431
b) 121 345; 121 600; 124 543; 152 342; 156 432
c) 26 700; 216 300; 216 732; 262 372; 263 273
d) 491 099; 491 916; 491 939; 491 950; 491 961
e) 102 347; 103 429; 256 321; 300 251; 301 925; 593 487
2. a) 67 431; 62 134; 42 361; 14 631; 1 699
b) 156 432; 152 342; 124 543; 121 600; 121 345
c) 263 273; 262 372; 216 732; 216 300; 26 700
d) 491 961; 491 950; 491 939; 491 916; 491 099
e) 593 487; 301 925; 300 251; 256 321; 103 429; 102 347

Exercise 4
1. a) 435 005 01; b) 795 650 000; c) 31 536 000; d) 855 000 405; e) 150 000 000
2. a) One hundred forty eight million eight hundred thousand; b) Seven hundred seventy five million nine hundred thousand; c) Four

Extension activity
1. The chart shows annual salaries for some famous sports stars:

<table>
<thead>
<tr>
<th>SPORT</th>
<th>ANNUAL SALARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soccer</td>
<td>₦6 500 000</td>
</tr>
<tr>
<td>Tennis</td>
<td>Two million four hundred and eighty thousand</td>
</tr>
<tr>
<td>Rugby</td>
<td>1 225 500</td>
</tr>
<tr>
<td>Gold</td>
<td>Eighteen million</td>
</tr>
<tr>
<td>Basketball</td>
<td>12 350 200</td>
</tr>
</tbody>
</table>

Ask pupils to arrange the salaries in order from least to greatest by sport. Pupils should be able to explain how they decided on the order.

Homework activity
Worksheet 2 page 8 Question 4.

Lesson 4 Pupil’s Book page 18

Preparation
You will need to have:
• Pupil’s Book
• Workbook.

Starter activity
Suggestion: Bring newspapers or magazines or any other sources of media found in real life and ask pupils to look up word numbers and figure numbers. Ask them to explain the context in which these numbers are used in the media.

Lesson focus
The focus of this lesson is on familiarising pupils with the contextual nature of numbers and understanding how numbers are used in our daily lives. Complete Exercise 4 page 18.

Answers
Exercise 4
1. a) 435 005 01; b) 795 650 000; c) 31 536 000; d) 855 000 405; e) 150 000 000
2. a) One hundred forty eight million eight hundred thousand; b) Seven hundred seventy five million nine hundred thousand; c) Four
hundred ninety five thousand five hundred and fifty; d) Five thousand two hundred and fifty; e) Nine million five hundred and sixty thousand

**Assessment**

Listen to pupils answers whilst completing Exercise 4 in class. Identify any pupils who need extra practice.

**Extension activity**

Pupils to find out how many minutes there are in July.

**Homework activity**

Ask pupils to research and find out the distance of all the planets from the Sun.

---

**Lesson 5 Pupil’s Book page 19**

#### Preparation

You will need to have:
- Pupil’s Book
- Workbook.

#### Lesson focus

Revise the aspects covered in this unit. Emphasise the summary on page 20 of the PB and explain again each of the bulleted points.

#### Answers

**Exercise 5**

| seven million one hundred thousand and seven | 15 003 236 |
| Three million, ten thousand and thirteen | 111 111 111 |
| One hundred and twenty eight thousand, one hundred and one | 7 100 007 |
| Fifteen million, three thousand, two hundred and thirty-six | 3 010 013 |
| Nineteen million one hundred thousand and ninety-one | 128 101 |
| One hundred and eleven million one hundred and eleven | 19 100 091 |

**Revision exercise**

1. a) Two million forty eight thousand one hundred and twelve

---

**Assessment**

Use the Revision exercise as an informal assessment.

**Extension activity**

Challenge page 20.

**Homework activity**

Refer to the table in Question 4 of the Revision exercise page 20 and write the figures out in words.

---

**Answers to Worksheet 2 page 7 Workbook**

1. a) 98 b) 705 c) 520

2. a) 9,700,520 b) One hundred and eighty three thousand, seven hundred and fifty six
c) Two million, seven hundred and fifty three thousand, eight hundred and sixty four
d) 5,040,405

3. 37,750,750,057,988,632,2,568,881,3,333,333,45,001,100.

4. a) 30,000.
b, c & d) Answers will vary, pupils must select numbers so that the sum of the external numbers add up to the internal number.
Objectives
By the end of this unit, pupils will be able to:
• Find the factors of a given whole number
• Identify prime numbers less than 100
• Express whole numbers, less than 100, as product of prime factors
• Solve problems using quantitative reasoning.

Suggested resources
Table of factors chart; Number chart

Key word definitions
factor: a number that will divide exactly into another number
prime factor: a factor of a number that is also a prime number
remainder: occurs when a number cannot divide evenly into another

Evaluation guide
Pupils to:
1. Identify prime numbers from 1 to 100.
2. Express given numbers as product of prime factors.

Lesson 1 Pupil’s Book page 21

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Table of factors chart.

Starter activity
Revise the meaning of division and the concept of “remainder” with pupils. Make sure they are able to divide evenly divisible and unevenly divisible numbers using long or short division methods.

Lesson focus
Explain the concept of a factor and how it relates to the process of multiplication. When two numbers are multiplied they produce a product. When we find the factors of a number, it is the reverse process of finding the product. In other words, the product is broken up into the 2 constituents that were multiplied together originally. Refer to the example on page 21 of the PB and explain how 30 can be broken down into its factors. Pay careful attention to explaining that 30 can have more than 1 set of factors as shown in the PB example.

Explaining carefully that multiples and factors are related. If a number is a multiple of x then x is a factor of that number. Look at a simple multiplication statement such as $4 \times 5 = 20$ and explain it in terms of multiples and factors: 20 is a multiple of 4 and a multiple of 5, and 4 and 5 are both factors of 20. Repeat for $24 \div 6 = 4$: 24 is a multiple of 4 and of 6, and 4 and 6 are factors of 24. Write more statements on the board and ask the pupils to explain them in terms of factors and multiples. Complete Exercise 1 page 21.

Answers
Exercise 1
1. a) 1; 3; 5; 15; b) 1; 2; 4; 6; 24; c) 1; 2; 4; 8; 16; 32; d) 1; 47; e) 1; 3; 17; 51; f) 1; 2; 4; 8; 16; 32; 64; g) 1; 2; 3; 4; 6; 8; 9; 12; 18; 24; 36; 72; h) 1; 3; 9; 27; 81; i) 1; 2; 4; 8; 11; 22; 44; 88; j) 1; 2; 3; 4; 6; 8; 12; 16; 24; 32; 48; 96
2. Factors of each of the numbers:
   a) 16 are 1; 2; 4; 8; 16
   b) 28 are 1; 2; 4; 7; 28
   c) 48 are 1; 2; 3; 4; 6; 8; 12; 16; 24; 48
   d) 56 are 1; 2; 4; 7; 8; 14; 28; 56
   e) 60 are 1; 2; 3; 4; 5; 6; 10; 12; 15; 20; 30; 60
   f) 66 are 1; 2; 3; 6; 11; 22; 33; 66
   g) 84 are 1; 2; 3; 4; 6; 7; 12; 14; 21; 28; 42; 84
   h) 90 are 1; 2; 3; 5; 6; 9; 10; 15; 18; 30; 45; and 90
   i) 96 are 1; 2; 3; 4; 6; 8; 12; 16; 24; 32; 48; 96
   j) 99 are 1; 3; 9; 11; 33; 99

Of the numbers 1, 2, 3, 5, 6, 10 and 15, only 1 is a factor of each of the numbers above.

Extension activity
For the Challenge encourage pupils to find pairs of numbers whose product matches the numbers given, so for Question 1: 2 × 5 = 10, so any multiple of 10 will also be a multiple of 2 and of 5. Cheryl is making candy baskets for her friends. She has 36 chocolate bars, 18 lollipops, and 12 gummy bears. All baskets must have the same number of each item.

What is the greatest number of candy baskets she can make without any items left over? Use what you know about factors to explain your answer.

Homework activity
Worksheet 3 page 9 Question 1.

Lesson 2  Pupil’s Book page 21

Preparation
You will need to have:
- Pupil’s Book
- Workbook
- Table of factors chart
- Number chart
- Sieve of Eratosthenes.

Starter activity
Play ‘What is my number?’ with the pupils, focusing on questions that involve multiples and divisibility of 2, 3, 4, 5, 6 and 9. Ask the pupils questions such as ‘My number is divisible by 3 and it is less than 20, what could my number be?’, ‘My number is a multiple of both 4 and 10 and is more than 70, but less than 100, what is my number?’ ‘My number is a three-digit multiple of 4 (or 3, 6, 9), what could it be?’ and ‘Is 2 853 a multiple of 6? How do you know?’

Lesson focus
Explain that a prime number has only two factors, i.e. 1 and itself. Also emphasise that 1 is not a prime number as prime numbers all have 2 factors. The Sieve of Eratosthenes is a useful and fun resource that can be used to enhance pupils understanding of what a prime number is. Refer to page 22 for the example of how this activity works. A larger copy of the Sieve of Eratosthenes can be downloaded from the internet for photocopying. Complete Exercise 2.

Answers
Exercise 2

1. 2, 3, 5, 7. There are 4 prime numbers below 10.
   1 is not a prime number; it is considered as a special number.

2. 23; 29; 31; 37. There are 4 prime numbers between 20 and 40.

3. 53; 59; 61; 67; 71; 73; 79; 83; 89; 97. There are 10 prime numbers between 50 and 100.

4. 1 2 4 9 13 22 63 89

Assessment
Check that pupils understand the meaning of prime numbers. If pupils are experiencing difficulty, ask them to make a number square containing the numbers 1–100 and to circle all the prime numbers.

Extension activity
Ask pupils to find all the prime numbers between 100 and 150. Can they find primes up to 200?

Homework activity
Worksheet 3 page 10 Question 2.
Lesson 3  Pupil’s Book page 23

Preparation
You will need to have:
- Pupil’s Book
- Workbook
- Table of factors chart
- Number chart.

Starter activity
Use the example from the previous lesson when you found the factors of 30. Take any pair of factors e.g. 15 & 2 and ask pupils which of these 2 numbers are prime. They should be able to identify 15 as not prime. Now ask them to find the factors of 15 and to state whether those factors are prime. Point out that by using prime factors 30 can be obtained by multiplying 2, 3 and 5. Thus there are three prime factors instead of the 2 we worked with in the previous lesson.

Lesson focus
Refer to the steps outlined on page 23 of the PB and find the prime factors of a few more numbers with the pupils before completing the exercise with them. Complete Exercise 3 page 23 PB.

Answers
Exercise 3
1. a) 3; 5; b) 2; c) 2; d) 47; e) 3; 17; f) 2; g) 2; 3; h) 3; i) 2; 3
2. a) 30 prime factors are 2; 3; 5 or 30 = 2 × 3 × 5
   b) 36 prime factors are 2; 3 or 36 = 2 × 2 × 3 × 3
   c) 48 prime factors are 2; 3 or 48 = 2 × 2 × 2 × 2 × 3
   d) 60 prime factors are 2; 3; 5 or 60 = 2 × 2 × 3 × 5
   e) 75 prime factors are 3; 5 or 75 = 3 × 5 × 5
   f) 100 prime factors are 2; 5 or 100 = 2 × 2 × 5 × 5

Extension activity
Ask pupils to work through the following exercise. Pupils have to find the prime factors of the exercise below. Take note that this might be quite a demanding exercise and you may have to show pupils how to go about finding the prime factors and how to write up the answers.

<p>| | | | | |</p>
<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>18</td>
<td>2.</td>
<td>55</td>
<td>3.</td>
</tr>
<tr>
<td>4.</td>
<td>41</td>
<td>5.</td>
<td>39</td>
<td>6.</td>
</tr>
<tr>
<td>7.</td>
<td>61</td>
<td>8.</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>89</td>
<td>10.</td>
<td>75</td>
<td>11.</td>
</tr>
<tr>
<td>12.</td>
<td>96</td>
<td>13.</td>
<td>55</td>
<td>14.</td>
</tr>
<tr>
<td>15.</td>
<td>88</td>
<td>16.</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>80</td>
<td>18.</td>
<td>65</td>
<td>19.</td>
</tr>
<tr>
<td>20.</td>
<td>66</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Answers
1. 2 × 3 × 3
2. 5 × 11
3. 1 × 53
4. 1 × 41
5. 3 × 13
6. 3 × 23
7. 1 × 61
8. 2 × 2
9. 1 × 89
10. 3 × 5 × 5
11. 2 × 2 × 2 × 2 × 2
12. 2 × 2 × 2 × 2 × 3
13. 5 × 11
14. 2 × 2 × 5 × 5
15. 2 × 2 × 2 × 11
16. 2 × 2 × 3 × 3
17. 2 × 2 × 2 × 2 × 5
18. 3 × 13
19. 2 × 2 × 3
20. 2 × 3 × 11

Homework activity
Worksheet 3 page 10 Question 3.

Lesson 4  Pupil’s Book page 23

Preparation
You will need to have:
- Pupil’s Book
- Workbook
- Table of factors chart.

Lesson focus
Use Exercise 4 and the Revision exercise on page 24 of the PB to reinforce the concepts covered in this unit. Provide guidance and monitor pupils ability to work through these exercises on their own.

Assessment
Make sure that pupils have a good understanding of prime factors. Revise multiplication tables or put up charts of multiplication tables around the classroom.
Unit 3: Factors and prime numbers less than 100

Answers

Exercise 4

1. 5
   70
   2
   14
   35

2. 9
   11
   99
   9
   11

3. 4
   96
   12
   24
   8

4. 72
   9
   8

5. 2
   4
   21
   42
   84

Workbook Answers Worksheet 3

1. a) completed
   b) 1 30
       2 15
       3 10
       5 6
   c) 1 84
      2 42
      3 28
      4 21
      6 14
      7 12
   d) 1 120
      2 60
      3 40
      4 30
      5 24
      6 20
      8 15
      10 12
   e) 1 20
      2 10
      4 5
   f) 1 154
      2 77
      7 22
      11 14
   g) 1 1155
      3 385
      5 231
      7 165
      11 105
      15 77

2. b) 24 = 2,2,2,3
    c) 45 = 3,3,5
    d) 84 = 2,2,3,2

3. a) 24 = 2,3; 36 = 2,3
    b) 24 = 24 × 1, 12 × 2, 8 × 3, 6 × 4;
       36 = 36 × 1, 18 × 2, 12 × 3, 4 × 9, 6 × 6;
       common factors are 12, 3, 2, 6, 4, highest common factor is 12.

4. a) 24 = 2,3; 36 = 2,3
    b) 450 = 3,3,5,5

5. a) 15
    b) 7
    c) 15
    d) 6
    e) 24(12 × 2)
    f) 6

Revision exercise

1. 45  2. 42  3. 48  4. 48
5. 48  6. 54  7. 41; 43; 47; 53; 59; 61
8. a) 24 = 1 × 24; 2 × 12; 3 × 8; 4 × 6
     b) 45 = 1 × 45; 3 × 15; 5 × 9
     c) 36 = 1 × 36; 2 × 18; 3 × 12; 4 × 9; 6 × 6
     d) 42 = 1 × 42; 2 × 21; 3 × 14; 6 × 7
9. a) 16 = 2 × 2 × 2 × 2
     b) 70 = 2 × 5 × 7
     c) 72 = 2 × 2 × 2 × 3 × 3
     d) 880 = 2 × 2 × 2 × 2 × 2 × 5 × 11
     e) 94 = 2 × 47
     f) 100 = 2 × 2 × 5 × 5

Assessment

Use the Revision exercise to assess pupils and evaluate them.

Extension activity

Find the Prime Factors of the Numbers:

1. 66  2. 72  3. 1  4. 80
5. 4  6. 9  7. 8  8. 57
9. 56 10. 42 11. 5 12. 38
13. 14 14. 7 15. 69

Homework activity

Worksheet 3 page 10 Question 4.
Worksheet 3 page 10 Question 5.
Unit 4: Changing fractions to decimals and percentages

Objectives
By the end of this unit, pupils will be able to:
• Change fractions to decimals and percentages
• Solve quantitative aptitude questions relating to percentages.

Suggested resources
Fraction-decimal conversion chart; Fraction-percentage chart; Decimal-percentage conversion chart; Percentage-decimal conversion chart; Flash cards; 10 × 10 grid paper

Key word definitions
convert: to change one thing into another
denominator: the number in a fraction that is below the line and that divides the number above the line
numerator: the number written above the line in a common fraction to indicate the number of parts of the whole

Evaluation guide
Pupils to:
1. Change fractions to decimals and decimals to percentages and vice versa.
2. Quantitative aptitude related to percentage.

Teaching this unit
Pupils have been working with fractions for a number of grades now. This unit builds directly on the work done on fractions in the previous grade. Throughout this unit refer to the number line as often as possible and guide your pupils to see where different fractions are placed on the number line. To introduce pupils to the content of this unit, take care to explain to pupils that fractions, decimals and percentages are equivalent forms i.e. they are just different ways of expressing how parts of a whole are divided. In the case of decimals the whole is denoted by 1 and in the case of percentages the whole is 100 (all percentages are expressed as parts of 100).

Lesson 1  Pupil’s Book page 25

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Fraction-decimal conversion chart
• 10 × 10 grid paper.

Starter activity
Hand out copies of 10 × 10 grid paper and ask pupils to shade various fractional parts e.g. Shade half of the blocks, shade a quarter of all the blocks, etc.

Lesson focus
The word decimal is derived from the Latin word for 10 and therefore implies that a unit can be broken up into ten equal parts. Refer to page 25 in the PB and explain how the circles representing the unit have been broken up into fractional parts, which can then be considered as parts of ten. Explain that decimal numbers can be obtained by dividing a number by ten e.g. 5 can be converted into decimal by simply dividing by 10 \( \frac{5}{10} = 0.5 \). By writing these numbers in the form of a fraction i.e. \( \frac{5}{10} \), the fraction can be simplified to obtain \( \frac{1}{2} \).

Work through the examples on page 25 of the PB to reinforce the process of conversion from fraction to decimal and vice versa. Complete exercises 1, 2, 3 page 26.
Exercise 1
1 a) 0.9  b) 0.7  c) 0.3  
   d) 0.48  e) 0.84

Exercise 2
1 a) \(\frac{3}{10}\)  b) \(\frac{5}{10} - \frac{1}{2}\)  c) \(\frac{5}{10}\)  
   d) \(\frac{47}{100}\)  e) \(\frac{75}{100} = \frac{3}{4}\)

Exercise 3
1 a) 2 000  b) 9 000  
   c) 7 000  d) 1 000

Assessment
Check that pupils remember the parts of a fraction, use a number line and board work to revise.

Extension activity
Let pupils write out fractions using multiples of 5 and convert to decimals.

Homework activity
Give pupils the following exercise for homework.

Answers
1a. \(\frac{1}{4}\) = 0.25  1b. \(\frac{86}{100}\) = 0.86  1c. \(\frac{7}{50}\) = 0.14
2a. \(\frac{38}{100}\) = 0.38  2b. \(\frac{7}{10}\) = 0.7  2c. \(\frac{1}{10}\) = 0.1
3a. \(\frac{1}{2}\) = 0.5  3b. \(\frac{3}{10}\) = 0.3  3c. \(\frac{41}{50}\) = 0.82
4a. \(\frac{6}{10}\) = 0.6  4b. \(\frac{8}{10}\) = 0.8  4c. \(\frac{2}{10}\) = 0.2
5a. \(\frac{41}{100}\) = 0.41  5b. \(\frac{7}{100}\) = 0.07  5c. \(\frac{27}{100}\) = 0.26
6a. \(\frac{9}{10}\) = 0.9  6b. \(\frac{3}{4}\) = 0.75  6c. \(\frac{66}{100}\) = 0.66
7a. \(\frac{2}{25}\) = 0.08  7b. \(\frac{6}{100}\) = 0.06  7c. \(\frac{44}{100}\) = 0.44
8a. \(\frac{4}{10}\) = 0.4  8b. \(\frac{46}{100}\) = 0.46  8c. \(\frac{59}{100}\) = 0.59

Lesson 2  Pupil’s Book page 27

Preparation
You will need to have:  
• Pupil’s Book  
• Workbook  
• Decimal-percentage conversion chart  
• Fraction-decimal conversion chart.

Starter activity
Revisit the 10 × 10 grid activity of the previous lesson and point out that the grid contains a total of 100 blocks. Ask pupils to shade a chosen number of blocks e.g. 20, 25, etc. and to write the number of shaded blocks over the total number of blocks in the grid. They should obtain fractions with denominators of 100.

Lesson focus
Make the connection with the starter activity by pointing out that fractions with denominators of 100 are called percentages. Therefore, percentage means “per 100” and the symbol % is used. In order to change any fraction to a percentage (i.e. a value out of 100), the denominator must be converted to 100. Work through the examples on page 27 of the PB before assigning Exercise 4 to the
pupils. Carefully explain how Exercise 5 should be completed by working through one of the examples in the table. Complete Exercise 4 and 5 pages 27 and 28 PB.

**Answers**

**Exercise 4**

1. a) \(\frac{68}{100} = 68\%\)  
   b) \(\frac{14}{100} = 14\%\)  
   c) \(\frac{9}{10} = 90\%\)  
   d) \(\frac{63}{100} = 63\%\)  
   e) \(\frac{99}{100} = 99\%\)

**Exercise 5**

<table>
<thead>
<tr>
<th>Fraction</th>
<th>Decimal fraction</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\frac{1}{2})</td>
<td>0.5</td>
<td>50</td>
</tr>
<tr>
<td>(\frac{1}{10})</td>
<td>0.1</td>
<td>10</td>
</tr>
<tr>
<td>(\frac{3}{10})</td>
<td>0.3</td>
<td>30</td>
</tr>
<tr>
<td>(\frac{3}{5})</td>
<td>0.6</td>
<td>60</td>
</tr>
<tr>
<td>(\frac{17}{100})</td>
<td>0.17</td>
<td>17</td>
</tr>
<tr>
<td>(\frac{38}{100})</td>
<td>0.38</td>
<td>38</td>
</tr>
<tr>
<td>(\frac{1}{5})</td>
<td>0.2</td>
<td>20</td>
</tr>
</tbody>
</table>

**Exercise 6**

a)  

<table>
<thead>
<tr>
<th>Activity</th>
<th>Fraction</th>
<th>Hours of day</th>
<th>Decimal fraction</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleeping</td>
<td>(\frac{3}{8})</td>
<td>9</td>
<td>0.375</td>
<td>37.5</td>
</tr>
<tr>
<td>School</td>
<td>(\frac{2}{8})</td>
<td>6</td>
<td>0.25</td>
<td>25</td>
</tr>
<tr>
<td>Playing</td>
<td>(\frac{1}{8})</td>
<td>3</td>
<td>0.125</td>
<td>12.5</td>
</tr>
<tr>
<td>Helping</td>
<td>(\frac{1}{8})</td>
<td>3</td>
<td>0.125</td>
<td>12.5</td>
</tr>
<tr>
<td>Sport</td>
<td>(\frac{1}{8})</td>
<td>3</td>
<td>0.125</td>
<td>12.5</td>
</tr>
</tbody>
</table>

b)  

<table>
<thead>
<tr>
<th>Language spoken</th>
<th>Fraction</th>
<th>Percentage</th>
<th>Number if 500 people in village</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swahili</td>
<td>(\frac{6}{10})</td>
<td>0.60</td>
<td>300</td>
</tr>
<tr>
<td>English</td>
<td>(\frac{3}{10})</td>
<td>0.30</td>
<td>150</td>
</tr>
<tr>
<td>Kikuyu</td>
<td>(\frac{1}{10})</td>
<td>0.10</td>
<td>50</td>
</tr>
</tbody>
</table>

**Assessment**

Check that pupils can:
- Identify a percentage
- Change fractions to percentage.

**Extension activity**

Complete the following exercise.

1. Five children raked Mr. Jones’ yard on Friday afternoon and earned \(\text{\$30}\) which they shared equally.
   a) What percentage of the money must each receive?  
   b) Write this percentage as a fraction that each must receive.  
   c) Write this percentage as a decimal fraction.

**Homework activity**

1. Convert the given decimals and fractions into percentages.  
   a) 0.65  
   b) \(\frac{3}{15}\)  
   c) 0.91  
   d) \(\frac{4}{24}\)  
   e) 0.05  
   f) \(\frac{2}{7}\)

2. Convert the following percentages into decimals and then convert them into fractions.
   a) 3\%  
   b) 32\%  
   c) 6.6\%  
   d) 14\%  
   e) 0.25\%  
   f) 265.34\%

**Preparation**

You will need to have:
- Pupil’s Book
- Workbook
- Fraction-decimal conversion chart
- Fraction-percentage chart
- Decimal-percentage conversion chart
- Percentage-decimal conversion chart.
Lesson focus
This lesson consolidates lessons 1 and 2 by working through Worksheet 4 page 12. Check pupils progress and monitor carefully how they cope with integrating the content covered in this unit. Pupils to start Worksheet 4 and complete it for homework.

Answers
See worksheet answers at the end of the unit.

Assessment
Check whether pupils can change fractions to decimals and percentages with confidence. Give help where needed.

Homework activity
Pupils to complete the worksheet.

Lesson 4  Pupil’s Book page 29

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Fraction-decimal conversion chart
• Fraction-percentage chart
• Decimal-percentage conversion chart
• Percentage-decimal conversion chart.

Lesson focus
Pupils revise the concepts covered in this unit by working through the Revision exercise. Check pupils progress and monitor carefully how they cope with integrating the content covered in this unit.

Answers
Revision exercise
4. a)

<table>
<thead>
<tr>
<th>Sport</th>
<th>Fraction</th>
<th>Decimal fraction</th>
<th>Number if 1 000 pupils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>$\frac{9}{20}$</td>
<td>0.45</td>
<td>450</td>
</tr>
<tr>
<td>Netball</td>
<td>$\frac{7}{20}$</td>
<td>0.35</td>
<td>350</td>
</tr>
<tr>
<td>Cricket</td>
<td>$\frac{1}{5}$</td>
<td>0.20</td>
<td>200</td>
</tr>
</tbody>
</table>

b)–d) Language spoken

<table>
<thead>
<tr>
<th></th>
<th>Football</th>
<th>Netball</th>
<th>Cricket</th>
</tr>
</thead>
<tbody>
<tr>
<td>20%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment
Check whether pupils can change fractions to decimals and percentages with confidence. Give extra practice if needed.

Homework activity
Pupils to correct answers.

Workbook answers Worksheet 4
1. a) 0.5  b) 0.625  c) 0.65
   d) 0.187  e) 0.24  f) 0.36

2. a) $\frac{1}{4}$  b) $\frac{3}{5}$  c) $\frac{7}{100}$
   d) $\frac{19}{20}$  e) $\frac{3}{400}$

1. $\frac{3}{4}$  0.75  75%
   $\frac{67}{100}$  0.67  67%
   $\frac{7}{10}$  0.7  70%
   $\frac{32}{5}$  3.4  340%
   $\frac{12}{5}$  1.8  180%

2. a) 24  b) 6
   c) 275.4  d) 9

3. a) 315  b) 18  c) 25%
   d) 108  e) 200%  f) 2 000

4. a) 16 $\frac{3}{5}$%  b) 12
   c) No 30% fell  d) Thursday and Sunday

5. a) 100 mm  b) 25%
   c) No 30% fell  d) Thursday and Sunday
Objectives
By the end of this unit, pupils will be able to:
• State the relationship between fraction and ratio
• Solve quantitative aptitude problems related to ratio.

Suggested resources
Concrete objects such as fruits (or shapes that can be divided into a number of equal parts); Maps for scaling down; House plan for scaling down

Key word definitions
ratio: shows the relative sizes of two or more values
truncated: shorten (something) by cutting off the top or the end
scaled down: a reduction according to a fixed ratio
scaled up: an increase proportionally

Evaluation guide
Pupils to:
1. State the relationship between ratio and fraction.
2. Solve quantitative aptitude problems related to ratio.
3. Find the ratios between two numbers.

Lesson 1 Pupil’s Book page 30

Preparation
You will need to have:
• Pupil’s Book
• Workbook.

Starter activity
Practise writing equivalent fractions. Begin with unitary fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, and ask pupils to give you as many equivalent fractions as they can for each. Write these on the board in a list. Ask them to consider the list, and tell you which is the ‘simplest’. Then introduce other fractions such as $\frac{2}{3}$, $\frac{3}{4}$, etc, and repeat the process. Then write on the board the fraction $\frac{10}{25}$, and ask pupils to give you equivalent fractions. If they do not suggest it, point out that $\frac{2}{5}$ is equivalent, to remind them that they can divide as well as multiply to get equivalent fractions.

Lesson focus
Explain that the word ‘ratio’ is used to describe the relative numbers of different things or parts. So when observing a total of 6 vehicles there are 2 buses for every 4 cars, which can be written in the form: ‘2 buses:4 cars’. The colon is used to separate the two parts of the ratio. The two sides of the ratio behave in exactly the same way as a fraction, and so it can also be simplified (we can find an equivalent ratio). In this case 2:4 can be simplified to 1:2, so the sentence could be written as ‘Out of three vehicles, there is 1 bus for every 2 cars’. I.e. there are half as many buses as cars, or twice as many cars as buses. Ensure that pupils understand the concept of ratio and the language used, before asking them to complete questions 1 to 6 of Exercise 1 on page 30.

Answers
Exercise 1
1. 21:19
2. 5:7
3. 19:6
4. 20:40 or 2:4
5. 1:1
Assessment
Explain to the pupils how ratio can be used to increase or decrease quantities in a regular way. They should know that when they increase something they need to multiply it by a ratio, in the form of an improper fraction, while to decrease something they will multiply by a ratio in the form of a simple fraction.

Extension activity
Challenge page 30.
Write the ratio of the following:
1. 🌟🌟🌟🌟
2. 🌟🌟🌟🌟🌟🌟
3. 🌟🌟🌟🌟🌟🌟
4. 🌟🌟🌟🌟🌟🌟
5. 🌟🌟🌟🌟🌟🌟

Homework activity
Worksheet 5 page 14 questions 1 & 2.

Lesson 2  Pupil’s Book page 31

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Concrete objects such as fruits (or shapes that can be divided into a number of equal parts).

Starter activity
Provide visual images for ratios then ask the pupils to describe the scenario using the language and notation of ratio, and vice versa. For example, ice cream cones have two scoops of chocolate ice cream to every one scoop of strawberry. You might extend the starter by using the colour coded tiles/squared paper and ask pupils to put ratios of one colour to another. E.g. The ratio of black tiles to white tiles is one to every three. On a more immediate level, you could ask the pupils to work out the ratio of boys to girls in the class and, if possible, the ratio of boys to girls in the school.

Lesson focus
Work through the example on page 31 of the PB showing how the ratio of 20:30 can be simplified by dividing both numbers by their highest common factor viz. 10. Thus simplifying the ratio to 2:3. This is called scaling down. Similarly, the ratio can be scaled up by multiplying both numbers in the ratio by the same scale factor e.g. 2. Therefore, 20:30 scaled up by 2 will become 40:60. However, reinforce the concept that whether the ratio is scaled up or down does not matter as the ratio will remain the same. Complete Exercise 2 page 31 and Exercise 3 page 32.

Answers
Exercise 2
1. 20:50 = 2:5
2. 40:80 = 4:8 = 1:2
3. 20:45
4. 30 min:2 h = 30:120 = 1:4
5. 7 days:1 week = 1:1
6. 60 cm:1 m = 60:100 = 3:5
7. 18 kg:90 kg = 1:5
8. 500 cm:3 m = 500:300 = 5:3
9. 70 g:5 kg = 70:5 000 = 7:500
10. 6 m:1 y = 6:12 = 1:2

Exercise 3
1. \(x:4 = 10:20\)
   \[\frac{x}{4} = \frac{10}{20} \implies \frac{x}{2} = 2; \quad x = 2\]
2. \(6:7 = 24:m\)
   \[\frac{6}{7} = \frac{24}{m} \quad \text{and} \quad m = 28; \quad m = 28\]
3. \(16:5 = y:10\)
   \[\frac{16}{5} = \frac{y}{10} \implies y = 32; \quad y = 32\]
4. \(r:2 = 36:72\)
   \[\frac{r}{2} = \frac{36}{72} \quad \text{and} \quad r = 1\]
5. \(2:3 = 24:k\)
   \[\frac{2}{3} = \frac{24}{k} \implies k = 36; \quad k = 36\]
6. \(p:5 = 14:35\)
   \[\frac{p}{5} = \frac{14}{35} \implies p = 10; \quad p = 10\]
7. \(18:x = 24:64\)
   \[\frac{18}{x} = \frac{24}{64} \implies x = \frac{18 \times 8}{3} \implies x = 48\]
8. \(3:10 = 24:n\)
   \[\frac{3}{10} = \frac{24}{n} \implies n = \frac{24 \times 10}{3} = 8 \times 10 = 80; \quad n = 80\]
9. \(w:8 = 24:64\)
   \[\frac{w}{8} = \frac{24}{64} \implies w = \frac{3 \times 8}{8} \implies w = 3; \quad w = 3\]
10. \(8:9 = h:45\)
    \[\frac{8}{9} = \frac{h}{45} \implies h = \frac{8 \times 45}{9} = 40; \quad h = 40\]
Lesson focus

Pupils must now be taught how to extrapolate ratios from a sentence or group of words.

Work through the example on page 32 of the PB. This example shows how the numbers in the ratio must be combined to produce the whole. It is, therefore, important that pupils are not still struggling with an understanding of the concept of fractions i.e. Parts of a whole.

If pupils struggle to grasp the example, you may have to do a few more examples to reinforce their understanding before letting them do Exercise 4 on page 32.

Answers

Exercise 4

1. \(\frac{22}{50} : \frac{24}{100}\), therefore ratio of bad to good mangoes is 24:76 or \(\frac{12}{33}:\frac{8}{19}\) or 6:19

2. 15 girls in class of 48; therefore 48 – 15 = 33 are boys. Ratio girls to boys is 15:33 = 5:11

3. 6 cm:24 km; convert to same unit 6:2 400 000 = 1:400 000

4. Ratio 1:4 of 1 500 is \(\frac{2}{4} \times 1 500 = 375\) and \(\frac{3}{4} \times 1 500 = 1 125\)
   therefore ratio of pearls is 375:1 125

5. Statue is 2m real lion 1.5m ratio = 2:1.5
   or \(\frac{2}{2.5} : \frac{1}{0.75}\) or 1:0.75 or 1: \(\frac{3}{4}\)

6. ratio 4:11, therefore \(\frac{1}{15}\) of 180 = \(\frac{180}{15}\) = 12 and 4 x 12 = 48 and 11 x 12 = 142 angles are 48° and 142°

7. Ratio 2:5. Calculate 1:2.5 if 1 = 1 400, 2.5 = 3 500, Sheriff’s share is 3 500

8. Flour:oil:water = 12:4:1 then \(\frac{12}{3} = 4\) and \(\frac{4}{4} = 1\)
   so 1 cup of oil should be used

9. Ratio 2:3 or \(\frac{2}{3} : \frac{1}{5}\) and \(\frac{3}{5}\) N180 000 or \(\frac{1}{2} = \frac{N60 000}{\frac{1}{2}}\), therefore if the first son collects \(\frac{1}{2}\) it is \(2 \times \frac{N60 000}{\frac{1}{2}} = N120 000\).

10. Share of 1:2 or \(\frac{2}{3} : \frac{1}{3}\) with \(\frac{2}{3}\) N3 500 or \(\frac{1}{3}\) N1 750 Bello’s share is N1 750 of a total of N3 500 + N1 750 = N5 250

Assessment

Make sure pupils understand how to create a ratio from a given word problem.
**Extension activity**
Give pupils the following exercises to attempt for extension. Answers can be checked at the start of the next lesson.

1. Salim had a hungry cat and Catherine had a very hungry dog. They had a 600 g bowl of food and decided that it should be split between the dog and cat in the ratio 2:1. How much food did each animal get?

2. Adu won $30 and shared the money amongst 6 other pupils in the ratio – 1:1:1:3:4:5. How much did each pupil get?

**Homework activity**
Worksheet 5 page 14 questions 5 & 6.

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**Lesson 4**  
**Pupil’s Book page 33**

**Preparation**
You will need to have:
- Pupil’s Book
- Workbook.

**Starter activity**
Recap work completed in lessons 1–3 of this unit. Ask pupils some quick questions on ratios.

**Lesson focus**
Pupils revise the concepts covered in this unit by working through the Revision exercise. Check pupils’ progress and monitor carefully how they cope with integrating the content covered in this unit. Complete Exercise 5 page 34 and Revision exercise page 34.

**Answers**

**Exercise 5**

1.  
<table>
<thead>
<tr>
<th>2</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>8</th>
<th>3</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>16</td>
<td>24</td>
<td>64</td>
<td>40</td>
<td>60</td>
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<td></td>
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</table>

2.  
<table>
<thead>
<tr>
<th>6</th>
<th>11</th>
<th>5</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>33</td>
<td>80</td>
<td>112</td>
</tr>
</tbody>
</table>

**Revision exercise**

1.  
   a) 1:9  
   b) 3:4  
   c) 2:7

2.  
   a) 6:2  
   b) 9:3  
   c) 5:6

3.  
   a) 2:3  
   b) 4:1  
   c) 2:3

4.  
   a) 1:100  
   b) 20:100 = 1:5

5.  
   a) false  
   b) true  
   c) false  
   d) true

6.  
   a) true  
   b) false  
   c) 225:100 = 45:20 = 9:4

---

**Workbook Answers Worksheet 5**

1.  
   a) 5:1  
   b) 1:2  
   c) 5:6  
   d) 2:3

2.  
   a) 10:14  
   b) 2:8  
   c) 30:32  
   d) 26:36

3.  
   a) 1:5  
   b) 3:6 or 1:2

4.  
   a) 1:100  
   b) 20:100 = 1:5

5.  
   a) false  
   b) true  
   c) false  
   d) true

7.  
   a) 1:9  
   b) 1:3  
   c) 51:119  
   d) 0.8:1

8.  
   84 pupils passed
Objectives
By the end of this unit, pupils will be able to:
• Add and subtract numbers involving three or more digits.

Suggested resources
Flash cards; Abacus; Counters or number lines; Colour-coded wooden blocks (small); Square pieces of cardboard

Key word definitions
vertical: at right angles to a horizontal plane; such that the top is directly above the bottom

Teaching this unit
Pupils will have covered addition and subtraction of both whole numbers and decimals in Grade 4.

They will have used the expansion method and the traditional column method which involves carrying and exchanging. This unit reinforces this method by getting pupils to add and subtract numbers with 3 digits or more. They will also use approximation to check their answers.

Frequently asked questions
Q Which is the best method to use for addition and subtraction?
A The column method is the most ‘economical’ method, in that it has the fewest steps. However, in some cases other methods are equally or even more effective. For example, a calculation such as 2 004 – 1 999 is most effective.

Common errors that pupils make
Pupils do not line the digits up correctly. Ask them to label the columns before they start work. Use squared paper, and insist that they put one digit in each square. They should also use rounding to estimate the answer. When demonstrating, always refer to the value of each digit as you write it.

Pupils ignore the zeros in subtraction, and go straight to the next whole number. This error means that they will exchange a thousand or a hundred for just ten units. Practise partitioning the numbers and then adding up what they have written down to check that the value is still the same. If you have Dienes apparatus, demonstrate the exchange physically by exchanging one thousand for ten hundreds, one hundred for ten tens (leaving nine hundreds) and so on.

Evaluation guide
Pupils to:
1. Add and subtract numbers involving three or more digits.

Lesson 1 Pupil’s Book page 36

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Counters or number lines
• Abacus
• Colour-coded wooden blocks (small)
• Square pieces of cardboard.

Starter activity
Give the pupils two-digit numbers. They should write down the number that when added to their given number will make 100, for example 45 and 55. Now give pupils a multiple of 10 up to 1 000 and ask for the pair to make 1 000, for example 460 and 540. Repeat this activity for multiples of 100 to 100 000, for example 2 300 and 7 700. Draw their attention to the fact that the number bonds they are using for all these activities are the same as number bonds to 100.
Lesson focus
Throughout this lesson, remind pupils to estimate an answer using rounding. Revise addition by going through the two worked examples on page 36 of the PB that show how the place values of numbers are arranged vertically and how numbers are added starting on the right with the units. Emphasise the need for carried numbers to be added to the next place value when each column adds up to 10 or more. For example, when we have 8 + 5, the answer is 13. 13 consist of 1 ten and 3 units and as such the ten such be carried across to the tens place value column. It is advisable to use concrete objects like an abacus or counting blocks or a number line to assist understanding amongst pupils. Then ask the pupils to do Exercise 1 page 36, and provide guidance with the carried numbers.

Answers
Exercise 1
1. 1 454  2. 1 465  3. 1 465
4. 1 601  5. 1 482  6. 1 554
7. 1 400  8. 574  9. 574
10. 840  11. 1 209  12. 582
13. 1 782  14. 636  15. 932

Assessment
Check pupil’s answers to Exercise 1 and make sure that they are lining up the digits correctly and using exchanging.

Homework activity
The following exercise may be given to provide extra practice to pupils. It is strongly recommended that pupils who are struggling should always do the extra exercises.
1. 183 + 854  2. 424 + 198
3. 370 + 398  4. 421 + 333
5. 658 + 150  6. 984 + 208
7. 591 + 253  8. 654 + 860
9. 810 + 742  10. 316 + 806
11. 953 + 174  12. 156 + 438

Lesson 2  Pupil’s Book page 37

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Counters or number lines
• Abacus
• Colour-coded wooden blocks (small)
• Square pieces of cardboard.

Starter activity
Revise subtraction of 2 digit numbers that do not involve “borrowing” e.g. 85 – 20, etc. Present these problems as a mental activity i.e. pupils should not be using any resources to solve these problems. Now present a few problems that involve borrowing e.g. 85 – 29, etc. This time allow pupils to use pen and paper to solve the problems. Do only a few of these so that you do not use too much of the lesson time. Recommended: 10 minutes maximum.

Lesson focus
Make sure that they understand how to subtract a larger number from a smaller one. You can use apparatus, like an abacus, to assist understanding. Before pupils do Exercise 2 and 3, explain, using the worked examples, what they should do when they subtract using the vertical method. Pay particular attention to what should be done if there are zeros on the top line when they need to exchange. You may need to show the class how to do this, establishing that 1 000 = 900 + 90 + 10, and that 10 000 = 9 000 + 900 + 90 + 10. Make sure that the pupils understand that, in these cases, exchanging means that zeros become 10, and then 9 as they are
exchanged again to the next column. Remind them again about lining up the digits correctly, especially when dealing with numbers of different lengths.

Complete Exercise 2 page 37 and Exercise 3 page 38.

**Answers**

### Exercise 2

1. 328  
2. 213  
3. 247  
4. 257  
5. 188  
6. 787  
7. 343  
8. 454  
9. 3032  
10. 3282  
11. 1277  
12. 2879  
13. 1189  
14. 1095  
15. 3736  
16. 1767  
17. 3115  
18. 2284  
19. 2993  
20. 6753

### Exercise 3

1. 667  
2. 421  
3. 129  
4. 393  
5. 396

**Assessment**

Check to make sure that pupils understand how to complete 3-digit subtraction with exchanging.

**Extension activity**

Add down and across. Then add the totals you calculated. The sum across should equal the sum down.

<table>
<thead>
<tr>
<th>838</th>
<th>443</th>
<th>732</th>
<th>353</th>
</tr>
</thead>
<tbody>
<tr>
<td>170</td>
<td>66</td>
<td>246</td>
<td>140</td>
</tr>
<tr>
<td>680</td>
<td>474</td>
<td>679</td>
<td>389</td>
</tr>
<tr>
<td>161</td>
<td>85</td>
<td>156</td>
<td>24</td>
</tr>
</tbody>
</table>

**Homework activity**

Worksheet 6 Page 15 questions 1 & 2.

---

### Lesson 3  Pupil’s Book page 38

**Preparation**

You will need to have:

- Pupil’s Book
- Workbook
- Counters or number lines
- Abacus.

**Starter activity**

Put some ‘entrance’ prices (multiples of 10) on the board for adults, children and senior citizens. Ask questions such as: ‘What is the difference in price between adults and senior citizens?’ ‘How much more is it for an adult than for a child?’; ‘How much will it cost for three adults, six children, and five senior citizens?’ and ‘How much change would four adults get from 1 000?’

**Lesson focus**

Explain that, to find the answers to word problems, pupils need to work out whether they need to add or subtract, or both. They need to look for clues that are in the question, for example, ‘find the total’ and ‘altogether’ mean addition, while ‘how many more’, ‘less’ and ‘change from’ all mean subtraction. Give the pupils some word problems of your own and ask them to decide which operation they would need to use to solve them. Then ask them to do Exercise 4 page 39 and the Quantitative reasoning activity on page 40, if necessary, going through the questions first, to highlight the key words and numbers.

**Answers**

### Exercise 4

1. 793  
2. 5923  
3. 3870  
4. 476  
5. 1744  
6. 1754  
7. 5403  
8. 1301  
9. N8567  
10. N2443

### Quantitative reasoning

1. 128 + 457 = 585  
2. 562 + 238 = 800  
3. 5358 + 1987 = 7345
Assessment
Use Worksheet 6 Question 3 for assessment purposes. Each pupil should complete this on their own for homework. Collect in the answers to mark them, identify any problem areas and revisit those areas if necessary.

Homework activity
Worksheet 6 page 15 Question 3.

Lesson 4  Pupil’s Book page 41

Preparation
- Pupil’s Book
- Workbook
- Counters or number lines
- Abacus.

Lesson focus
Pupils revise the concepts covered in this unit by working through the Revision exercise. Check pupils’ progress and monitor carefully how they cope with integrating the content covered in this unit.

Answers
Revision exercise
1. a) 912  b) 701  c) 766
   d) 1057  e) 868  f) 7232
   g) 5166  h) 11367
2. a) 573  b) 276  c) 191
   d) 300  e) 2398  f) 4887
3. a) 7984  b) 1072  c) 524
   d) 1843  e) 1013
4. a) N17 011  b) N4 458  c) N9 332

Assessment
This assessment tests the extent to which the pupils have achieved the objectives stated at the beginning of this unit.

Collect in the answers to mark them, identify any problem areas and revisit those areas if necessary.

Extension activity
1. Mrs. Hadi had N4,000 in her savings account. She earned 10% interest each year. If she left that money in the account for one year, how much will she have in the account at the end of that year?
2. Mrs. Hadi baked 7 dozen biscuits and sold them for N4.25 per half-dozen. How much money would Mrs. Hilt make if she sold all of the cookies?
3. Mrs. Hadi bought 15 boxes of citrus fruits from a fundraiser. She paid N12 for each box. If 6% sales tax was added to the total cost, how much was her total bill?
4. Suppose you want to buy three loaves of bread that cost N1.50 each and a jar of peanut butter that costs N4. A jar of jam is N2.75, but you don’t need any jam. You have N10. How much money will you have left over?

Homework activity
Pupils to correct the revision test.

Lesson 5  Pupil’s Book page 40

Preparation
You will need to have:
- Pupil’s Book
- Workbook
- Counters or number lines
- Abacus.

Starter activity
Revise addition and subtraction of 2 digit numbers that does not involve “borrowing” e.g. 85 – 20, etc. Then present a few problems that involve borrowing e.g. 85 – 29, etc. This time allow pupils to use pen and paper to solve the problems. Do only a few of these so that you do not use too much of the lesson time. Recommended: 10 minutes maximum.

Lesson focus
Make sure that pupils understand how to subtract a larger number from a smaller one. You can use apparatus, like an abacus, to assist understanding. Make sure that the pupils understand that exchanging means that zeros become 10, and then 9 as they are exchanged again to the next column. Remind them
again about lining up the digits correctly, especially when dealing with numbers of different lengths.

Complete the two exercises below with the class.

1. Add the number at the top of the table to each of the numbers in the left column.

<table>
<thead>
<tr>
<th>Add 177</th>
<th>Add 187</th>
</tr>
</thead>
<tbody>
<tr>
<td>234</td>
<td>207</td>
</tr>
<tr>
<td>671</td>
<td>771</td>
</tr>
<tr>
<td>849</td>
<td>64</td>
</tr>
<tr>
<td>118</td>
<td>331</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Add 909</th>
<th>Add 712</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>317</td>
</tr>
<tr>
<td>635</td>
<td>612</td>
</tr>
<tr>
<td>232</td>
<td>635</td>
</tr>
<tr>
<td>97</td>
<td>857</td>
</tr>
</tbody>
</table>

2. Subtract the number at the top of the table from each of the numbers in the left column.

<table>
<thead>
<tr>
<th>Subtract 177</th>
<th>Subtract 187</th>
</tr>
</thead>
<tbody>
<tr>
<td>234</td>
<td>207</td>
</tr>
<tr>
<td>671</td>
<td>771</td>
</tr>
<tr>
<td>849</td>
<td>64</td>
</tr>
<tr>
<td>118</td>
<td>331</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subtract 309</th>
<th>Subtract 512</th>
</tr>
</thead>
<tbody>
<tr>
<td>442</td>
<td>917</td>
</tr>
<tr>
<td>635</td>
<td>612</td>
</tr>
<tr>
<td>832</td>
<td>635</td>
</tr>
<tr>
<td>797</td>
<td>857</td>
</tr>
</tbody>
</table>

Then complete the following exercise in which either addition or subtraction is needed with the class.

1. The school ordered eight thousand kilograms of rocks for a rock garden. However, the company delivered only 4 875 kg of rocks. Calculate the shortfall.

2. Edu and Emu spotted some migratory birds. They calculated that the birds must have travelled 3 220 km to get here. The birds are on their way further north to a place that is a further 2 895 km. What is the total distance the birds will have travelled when they reach their destination?

3. A house on Kwame Street sold for ₦119,673 less than the house on Templeton Lane. If the house on Templeton Lane sold for ₦475,006, how much did the house on Kwame Street sell for?

4. In 2010, the city of Kansas City, Missouri had a population of 459,787. In 1990, its population was 435,187. How much larger was Kansas City's population in 2010, than in 1990?

5. Mrs. Aseyu earns ₦106,859 per year. Mrs. Dadu earns ₦317,929 per year. How much less money does Mrs. Aseyu earn than Mrs. Dadu?

6. Joan's high school played 758 football games this year, 117 of the games were played at night. She attended 303 games. How many football games did Joan miss?

Assessment
Check that pupils understand how to correctly interpret and order word problems.

Extension activity
1. Sam has 122 books and he has read 7 of them. Jason has 129 books. How many books do they have together?

Homework activity
Worksheet 6 page 16 Question 4.

Workbook answers Worksheet 6

1. a) 522  b) 827  c) 911  d) 945  e) 575  f) 1201  g) 1158  h) 1023  i) 6723  j) 6327

2. a) 175  b) 157  c) 526  d) 465  e) 3675  f) 4157  g) 2024  h) 4665

3. a) 141  b) 62  c) 267  d) 3318

4. a) 501  b) 4110  c) 1030  d) 982  e) 1778  f) 2218
Objectives

By the end of this unit, pupils will be able to:

• Add and subtract mixed fractions

• Solve quantitative reasoning problems involving addition and subtraction of fractions

• Add and subtract decimal fractions.

Suggested resources

Fraction chart; Abacus; Flash cards; Number lines

Key word definitions

denominator: the number below a fraction line

numerator: the number above a fraction line

proper fraction: a fraction where the denominator is greater than the numerator so the fraction is less than 1

Frequently asked questions

Q What prior knowledge should the pupil have?
A Pupils should have a good working knowledge of whole numbers and be comfortable with the four basic arithmetic operations of addition, subtraction, multiplication and division. They should be familiar with fractions with denominators up to 100; be able to identify and find equivalent fractions using a fraction wall; be able to calculate fractions of numbers up to 1 000; be able compare and order basic fractions and also be able to solve simple problems that involve fractions.

Q My pupils often complain that they find fractions difficult and confusing. What should I tell them?
A Reassure them that many people, even pupils in higher grades and adults, do not enjoy working with fractions. However, this is an important skill that they will need in real life, so they need to persevere.

Common errors that pupils make

Some pupils usually confuse the whole number and the fraction i.e. \( \frac{1}{14} \) is sometimes written as 114.

Compare the fractions so that pupils see they are different. Pupils correctly identify the numbers in a word problem, but then use the wrong operation, adding when they should subtract and vice versa. Show them how they can restate a question in their own words. This will often help them to decide what operation they should use.

Evaluation guide

Pupils to:

1. Add and subtract given fractions and mixed fractions.
2. Solve quantitative aptitude problems involving additions and subtraction of fractions.
3. Add and subtract given decimal fractions.

Lesson 1  Pupil’s Book page 42

Preparation

You will need to have:

• Pupil’s Book
• Workbook
• Fraction chart
• Number lines.

Starter activity

Write an improper fraction on the board, e.g. \( \frac{33}{8} \). Ask the pupils to convert it to a mixed number. Ask them to identify the whole number in the mixed number and the fraction, \( \frac{33}{8} = 4\frac{1}{8} \) which has 4 as the whole number and \( \frac{1}{8} \) as the fraction. Give more examples of improper fractions and ask the pupils to convert or change to mixed numbers.
Lesson focus

Explain that a proper fraction has a denominator that is larger than the numerator and an improper fraction the denominator is smaller than the numerator. Also explain that the improper fraction can be written as a mixed fraction – a mixed fraction is an improper fraction written as a whole number and a proper fraction. Work through the examples on page 42 of the PB with the pupils. Show them how to convert mixed fractions to improper fractions and how to convert an improper fraction to a mixed fraction. Complete Exercise 1 page 43.

Answers

Exercise 1

1. a) \( \frac{3}{3} \)  
   b) \( \frac{2}{3} \)  
   c) \( \frac{3}{2} \)  
   d) \( \frac{1}{7} \)  
   e) \( \frac{1}{2} \)  
   f) \( \frac{1}{4} \)  
   g) \( \frac{7}{3} \)  
   h) \( \frac{6}{9} \)  
   i) \( \frac{41}{3} \)  
   j) \( \frac{39}{9} \)  

2. a) \( \frac{5}{2} \)  
   b) \( \frac{10}{5} \)  
   c) \( \frac{17}{8} \)  
   d) \( \frac{11}{5} \)  
   e) \( \frac{11}{7} \)  
   f) \( \frac{47}{5} \)  
   g) \( \frac{109}{9} \)  
   h) \( \frac{45}{4} \)  
   i) \( \frac{136}{7} \)  
   j) \( \frac{325}{8} \)  

Assessment

Check that pupils are confident at changing mixed fractions to improper fractions and vice versa. Give extra, easy examples if needed to build up confidence.

Extension activity

Challenge page 43 PB.

Homework activity

Worksheet 7 page 17 questions 1 & 2.

Lesson 2  Pupil’s Book page 43

Preparation

You will need to have:
- Pupil’s Book  
- Workbook  
- Fraction chart  
- Number lines.

Starter activity

Draw a clock face on the board, with numerals from 1 to 12. Show your pupils that a quarter of an hour can be written as \( \frac{3}{12} \) and that a half-an-hour can be written as \( \frac{6}{12} \). Ask them what fraction five minutes is of an hour, as a fraction with a denominator of 12. Repeat this for different numbers of minutes.

Lesson focus

In this lesson, pupils convert fractions into equivalent forms by multiplying or dividing the numerator and the denominator by the same whole number. This allows them to work with fractions that have the same denominators. Thus, all they have to do is add or subtract the numerators only while keeping the denominator the same. The most important concept is that they cannot add or subtract fractions unless they all have the same denominator. If fractions have different denominators, the pupils must first write them as equivalent fractions that have the same denominator. Work through the examples on page 44 of the PB before letting pupils attempt exercises 2 and 3.

Answers

Exercise 2

1. \( \frac{1}{2} + \frac{1}{5} = \frac{5}{10} + \frac{2}{10} = \frac{7}{10} \)  
2. \( \frac{2}{3} + \frac{1}{4} = \frac{3}{12} + \frac{3}{12} = \frac{11}{12} \)  
3. \( \frac{3}{7} + \frac{2}{5} = \frac{15}{35} + \frac{14}{35} = \frac{29}{35} \)  
4. \( \frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6} \)  
5. \( \frac{1}{2} + \frac{1}{5} = \frac{5}{10} + \frac{2}{10} = \frac{7}{10} \)  
6. \( \frac{1}{1} + \frac{1}{3} = \frac{3}{12} + \frac{2}{12} = \frac{7}{12} \)  
7. \( \frac{2}{3} + \frac{1}{3} = \frac{16}{40} + \frac{5}{10} = \frac{21}{10} \)  
8. \( \frac{3}{4} + \frac{3}{8} = \frac{6}{8} + \frac{3}{8} = \frac{9}{8} \frac{9}{8} \)  
9. \( \frac{1}{3} + \frac{1}{5} = \frac{5}{15} + \frac{12}{15} = \frac{17}{15} = \frac{1}{2} \frac{2}{15} \)  
10. \( \frac{6}{12} + \frac{1}{12} = \frac{11}{12} \frac{11}{12} \)  
11. \( \frac{5}{12} + \frac{1}{12} + \frac{1}{12} = \frac{15}{30} + \frac{10}{30} + \frac{12}{30} = \frac{27}{30} = \frac{7}{10} \)  
12. \( \frac{3}{1} + \frac{1}{1} + \frac{3}{1} = \frac{12}{16} + \frac{2}{16} + \frac{16}{16} = \frac{15}{16} \)  
13. \( \frac{1}{1} + \frac{1}{3} + \frac{3}{1} = \frac{6}{10} + \frac{2}{10} + \frac{5}{10} = \frac{11}{16} \)  
14. \( \frac{5}{16} + \frac{3}{16} + \frac{3}{16} = \frac{5}{16} + \frac{6}{16} + \frac{12}{16} = \frac{23}{16} = \frac{7}{16} \)
Unit 7: Adding and subtracting mixed fractions

15. \( \frac{1}{9} + \frac{5}{12} = \frac{16}{36} + \frac{15}{36} = \frac{21}{36} \)
16. \( 2 \frac{1}{2} + 3 \frac{1}{3} = \frac{5}{2} + \frac{10}{6} = \frac{15}{6} + \frac{20}{6} = \frac{35}{6} = 5 \frac{5}{6} \)
17. \( 4 \frac{2}{5} + 3 \frac{1}{7} = \frac{22}{5} + \frac{22}{35} = \frac{154}{35} + \frac{110}{35} = \frac{264}{35} = 7 \frac{19}{35} \)
18. \( 4 \frac{1}{2} + 7 \frac{1}{5} = \frac{9}{2} + \frac{36}{5} = \frac{45}{10} + \frac{72}{10} = \frac{117}{10} = 11 \frac{7}{10} \) or
4 + 7 and \( \frac{1}{2} + \frac{1}{3} = 11 \) and \( \frac{5}{10} + \frac{2}{10} = \frac{7}{10} \) so \( 11 \frac{7}{10} \)

Exercise 3

1. \( \frac{2}{3} - \frac{1}{2} - \frac{4}{3} - \frac{3}{6} = \frac{1}{6} \)
2. \( \frac{5}{8} - \frac{1}{8} = \frac{5}{8} - \frac{2}{8} = \frac{3}{8} \)
3. \( \frac{5}{6} - \frac{5}{8} = \frac{40}{48} - \frac{30}{48} = \frac{10}{24} \)
4. \( \frac{9}{13} - \frac{1}{26} = \frac{16}{26} - \frac{1}{26} = \frac{15}{26} \)
5. \( \frac{2}{3} - \frac{1}{2} = \frac{1}{6} - \frac{2}{3} = \frac{1}{6} \)
6. \( \frac{3}{5} - \frac{3}{6} = \frac{3}{30} - \frac{2}{3} = \frac{1}{3} \)
7. \( \frac{11}{12} - \frac{3}{8} = \frac{44}{48} - \frac{18}{48} = \frac{26}{48} = \frac{13}{24} \)
8. \( \frac{7}{9} - \frac{1}{4} = \frac{28}{36} - \frac{9}{36} = \frac{19}{36} \)
9. \( \frac{1}{5} - \frac{1}{12} = \frac{48}{60} - \frac{15}{60} = \frac{33}{60} \)
10. \( \frac{7}{10} - \frac{1}{2} = \frac{7}{10} - \frac{5}{10} = \frac{2}{10} = \frac{1}{5} \)
11. \( 3 \frac{1}{2} - 2 \frac{1}{4} = \frac{7}{2} - \frac{9}{4} = \frac{14}{4} - \frac{9}{4} = \frac{5}{4} = 1 \frac{1}{4} \) or
\( 3 \frac{1}{2} - 2 \frac{1}{4} = \frac{12}{4} - \frac{4}{4} = \frac{1}{4} \)
12. \( 7 \frac{1}{2} - 2 \frac{3}{8} = \frac{14}{8} - \frac{19}{8} = \frac{299}{40} - \frac{95}{40} = \frac{13}{4} = 4 \frac{33}{40} \)
13. \( 5 \frac{2}{3} - 3 \frac{1}{2} = \frac{24}{6} - \frac{5}{2} = \frac{21}{6} \)
14. \( 6 \frac{2}{3} - 4 \frac{1}{2} = \frac{26}{6} - \frac{3}{2} = \frac{21}{6} \)
15. \( 5 \frac{1}{6} - 3 \frac{5}{6} = \frac{21}{6} - \frac{23}{6} = \frac{63}{12} - \frac{46}{12} = \frac{17}{12} = 1 \frac{5}{12} \)
16. \( 4 \frac{7}{13} - 1 \frac{1}{3} = \frac{32}{13} - \frac{10}{3} = \frac{31}{39} \)
17. \( 8 \frac{1}{8} - 3 \frac{1}{5} = \frac{65}{8} - \frac{19}{5} = \frac{325}{40} - \frac{152}{40} = \frac{173}{40} = 4 \frac{13}{40} \)
18. \( 6 - \frac{2}{2} = 6 - 1 = 5 \)
19. \( 3 \frac{2}{2} - \frac{1}{5} - \frac{5}{14} = \frac{23}{7} - \frac{19}{14} = \frac{16}{14} - \frac{19}{14} = \frac{27}{14} = 1 \frac{13}{14} \)
20. \( 3 \frac{1}{5} - \frac{2}{3} = \frac{16}{5} - \frac{3}{1} = \frac{64}{20} - \frac{25}{20} = \frac{39}{20} = \frac{29}{20} \)

Exercise 4

Add
1. \( 5.7 \)
2. \( 8.5 \)
3. \( 13.1 \)
4. \( 19.19 \)
5. \( 10.613 \)
6. \( 9.472 \)
7. \( 5.822 \)
8. \( 7.819 \)
9. \( 27.547 \)
10. \( 53.746 \)

Subtract
1. \( 2.82 \)
2. \( 6.583 \)
3. \( 1.17 \)
4. \( 3.2 \)
5. \( 5.362 \)
6. \( 6.153 \)
7. \( 24.78 \)
8. \( 5.1 \)
9. \( 26.817 \)
10. \( 14.18 \)

Homework activity
Worksheet 7 page 17 Question 3.

Lesson 3  Pupil's Book page 45

Preparation
You will need to have:
- Pupil's Book
- Workbook
- Fraction chart
- Number lines.

Starter activity
Play subtraction bingo – subtracting the two scores. For this activity divide the class into 2 groups each with a die. Both groups roll their die and note the numbers on with it has landed. For example, throw 4 and 6 where the first group's die represent whole numbers and the second group's die represent decimal numbers i.e. 6 and 0.4. With roll of the die the teacher determines whether the 2 die values will be added or subtracted and each groups gets a chance to give an answer.

Lesson focus
Explain that before pupils add or subtract decimal fractions, they have to arrange them in proper order by using the column method i.e. tens underneath each other, units underneath each other, tenths underneath each other, etc. Remind pupils of the carrying rule in addition and the borrowing rule in subtraction. Also take care to explain the consistency of the decimal comma. Complete Exercise 4 page 45 PB.

Answers

Exercise 4

Add
1. \( 5.7 \)
2. \( 8.5 \)
3. \( 13.1 \)
4. \( 19.19 \)
5. \( 10.613 \)
6. \( 9.472 \)
7. \( 5.822 \)
8. \( 7.819 \)
9. \( 27.547 \)
10. \( 53.746 \)

Subtract
1. \( 2.82 \)
2. \( 6.583 \)
3. \( 1.17 \)
4. \( 3.2 \)
5. \( 5.362 \)
6. \( 6.153 \)
7. \( 24.78 \)
8. \( 5.1 \)
9. \( 26.817 \)
10. \( 14.18 \)
Assessment
Assess if pupils can:
• Add decimal fractions correctly
• Subtract decimal fractions correctly
• Make the denominators the same by using equivalent forms.

Homework activity
Worksheet 7 page 17 questions 4 & 5.

Lesson 4  Pupil's Book page 46

Preparation
You will need to have:
• Pupil's Book     • Fraction chart
• Number lines.

Starter activity
Write the following word problem on the board:
Adu has 24 eggs. She gives \( \frac{1}{3} \) away and uses \( \frac{1}{6} \) to bake a cake. How many eggs does she have left? Ask your pupils to solve this problem in any way that they like. Once all your pupils have finished, show them different solutions to this problem, including these.
Solution A: \( \frac{1}{3} \) of 24 = 8 and \( \frac{1}{6} \) of 24 = 4; 8 + 4 = 12; 24 – 12 = 12, so she has 12 eggs left.
Solution B: \( \frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2} \). She has 1 – \( \frac{1}{2} = \frac{1}{2} \) of the eggs left. \( \frac{1}{2} \) of 24 eggs = 12 eggs, so she has 12 eggs left.
Ask your pupils whether any of them solved the problem in a different way. If so, ask them to write their solution on the board. The aim of this activity is to show your pupils that there is often more than one way to solve a word problem, and that any solution is acceptable, as long as it is mathematically correct.

Lesson focus
The focus of this lesson is on solving word problems that involve mixed and improper fractions. Encourage your pupils to always read through a word problem carefully, before deciding what operations they should use. Emphasise again the steps to follow when solving fractions problems with different denominators. Make pupils aware of the importance of writing equivalent fractions in the correct position before adding or subtracting.

Answers
Exercise 5
1. \( \frac{3}{4} + \frac{1}{2} = \frac{6}{8} + \frac{4}{8} = \frac{10}{8} = \frac{5}{4} \)
2. \( \frac{3}{4} - \frac{1}{2} = \frac{6}{8} - \frac{4}{8} = \frac{2}{8} = \frac{1}{4} \)
3. \( \frac{3}{4} + \frac{1}{2} = \frac{3}{4} + \frac{2}{4} = \frac{5}{4} \)
4. \( \frac{3}{4} - \frac{1}{2} = \frac{6}{8} - \frac{4}{8} = \frac{2}{8} = \frac{1}{4} \)
5. \( \frac{3}{4} + \frac{1}{2} = \frac{3}{4} + \frac{2}{4} = \frac{5}{4} \)
6. \( \frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4} \)
7. \( \frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4} \)
8. \( \frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4} \)
9. \( \frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4} \)
10. \( \frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4} \)
11. \( \frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4} \)
12. \( \frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4} \)
13. \( \frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4} \)
14. \( \frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4} \)
15. \( \frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4} \)
16. \( \frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4} \)
17. \( \frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4} \)
18. \( \frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4} \)
19. \( \frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4} \)
20. \( \frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{1}{4} \)

Assessment
Pupils need to be able to follow steps correctly and interpret the question before attempting word problems. Use some lesson time to go through Exercise 5 again and make sure that pupils have used the correct steps for each question.

Homework activity
Worksheet 7 page 17 questions 6, 7 & 8.

Lesson 5  Pupil's Book pages 48 & 49

Preparation
You will need to have:
• Pupil’s Book     • Workbook.
Starter activity
Use the extra word problems that pupils made up as an extension activity in Lesson 4 as a starter activity.

Lesson focus
Pupils revise the concepts covered in this unit by working through the Revision exercise. Check pupils’ progress and monitor carefully how they cope with integrating the content covered in this unit.

You should give the pupils a set time (30–40 min) in which to complete the Revision exercise. Each pupil should work on their own. Encourage pupils not to spend too much time on one question if they get stuck. Instead, they should leave it and come back to it if they have time left. Encourage them to check their answers if they finish before the set time is over. Collect in the answers to mark them, identify any problem areas and revisit those areas if necessary.

Answers

Exercise 6
1. $\frac{3}{5} - \frac{7}{10} = \frac{6}{10} - \frac{7}{10} = \frac{-1}{10}$
2. $\frac{4}{5} - \frac{3}{4} = \frac{16}{20} - \frac{15}{20} = \frac{1}{20}$
3. $5.123 - 1.239 = 3.884$
4. $\frac{5}{12} - \frac{1}{4} = \frac{10}{24} - \frac{6}{24} = \frac{4}{24} = \frac{1}{6}$
5. $\frac{7}{12} - \frac{1}{8} = \frac{14}{24} - \frac{3}{24} = \frac{11}{24}$
6. $14.32 - 7.123 = 7.2$

Revision exercise
1. a) $\frac{3}{2} + \frac{1}{2} = \frac{4}{2} + \frac{1}{2} = \frac{5}{2} = 2\frac{1}{2}$
   b) $15\frac{1}{2} + 16\frac{3}{4} = 31\frac{3}{4} + \frac{3}{4} = 32\frac{1}{4}$
   c) $4\frac{2}{7} + 2\frac{2}{3} = 6\frac{8}{21} + 2\frac{1}{3} = 6\frac{29}{21} = 7\frac{1}{28}$
2. a) $5\frac{1}{3} + 2\frac{2}{3} = 7\frac{5}{9} + \frac{2}{3} = 7\frac{7}{9}$
   b) $10 - 4\frac{4}{25} = 9\frac{25}{25} - 4\frac{4}{25} = 5\frac{21}{25}$
   c) $1\frac{1}{3} + 1\frac{1}{4} = 2\frac{8}{12} + \frac{3}{12} = 2\frac{11}{12}$
3. a) $\frac{3}{2} - 4\frac{1}{2} = \frac{3}{2} - \frac{9}{2} + \frac{3}{2} = \frac{13}{6} = 2\frac{1}{6}$
   b) $8\frac{2}{7} - 2\frac{3}{14} = \frac{56}{7} - \frac{22}{14} = \frac{44}{14} = 3\frac{2}{7}$
4. a) $7.546$ b) $4.433$
5. a) $0.182$ b) $4.433$

Assessment
This assessment tests the extent to which the pupils have achieved the objectives stated at the beginning of this unit. Collect in the answers to mark them, identify any problem areas and revisit those areas if necessary.

Homework activity
Worksheet 7 page 17 questions 9 & 10.

Workbook answers Worksheet 7 page 17
1. a) $\frac{4}{4} = 1$
   b) $\frac{15}{7} = 2\frac{1}{7}$
   c) $\frac{24}{30} + \frac{5}{30} = \frac{5}{30}$
   d) $\frac{5}{9} + \frac{1}{7} = \frac{5}{63} + \frac{9}{63} = \frac{516}{63}$
   e) $\frac{11}{8} + \frac{1}{4} = \frac{11}{8} + \frac{2}{8} = \frac{121}{8}$
2. a) $\frac{75}{12} - \frac{44}{12} = \frac{31}{12}$
   b) $\frac{141}{15} - \frac{5}{15} = \frac{136}{15}$
   c) $\frac{19}{8} - \frac{10}{8} = \frac{9}{8} = 1\frac{1}{8}$
   d) $\frac{68}{9} - \frac{11}{4} = \frac{272}{36} - \frac{99}{36} = \frac{173}{36} = \frac{429}{36}$
   e) $\frac{51}{5} - \frac{19}{2} = \frac{102}{10} - \frac{95}{10} = \frac{7}{10}$
3. a) $4.3$ b) $4.64$
   c) $9.76$ d) $8.688$
   e) $1.072$ f) $3.34$
   g) $7.588$ h) $4.248$
   i) $12.56$ j) $8.408$
4. $\frac{1}{8}$
5. a) Total cost = $\text{₦405.48}$
   b) 10 tuber of yam is $\text{₦4275.48 less than rice}$
6. a) $4.764$
   b) $8.163$
   c) $18.572 by 1.482 g$
9. $53.973$
10. Sum = $6\frac{4}{15}$, difference = $1\frac{1}{15}$
Objectives
By the end of this unit, pupils will be able to:
• Multiply a 3-digit number by a 3-digit number
• Solve quantitative aptitude problems relating to multiplication
• Apply “of” as multiplication with fractions.

Suggested resources
Multiplication charts; Chart showing quantitative aptitude problems on multiplication; Bead counters; Oranges

Key word definitions
product: the answer when two or more numbers have been multiplied together

Common errors that pupils make
Pupils find it difficult to work out which operations to use in word problems. Give the pupils plenty of practice in reading word problems, identifying the numbers and key words. Writing their own word problems usually helps to remedy the problem.

Evaluation guide
Pupils to:
1. Multiply a 3-digit number by a 3-digit number.
2. Solve quantitative aptitude problems on multiplication.
3. Apply “of” as multiplication with fractions.

Lesson 1  Pupil’s Book page 50

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Multiplication charts.

Starter activity
Practise doubling and halving two-digit numbers with the pupils, including odd numbers. Then double and halve three- and four-digit multiples of ten. Then practise multiplying single-digit numbers by multiples of ten, for example 4 × 80; 3 × 120; 5 × 60; 20 × 8; 150 × 4 and 2 000 × 6.

Lesson focus
Show pupils how we use the column method to multiply two 3-digit numbers by writing the numbers underneath each other. Refer to the worked example in the PB on page 50 and demonstrate how each place value is partitioned i.e. multiply 428 by the 5 units, then multiply 428 by the 4 tens (40) and then multiply 428 by the 2 hundreds (200). Show how each product is written underneath each other again and how the 3 products are then added using the column method. Relate your explanation to the 4 step process outlined in the PB on page 50.

Answers
Exercise 1
1. a) 42 300  b) 244 500
c) 108 500  d) 590 400
e) 174 400  f) 166 800
g) 306 600  h) 413 100
i) 225 000
2. a) 59 520  b) 274 750
c) 351 912  d) 386 682
e) 233 686  f) 87 360
g) 341 136  h) 59 532
i) 269 864  j) 698 148
k) 46 500  l) 221 400
m) 475 115  n) 232 800
Real life problems
1. 69 800  
2. 232 800  
3. 157 776  
4. 95 850  
5. 49 680  
6. 118 000  
7. 146 102  
8. 312 092

Assessment
Check that pupils can multiply two three-digit numbers by using the column method. Give extra practice in setting out three-digit multiplication if needed.

Extension activity
Ask pupils to complete the Challenge activity on page 50 of the PB.

Homework activity
Worksheet 8 page 18 Question 1.

Lesson 2  Pupil’s Book page 51

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Multiplication charts
• Bead counters
• Oranges.

Starter activity
Play ‘What’s my number?’ with the pupils, asking questions that require them to calculate a product and also use division facts, for example, ‘I am thinking of a number; if I divide it by 6, the answer is 4; what is my number (24)?’ and ‘If I multiply my number by 7, the answer is 35; what is my number (5)?’ You can also extend this activity to include multiples of 10 in the same way.

Lesson focus
For these problems, remind the pupils that they will need to use their knowledge of multiplication facts and interpretation to solve them. Worked through one of the examples with the pupils to show them how to solve the first two questions. Complete Exercise 2 page 52 of PB.

Answers

Exercise 2
1. a) 9  
b) \(22 \frac{2}{4} = 22 \frac{1}{2}\)  
c) \(£21\)  
d) 45  
e) 16  
f) 84 hrs  
g) 80  
h) 170  
i) 140  
j) 181.99  
k) 546  
l) 135.99

Assessment
Check whether pupils can translate word sums into the multiplication operation.

Extension activity
Give the pupils more practice in multiplying three-digit numbers by two-digit numbers using the grid method, for example 253 × 35 and 175 × 57. Below is a suggested exercise.

Multiply the following using the column method.

1. 234 × 157  
2. 109 × 362  
3. 180 × 203  
4. 320 × 265  
5. 188 × 239  
6. 627 × 107

Homework activity
Worksheet 8 page 18 Question 2.

Lesson 3  Pupil’s Book page 51

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Multiplication charts
• Bead counters.

Starter activity
Revise mathematical terms with pupils. Explain that certain words are indicators for particular mathematical procedures.
**Lesson focus**

Explain that the use of the word “of” in mathematics denotes multiplication. Refer to the worked example on page 52 of the PB and illustrate how to extrapolate the mathematical processes from the given words. Use a few verbal examples involving “of” to familiarize pupils with its operation. For example, the teacher may call out “What is a half of 10?” etc. to elicit verbal responses from the pupils. Complete Exercise 3 and Exercise 4 page 52 of PB.

**Answers**

**Exercise 3**

1. 2 km
2. 84 cm
3. 54
4. 290
5. \(\frac{2}{5}\)th

**Exercise 4**

1. 33 800
2. 43 617 800
3. 53 010 000
4. 47 304

**Assessment**

Assess their performance in the following:

- Can pupils confidently translate “of” into a multiplication operation and solve the problems?

**Homework activity**

Worksheet 8 page 18 Question 3.

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**Lesson 4  Pupil’s Book page 53**

**Preparation**

You will need to have:
- Pupil’s Book
- Workbook
- Multiplication charts
- Chart showing quantitative aptitude problems on multiplication.

**Starter activity**

Play ‘What’s my number?’ from Lesson 2 with the pupils, asking questions that require them to calculate a product and also use division facts, for example, ‘I am thinking of a number; if I divide it by 6, the answer is 4; what is my number (24)?’ and ‘If I multiply my number by 7, the answer is 35; what is my number (5)?’ You can also extend this activity to include multiples of 10 in the same way.

**Lesson focus**

Complete Quantitative Reasoning page 53 and Revision exercise page 54 PB.

**Answers**

**Revision exercise**

1. a) 83 400  
   b) 1 557 600  
   c) 177 650  
   d) 231 350  
   e) 26 432  
   f) 66 759  
   g) 217 422  
2. a) 56  
   b) 2  
   c) 24  
   d) 36  
   e) 900  
   f) 48  
3. 90
4. 3  
5. 102 m

**Assessment**

Assess pupil’s performance in the following areas:
- Can pupils multiply three-digit numbers?
- Can pupils solve problems involving multiplication?
- Can pupils translate word sums into the multiplication operation?

**Extension activity**

Ask pupils to construct 10 of their own Quantitative reasoning problems. Advise them to use the same format as the problems in the exercise.

**Homework activity**

Worksheet 8 page 18 Question 4.
Lesson 5  Pupil’s Book page 53

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Multiplication charts
• Chart showing quantitative aptitude problems on multiplication.

Starter activity
Revise the Quantitative reasoning exercise from the previous lesson and ask pupils to share any extra examples that they made up with the rest of the class.

Lesson focus
This lesson consolidates previous work in Unit 8 and also gives extra practice in word problems.

Complete the following word sums:
1. Bede’s General Store sells a lot of juice bottles. It ordered 287 cases of orange juice in 2012. If each case contains 144 bottles, how many total bottles of orange juice did it buy?
2. Gage’s Family Amusement park uses a lot of ice during the summer months to keep refreshments cool. Every day, it uses 769 bags of ice. If each bag of ice contains 362 ice cubes, how many total ice cubes are used every day at the amusement park?
3. The Orange Computer Company sold 538 computers on May 15. Each computer costs N795. How much money did the Orange Computer Company take in on May 15?
4. During the spring and summer concert months, the fairground has a capacity of 872 people. Each night there was a concert, the fairground was at full capacity. If there were 109 nights in which there was a concert, how many total people were at the concerts during the spring and summer months?
5. Top Notch IT Service employs 436 technicians. If each technician works 237 days per year, how many total days do Top Notch IT Service technicians work every year?
6. Mrs. Hara has 6 boxes of pens. Each box has 19 pens in it. If she sold each pen for N0.75, how much money would Mrs. Hara earn?
7. Mr. Yakini learned that N1,348 worth of tickets were sold at the carnival. If tickets cost 4 for N1, how many tickets were sold?
8. Mrs. Hara sold 120 pencils for N0.35 each. If half of the cost is profit, how much profit did she make on the pencils?

Assessment
Make sure that pupils have completely consolidated the work in Unit 8 before moving on to Unit 9.

Extension activity
You are about to go on a long road trip with your family. You are buying water bottles to drink during the trip. The trip lasts 7 days, and you expect that you will need to drink 34 of a bottle of water for every day of the trip. What is the smallest whole number of water bottles you will have to buy to have enough water for the trip?

Homework activity
Worksheet 8 page 18 questions 5, 6 & 7.

Workbook Answers Worksheet 8
1. a) 45 540  b) 208 128  
   c) 169 592  d) 152 400  
   e) 173 600  
2. a) 215 006  b) 137 600  
   c) 459 500  d) 194 103  
   e) 141 382  
3. a) 44600  b) 116 200  
   c) 77244  d) 144 555  
   e) 461 216  
4.  
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<td>182 800</td>
<td>249 200</td>
</tr>
<tr>
<td>173 000</td>
<td>228 500</td>
<td>311 500</td>
</tr>
</tbody>
</table>
5. 259 361  
6. 20 000  
7. a) 30  b) 60  c) 140  
   d) N400  e) 40
Objectives
By the end of this unit, pupils will be able to:
• Multiply numbers by zero and one.

Suggested resources
Multiplication chart; Flip chart

Key word definitions
zero: no quantity or number; nought; nothing; the figure 0

Evaluation guide
Pupils to:
1. Multiply numbers by zero and one.

Lesson 1  Pupil’s Book page 55

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Multiplication chart.

Starter activity
Ask pupils what number always gives you your original number back no matter what you multiply it by? The “I” in Identity Element gives us a hint to its use. Think “I have a unique Identity and I don’t want to change it!” Ask pupils what number always gives you your original number back no matter what you add it to?

Lesson focus
For multiplication by zero refer to the examples on page 55 of the PB. Explain by means of grouping how multiplication by zero produces zero i.e. 3 groups of nothing is still nothing. Also refer to page 55 for examples on how multiplication by 1 results in the identity element i.e. the number by which 1 is multiplied. Complete Exercise 1 page 56.

Answers
Exercise 1
1. 4 × 0 = 0 2. 0 × 5 = 0
3. 1 × 5 = 5 4. 0 × 70 = 0
5. 1 × 64 = 64 6. 0 × 8 = 0
7. 50 × 0 = 0 8. 0 × 41 = 0
9. 73 × 0 = 0 10. 0 × 135 = 0
11. 128 × 0 = 0 12. 48 × 0 = 0
13. 1 × 0 × 3 = 0 14. 10 × 4 × 0 = 0
15. 0 × 15 × 90 = 0
16. Fifty-six multiplied by zero = zero
17. Zero multiplied by forty = zero
18. Forty-one multiplied by one = forty-one
19. One hundred and twenty multiplied by one = one hundred and twenty
20. The product of 1 005 and 1 = 1 005

Assessment
Assess their performance in the following:
Can multiply by zero and one without making mistakes?

Extension activity
Ask pupils to complete the Challenge activity on page 55 and the Challenge activity on page 56 of the PB.

Homework activity
Worksheet 9 page 19 questions 1, 2 & 3.
Lesson 2  Pupil’s Book page 56

 Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Multiplication chart.

 Starter activity
Revise place values and decimal place values with the pupils. Show pupils that if they are given a large number like 1 002 502, each of the zeroes in the large number occupy a place value position even though that place value contains nothing. Give pupils a few more very large or small (decimal) numbers and ask them which place value the zero holds.

 Lesson focus
Take care to explain the different values of the zero digit when used in positional notation. Take care to guide pupils between the different products when multiplying by zero and 1. Keep using the concept of groups (i.e. 3 groups of 4 = 12, etc.) if pupils struggle to understand the concept initially. Complete Exercise 2 on page 57 of PB.

 Answers
Exercise 2
1. 2. 3. 4. 5. 6. 7. 8.

 Assessment
Check that pupils can pupils multiply large numbers with zeroes in them. Give extra practice if needed.

Lesson 3  Pupil’s Book page 58

 Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Multiplication chart.

 Starter activity
Use the first five minutes of the lesson to review lessons 1 and 2.

 Lesson focus
Pupils revise the concepts covered in this unit by working through the Revision exercise. Check pupils’ progress and monitor carefully how they cope with integrating the content covered in this unit. Complete the Revision exercise on page 58 PB.

 Answers
Revision exercise
1. a) $0 \times 11 = 0$  b) $4 \times 0 = 0$  c) $5 \times 0 = 0$
   d) $59 \times 0 = 0$  e) $110 \times 0 = 0$  f) $0 \times 99 = 0$
2. Any number multiplied by 0 equals 0.
3. a) $1 \times 98 = 98$  b) $194 \times 1 = 194$
   c) $40 \times 1 = 40$  d) $53 \times 1 = 53$
   e) $1 432 \times 1 = 1 432$
4. Any number multiplied by 1 equals the same number.
5. a) $0 \times 5 = 5$ groups of 0 = 0
   b) $0 \times 6 = 6$ groups of 0 = 0
   c) $9 \times 0 = 9$ groups of 0 = 0
   d) $3 \times 1 = 3$ groups of 1 = 3
   e) $1 \times 8 = 8$ groups of 1 = 8

 Assessment
This revision exercise will indicate the extent to which the pupils have achieved the objectives stated at the beginning of this unit.
Lesson 4  Pupil’s Book page 54 and 58

Preparation
You will need to have:
• Pupil’s Book.

Starter activity
Play ‘What’s my number?’ with the pupils, asking questions that require them to calculate a product and also use division facts, for example, ‘I am thinking of a number; if I divide it by 6, the answer is 4; what is my number (24)?’ and ‘If I multiply my number by 7, the answer is 35; what is my number(5)?’ You can also extend this activity to include multiples of 10 in the same way.

Lesson focus
Give pupils a few quick questions to answer out loud. Practise doubling and halving two-digit numbers with the pupils, including odd numbers. Then double and halve three- and four-digit multiples of ten. Then practise multiplying single-digit numbers by multiples of ten, for example 4 × 80; 3 × 120; 5 × 60; 20 × 8; 150 × 4 and 2 000 × 6. Remind pupils of how we use the column method to multiply two 3-digit numbers by writing the numbers underneath each other. Remind pupils of how we add fractions and decimals and then give the following examples for pupils to work through:
1. a) 1 + 0.98  b) 0.3 + 1.8
c) 1.5 + 0.35  d) 1.12 + 3.45
e) 7.548 – 2.422  f) 8.109 – 5.003
g) 6.3 – 0.8  h) 12.962 – 11.99

Once these have been completed successfully give pupils the following to work through:
2. Find the missing number that was added to give the answer in each sum.
   a)  ?  ?  ?  ? + 61.02 = 162.48
   b) 19.49 + 28.25
   c)  ?  ?  ? + 12.5 = 60.3
   d) 37.663 + 73.963

3. Subtract the following:
   a) 9 – 0.97
   b) 14 – 4.5
   c) 12 – 4.449
   d) 131 – 4.330

Answers
1. a) 1.98  b) 2.1  c) 1.85
d) 4.57  e) 5.126  f) 3.106
g) 5.15  h) 0.972
2. a) 101.46  b) 8.76  c) 47.8
d) 36.3
3. a) 8.03  b) 9.5  c) 7.551
d) 8.77

Assessment
This revision should reinforce previous lessons in term 1. Use the opportunity to help any pupils who are struggling with specific concepts. Give extra practice where needed.

Extension activity
Give pupils the following word problems to work out:
1. A jug contains 2 3/4 litre of orange juice. After you pour 5/8 of a litre into a glass, how much is left in the jug?
2. Jackie has 1/3 of a chocolate bar. Steven has 4/12 of a chocolate bar. How much do they have together?

Homework activity
Multiply the following using the column method.
1. 234 × 157
2. 109 × 362
3. 180 × 203
4. 320 × 265
5. 188 × 239
6. 627 × 107

Workbook answers Worksheet 9
1. 0
2. Itself
3. a) 5 groups of 4 = 20
   b) 0 groups of 4 = 0
   c) 1 group of 4 = 4
   d) 6 groups of 1 = 6
   e) 0 groups of 6 = 0
4. a) 0  b) 0  c) 0  d) 20
   e) 25  f) 186
5. 0
6. 1
Unit 10: Multiplying decimals and fractions

Objectives
By the end of this unit, pupils will be able to:
• Multiply decimals by whole numbers
• Multiply decimal fractions by whole numbers
• Read numbers up to one million
• Write numbers up to one million.

Suggested resources
Multiplication charts; Flip chart; Digit cards; Place value table

Key word definitions
multiple: a number that may be divided by another a certain number of times without a remainder

Teaching this unit
This lesson looks at how to multiply decimals by 10, 100, 1000 and other multiples of ten. Before doing so, revise the concept of multiples with the pupils.

Common errors that pupils make
When multiplying or dividing by 10, 100 or 1 000 involves decimals or a decimal answer, the pupils often miscount and put the decimal point in the wrong place. Suggest that the pupils use rounding to find an approximate answer, for example 320 ÷ 100 is about 300 ÷ 100, which is 3. When they get the answer of 3.2, they can immediately see that their answer is correct. If necessary, the pupils can always use place value cards until they become used to moving the digits the correct number of places. Pupils forget the decimal point or put it in the wrong place. Remind the pupils to use approximation to work out where the decimal point should be and to count the decimal places in the question. The pupils make multiplication errors. Help them to learn the times tables to 10 × 10.

Evaluation guide
Pupils to:
1. Multiply decimals by whole numbers.
2. Multiply decimal fractions by whole numbers.

Lesson 1
Pupil’s Book page 59

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Multiplication chart
• Digit cards
• Place value table.

Starter activity
Revise counting forwards and backwards in 10s, starting at any multiple of 10 to 1 000. Then, count forwards and backwards in 10s starting at any other two- or three-digit number. Then, practise multiplying and dividing mentally by 10, for example 34 × 10; 45 × 10; 560 ÷ 10 and 2 300 ÷ 10. Ask the pupils if they can see any pattern in the answers. Make sure that they can see that the digits move one place to the left in multiplication (the units’ digit becomes the tens’ digit, the tens’ digit become the hundreds’ digit and so on) and that in division the reverse happens: the digits move one place to the right (the thousands’ digit becomes the hundreds’ digit, the hundreds’ digit becomes the tens’ digit and so on). When explaining what happens to the units’ digit, explain that it becomes the tenths’ digit, because, for example, 560 ÷ 10 can also be written as 56.0. Also explain what happens when you divide a two- or three-digit number by 10 that is not a multiple of 10, for example 56 ÷ 10 (the tens become units, the units become tenths and so on, and so 56 ÷ 10 = 5.6). Give the pupils a few of these to work out, for example 26 ÷ 10; 456 ÷ 10; 28 ÷ 10 and 289 ÷ 10.
Lesson focus
This lesson revises multiplying and dividing whole numbers by 10 and 100, and looks at the changes in place value. The pupils then relate this to multiplying and dividing by 1 000. Repeat the starter activity, but now multiply and divide by 100. Establish that the digits now move two places: the hundreds to ten thousands, the tens to thousands, the units to hundreds (for multiplication) and the thousands to tens, the hundreds to units, and the units to hundredths (for division). You can demonstrate this to the pupils using large digit cards and a large place value table. Physically move the digits two places to the left (multiplication) or right (division). Make sure that the pupils understand that the actual digits stay in the same order, but their values change as they move (place/position). Work through the example in the PB on page 59 to reinforce the pupils’ understanding of how the comma in decimal numbers shift when multiplying by 10, 100, 1 000, etc. Complete Exercise 1 page 59 and Exercise 2 page 60 PB.

Answers
Exercise 1
1. $4.56 \times 10 = 45.6$
2. $1.234 \times 1\,000 = 1\,234$
3. $5.238 \times 100 = 523.8$
4. $4.825 \times 10 = 48.25$
5. $1.08 \times 100 = 108$
6. $7.567 \times 100 = 756.7$
7. $38.76 \times 1\,000 = 38\,760$
8. $456.1 \times 100 = 45\,610$
9. $18.54 \times 100 = 1\,854$
10. $4.468 \times 1\,000 = 4\,468$

Exercise 2
1. a) $5.88\, m = 588\, cm$
   b) $6.02\, m = 602\, cm$
   c) $7.845\, m = 784.5\, cm$
   d) $4.56\, m = 456\, cm$
   e) $8.43\, m = 843\, cm$
2. a) $4.02\, kg = 4\,020\, g$
   b) $5.650\, kg = 5\,650\, g$
   c) $71.65\, kg = 71\,650\, g$
   d) $82.861\, kg = 82\,861\, g$
   e) $110.1\, kg = 110\,100\, g$

3. a) $9.456\, kl = 9\,456\, l$
   b) $0.568\, kl = 568\, l$
   c) $1.578\, kl = 1\,578\, l$
4. a) N$4.56 = 456\, kobo$
   b) N$7.82 = 782\, kobo$
   c) N$0.82 = 82\, kobo$
   d) N$1.96 = 196\, kobo$
   e) N$8.02 = 802\, kobo$

Assessment
Pupils should be able to multiply and divide decimals by 10, 100 and 1 000. Make sure they are able to understand changes in place values.

Extension activity
Ask pupils to complete the Challenge activity on page 60 of the PB.

Homework activity
Worksheet 10 page 20 Question 1.

Lesson 2  Pupil’s Book page 60

Preparation
You will need to have:
- Pupil’s Book
- Workbook
- Multiplication chart
- Digit cards
- Place value table.

Starter activity
Draw a number line on the board and calibrate it with decimal numbers. Practice moving the decimal point left and right. Ask pupils what happens when we move the decimal comma left i.e. the number becomes smaller, and if we move it to the right i.e. the number becomes bigger.

Lesson focus
Demonstrate that when we multiply decimals by multiples of 10 i.e. 10, 20, 30, etc., we can break up our work into two stages. First, break the whole number into units of tens, hundreds or thousands. E.g. $2,956 \times 50$ becomes $2,956 \times 10 \times 5$. 
Multiplying 2,956 shifts the comma one place back so that 2,956 becomes 29,56. Now multiply 29,56 by 5. Demonstrate another example before letting the pupils do Exercise 3 page 60 PB.

**Answers**

**Exercise 3**
1. $4.682 \times 60 = 280.92$
2. $5.196 \times 80 = 415.68$
3. $2.194 \times 20 = 43.88$
4. $81.45 \times 30 = 244.35$
5. $54.65 \times 400 = 21860$
6. $6.48 \times 200 = 1296$
7. $8.6591 \times 5000 = 43295.5$
8. $91.685 \times 2000 = 183370$
9. $100.456 \times 800 = 80364.8$
10. $56.7 \times 300 = 17010$
11. $6.7 \times 7000 = 46900$
12. $2.46 \times 8000 = 19680$
13. $8.289 \times 400 = 3315.6$
14. $9.245 \times 3000 = 27735$
15. $6.835 \times 4000 = 27340$
16. $5.148 \times 500 = 2574$
17. $58.49 \times 40 = 2339.6$
18. $38.56 \times 50 = 1928$
19. $45.67 \times 600 = 27402$
20. $165.781 \times 900 = 149202.9$

**Assessment**
Check that pupils can multiply decimals by multiples of 10 such as 20, 30, 40, etc. by breaking apart the multiples.

**Extension activity**
Ask pupils to complete the following problems.
1. A shop sells sweets at N0.75 per gram. Jon buys 20 grams of sweets. How much did he pay?
2. A man weighed 120 kg and when he went on a diet. He lost 0.167 of his original weight. How much does he weigh now?
3. The Nigerian Naira devalued by 0.15 of its original value. How much would N200 be worth now.
4. Kwame and Ndu have a lawn mowing service. Kwame charges N8.25 per hour and Ndu charges N5.85 per hour.
   a) How many hours did Kwame work if he earned N20?
   b) How many hours did Ndu work if he earned N20?
   c) On another job Kwame worked for 2.5 hours. How much did he earn?
   d) Ndu worked for 3 hours on another job. How much did he earn?

**Homework activity**
Worksheet 10 page 20 Question 2.

**Lesson 3** Pupil’s Book page 61

**Preparation**
You will need to have:
- Pupil’s Book
- Workbook
- Multiplication chart
- Digit cards
- Place value table.

**Starter activity**
Multiply and divide decimals to one decimal place, for example $2 \times 2.4; 4 \times 5.6; 5 \times 12.2; 3.2 \div 4$ and $12.4 \div 5$. Also practise multiplying and dividing decimals that are less than 1, for example $0.5 \times 6$ and $2.4 \div 4$. Explain that they are simply using their knowledge of multiplication facts and of place value.

**Lesson focus**
This lesson continues from the previous lesson, and shows the pupils how to use short multiplication to multiply decimals by double-digit numbers. Explain that multiplication of decimals by double digit numbers can be done in the column method by lining up the numbers in terms of place values i.e. tens underneath each other and units underneath each other. Refer to the examples on page 61 of the PB and work through these examples. We multiply from right to left starting with the unit of the second number which is multiplied with each value in the decimal number. Remind the pupils again about the carrying rule.

NB: point out to pupils that when a decimal number is multiplied by any whole number, the
original number of decimals places must be in the answer. E.g. 25.34 × 15 = 380.1. Complete Exercise 4 on page 61 of the PB.

**Answers**

**Exercise 4**

1. \(4.86 \times 32 = 155.52\)
2. \(51.65 \times 28 = 1446.2\)
3. \(0.89 \times 46 = 40.94\)
4. \(1.587 \times 19 = 30.153\)
5. \(23.7 \times 24 = 568.8\)
6. \(5.13 \times 67 = 343.71\)
7. \(6.42 \times 53 = 340.26\)
8. \(2.876 \times 71 = 204.196\)
9. \(2.945 \times 95 = 279.775\)
10. \(67.923 \times 42 = 2852.766\)
11. \(23.94 \times 87 = 2082.78\)
12. \(123.41 \times 56 = 6910.296\)
13. \(3.215 \times 35 = 112.525\)
14. \(78.64 \times 31 = 2437.84\)

**Assessment**
Check that pupils can multiply decimals by double digit numbers and apply the column method correctly when multiplying decimals by 2 digit numbers.

**Extension activity**
Ask pupils to complete the following puzzle.

Multiply and place the answers in the cross-number puzzle.

<table>
<thead>
<tr>
<th>Across:</th>
<th>Down:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. (4 \times 0.06)</td>
<td>a. (8 \times 0.009)</td>
</tr>
<tr>
<td>b. (3 \times 0.3)</td>
<td>b. (9 \times 0.03)</td>
</tr>
<tr>
<td>c. (10 \times 0.07)</td>
<td>c. (7 \times 0.07)</td>
</tr>
<tr>
<td>d. (90 \times 0.011)</td>
<td>d. (5 \times 0.16)</td>
</tr>
<tr>
<td>e. (100 \times 0.05)</td>
<td>e. (10 \times 0.3)</td>
</tr>
</tbody>
</table>

**Homework activity**
Worksheet 10 page 20 Question 1.

**Lesson 4** *Pupil’s Book page 62*

**Preparation**
You will need to have:
- Pupil’s Book
- Workbook
- Multiplication chart
- Digit cards
- Place value table.

**Starter activity**
Revise multiplication of decimals by powers of 10, multiples of 10 and whole numbers. Give pupils a few examples from real life which requires the use of decimals e.g. money transactions. Give a few simple verbal examples and ask pupils to calculate the answers mentally. For example, I buy 4 pencils at N\(0.25\), how much did I pay.

**Lesson focus**
Work through the first example from Exercise 5 with the pupils to help them extrapolate the mathematical information needed to put together an algorithm. Pupils must then work on their own as far as possible in trying to solve the rest of the problems. Complete Exercise 5 page 62 PB.
Answers

Exercise 5

1. A car will use $20.5 \times 7 = 143.5$ litres of fuel for 7 trips
2. Mrs. Gwakwalada will pay $₦67.45 \times 12$ months $= ₦809.40$ tax per year
3. Alhaji paid $₦110 050.67 \times 16 = ₦1 760 810.72$ customs duty
4. $€27 \times 246.58 = ₦6 657.66$
5. The area of the rectangle is $85.76 \times 57 = 4 888.32$ m²
6. $267.567 \times 300 = 80 270.1$
7. The total weight of the televisions is $500 \times 21.45$ kg $= 10 725$ kg
8. The total capacity is $68 \times 7.479$ litres $= 508.572$ litres
9. The value of the mistake is $₦2 846.65 - ₦2 486.56 = ₦360.09$  
   The total value of the mistake is $50 \times ₦360.09 = ₦18 004.50$
10. $6000 \times ₦144.50 = ₦867 000.00$
11. $34.13 \times 17 = 580.21$

Assessment
Check that pupils can extract the correct mathematical information from the text. Make sure pupils can apply an algorithm to solve a given problem.

Extension activity
1. Lucy jogs 1.2 km five times a week, and Sharon jogs $1 \frac{1}{2}$ km four times a week. Who jogs the most distance during one week?
2. Is 1.6 more than, less than, or equal to one and a half? Explain why.

Homework activity
Worksheet 10 page 20 Question 4.

Lesson 5  Pupil’s Book page 63

Preparation
You will need to have:
- Pupil’s Book
- Workbook
- Multiplication chart
- Place value table.

Starter activity
Revise multiplication of decimals by powers of 10, multiples of 10 and whole numbers. Put a few examples of decimal numbers and powers of 10, multiples of 10 and whole numbers on the board.

Lesson focus
Use the example from the PB on page 63 to explain this lesson to pupils and let pupils attempt Exercise 6 page 63 PB on their own.

Answers

Exercise 6

1.  
   \[
   43.52 \rightarrow 10 \rightarrow 435.2
   \]

2.  
   \[
   36.69 \rightarrow 10 \rightarrow 366.4
   \]

3.  
   \[
   649.3 \rightarrow 100 \rightarrow 64930 \rightarrow 649.3\overline{0}
   \]

4.  
   \[
   87.69 \rightarrow 100 \rightarrow 8769 \rightarrow 8.769\overline{0}
   \]

5.  
   \[
   1473 \rightarrow 30 \rightarrow 14730 \rightarrow 147.3\overline{0}
   \]

Assessment
Assess whether pupils are able to:
- Recognize the mathematical processes used to obtain an answer
- Read and understand word problems.

Extension activity
Ask pupils to construct 12 quantitative reasoning problems of their own.
Homework activity  
Worksheet 10 page 20 Question 5.

Lesson 6  Pupil’s Book page 64

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Multiplication chart.

Starter activity
Let pupils choose a favourite starter activity from previous lessons. Allow about ten minutes for the starter activity.

Lesson focus
In this lesson pupils revise the concepts covered in this unit by working through the Revision exercise. Check pupils’ progress and monitor carefully how they cope with integrating the content covered in this unit. Revision exercise page 65 PB.

Answers
Revision exercise
1. a) 3.45 × 10 = 34.5  
   b) 2.8 × 10 = 28  
   c) 3.912 × 100 = 391.2  
   d) 9.867 × 1 000 = 9 867  
   e) 8.45 × 1 000 = 8 450  
   f) 6.82 × 10 = 68.2  
   g) 7.612 × 100 = 761.2  
   h) 4.111 × 10 = 41.11  
   i) 5.78 × 100 = 578  
   j) 28.1 × 10 = 281
2. a) 17.51 × 40 = 700.4  
   b) 1.856 × 50 = 92.8  
   c) 7.982 × 70 = 555.74  
   d) 12.049 × 90 = 1 084.41  
   e) 6.785 × 800 = 5 428  
   f) 5.621 × 5 000 = 28 105  
   g) 3.42 × 3 000 = 10 260  
   h) 4.567 × 30 = 137.01
3. a) 45.8 × 30 = 1 374  
   b) 60.08 × 38 = 2 283.04
4. a) 90 × 46.58 = 4 192.20  
   b) 56 × 46.58 = 2 608.48  
   c) 182 × 46.58 = 8 477.56

Assessment
This revision exercise assesses the extent to which the pupils have achieved the objectives stated at the beginning of this unit. You should give the pupils a set time (30–40 min) in which to complete the assessment. Each pupil should work on their own. Encourage pupils not to spend too much time on one question if they get stuck. Instead, they should leave it and come back to it if they have time left. Encourage them to check their answers if they finish before the set time is over. Collect in the answers to mark them, identify any problem areas and revisit those areas if necessary.

Extension activity
There is no extension activity, pupils who finish early should use their time to check their answers.

Homework activity
Pupils to continue the project for homework if they do not complete it in class time.

Workbook answers Worksheet 10
1. a) 46  
   b) 685  
   c) 741.2  
   d) 5628.5  
   e) 4689  
   f) 158.3  
   g) 3481  
   h) 86004  
   i) 9605000  
   j) 780
2. a) 94.4  
   b) 229.5  
   c) 1574.5
3. a) done  
   b) 7.656 × 10 × 3 = 229.68
4. a) 4397 m  
   b) 586 cm  
   c) 3567 g  
   d) 7680 ℓ  
   e) 8712 kobo
5. a) 1611.12  
   b) 341.952  
   c) 87.906  
   d) 193.55  
   e) 0
**Term 1 Project**

Pupil’s Book page 65

**Objectives**
- Finding patterns using calculator skills.

**Preparation**
You will need to have:
- Pupil’s Book
- Calculators.

**Lesson 1**

**Starter activity**
Revise producing sequences of numbers, for example starting at 5 + 6. With some calculators it is possible to enter 5 + 6 into the calculator and keep pressing the = keys. You must check the calculators first, as not all calculators work in this way. Then do the same with 100 − 7.

**Lesson focus**
Encourage the pupils to spot the patterns and only use the calculator if they need to, to continue the pattern or sequence. When multiplying 25 by numbers that increase by 10 (for example 22, 32 and 42) the difference is always 10 × 25 = 250. In Question 3, the pupils have to spot that the difference in successive calculations is always the first number × 10. You may like to check their understanding and ask what the difference between, for example, 26 × 35 and 26 × 45 would be and ask them to explain how they know. In Questions 4 to 6, the answers form a repeating pattern (see answers), which they should be able to predict after three or four calculations. A useful discussion would be about what happens when the calculator runs out of space on the display – what happens to the numbers? (They are either rounded or cut off, depending on the type of calculator). For Question 4, pupils could be asked to explain the link between the middle number and the numbers of digits in the calculation (five-digit number has 5 in the middle and a seven-digit has 7 in middle).

Ask the pupils how far the pattern would work like this – what happens when the middle number gets to 10? (Difficult to tell with a calculator owing to the limited display space.) For those advanced pupils who finish or want extra activities, suggest they investigate 2 × 2; 22 × 22; 3 × 3; 33 × 33 and so on. The patterns are not quite so predictable, but there is a pattern! Encourage the pupils to explore other patterns in calculations for homework, such as what happens when you multiply 11; 111 and 1 111 by numbers whose digits add to more than nine.

**Lesson 2**

**Starter activity**
Remind pupils of the work they completed in the project. Make sure they all understand how to use a calculator.

**Lesson focus**
Use this lesson to go through the project answers.

**Answers to project**

1. a) done    b) done    c) 800    d) 1050
2. a) done    b) 1050 − 800 = 250
   c) 1550 − 1300 = 250
3. a) 575 − 325 = 250    b) 1075 − 825 = 250
   c) 1575 − 1325 = 250
4. Pupils to find their own answers and share with the class.
5. a) 600 & 1100    b) 1440 & 990
6. Pupils to find their own answers and share with the class.

**Homework**
Pupils can use homework time to make any corrections to the project.
Objectives

- To assess the extent to which pupils have understood and mastered the content of Units 1–10
- To provide feedback on areas in which intervention is needed.

Guidelines

The questions in this test cover Units 1–10, and so include questions on place value, fractions, decimals, addition, subtraction, multiplication, division and word problems. The questions are graded in order of difficulty within each section the first two word problems. Pupils should work through the questions on their own, taking as much time as they need. Encourage pupils not to spend too much time on a question if they get stuck. Instead, they should go on to the next question, and come back to the question they were struggling with if they have time. Encourage all pupils who have completed the task to spend at least five minutes checking their work.

Lesson 1

Lesson focus

Pupils will need paper or note books to work in. Explain to pupils how much time they will be allowed. Collect in paper or books for marking at the end of the allocated time. Mark each pupils work individually and assess areas that may need extra practice.

Answers

Term 1 Assessment

1. a) one thousand four hundred and fifty six
   b) Seventy eight thousand five hundred and nine
   c) Four hundred and four thousand six hundred and eighty
   d) Two thousand and nine

2. a) 300 050
   b) 5 604 079

3. a) 
   b) 

4. a) 103 798
   b) 2 145 706
   c) 30 500 876

5. a) <
   b) >
   c) >
   d) >
   e) <

6. a) Eight hundred
   b) Thirty thousand
   c) Forty million

7. 53, 59, 61, 67, 71, 73, 79, 83, 89, 97

8. d; b; c; a

9. a) $18 = 2 \times 3 \times 3$
   b) 

48 = $2 \times 2 \times 2 \times 2 \times 3$

10. HCF of 45 and 25 is 5

11. LCM of 12 and 60 is 60

12. a) 0.4
   b) 0.11
   c) 0.043
   d) 0.375
   e) 0.667

13. a) \(\frac{6}{20}\)
   b) \(43\frac{2}{20}\)
   c) \(17\frac{830}{1000}\)
14. a) 2 5% of 40
b) 7/40 17.5%
c) 10/40 25%
d) 30/40 0.75 75%
e) 30/40 1.25 125%
15. a) 178,104
tb) 103,406
16. a) 2/3 × 45 = 15
tb) 2/8 × 104 = 13
17.
\[
\begin{array}{cccc}
\times & 14 & 15 & 16 & 17 \\
0 & 0 & 0 & 0 & 0 \\
1 & 14 & 15 & 16 & 17 \\
\end{array}
\]
18. a) 1,302
tb) 1,332
tc) 1,332
19. a) 507
tb) 233
tc) 243
20. a) 5 2/3 + 2 1/4 = 5 8/12 + 2 3/12 = 7 11/12
tb) 7 2/8 + 4 3/8 = 6 10/8 + 4 3/8 = 2 7/8
21. a) 141,712
tb) 75,933
22. a) 2,593
tb) 55,114
23. a) 308,272
tb) 135,015
24. a) 2,916
tb) 5,776
tc) 7,744
25. a) 21
tb) 35
26. 76 + 24 = 100
27. 1,403
28. ₦45.67 × 46 = ₦2,100.82
29. 625 − 576 = 49 √ 49 = 7
30. 24 2/3 + 45 3/4 69 3/12 + 9/12 69 17/12 + 70 3/12

Lesson 2

Lesson focus
Use this lesson to go through the assessment answers and also to encourage pupils to ask questions if there are any answers that they do not understand.

Assessment
Use the results of the assessment to identify pupils who need extra help. Organise groups to work on specific areas of the content of Units 1–10, as needed.

Extension activity
Any pupils who do not have corrections to complete can make up shopping problems using naira and kobo.

Homework
Pupils to complete their corrections.
Objectives
By the end of this unit, pupils will be able to:
• Calculate squares of whole numbers more than 50 and calculate square roots of perfect squares greater than 400
• Solve quantitative aptitude problems involving squares of numbers more than 50 and square roots of numbers greater than 400.

Suggested resources
Charts of whole numbers more than 50 and perfect squares greater than 400; Charts on quantitative aptitude problems on square roots and squares of whole numbers; Paper (for square charts)

Key word definitions
square numbers: numbers you get when you multiply a number by itself
square root: a number which when multiplied by itself produces the given number. Square rooting is the inverse operation of squaring a number

Evaluation guide
Pupils to:
1. Calculate the squares and square roots of given numbers more than 50 and greater than 400.
2. Solve quantitative aptitude problems on squares of numbers more than 50 and square root numbers greater than 400.

Lesson 1 Pupil’s Book page 70

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Charts of whole numbers more than 50 and perfect squares greater than 400
• Paper (for square charts).

Starter activity
Revise the perfect squares between 1 and 100.
Remind pupils that in order to obtain a perfect square we multiply a chosen number by itself. Run through the perfect squares viz. 1, 4, 9, 16, 25, etc. and show pupils how each of these numbers are products of the first few sequential counting number i.e. 1 × 1, 2 × 2, 3 × 3, etc. Let pupils complete a table with all the perfect squares up to 100.

Lesson focus
The lesson extends the starter activity by considering seemingly large numbers. Take care to relate a square such as 50 × 50 to the basic square 5 × 5. Also remind pupils that the concept of the square number is directly related to the concept of the geometric square. The square has all sides equal and in order to calculate the area of the square, we multiply one side by another. Thus, obtaining a square number. Work through the example in the PB on page 71. Explain how a square number can be obtained using the skill of multiplication acquired previously. Work through Worksheet 11 page 21 Question 1 and 2 in class. Complete Exercise 1 on page 71 of the PB.

Answers
Exercise 1
1. Pupils to draw in their note books.
2. a) \(53^2 = 2809\) b) \(65^2 = 4225\)
   c) \(68^2 = 4624\) d) \(54^2 = 2916\)
   e) \(57^2 = 3249\) f) \(69^2 = 4761\)
3. a) \(71^2 = 5041\) b) \(79^2 = 6241\)
   c) \(67^2 = 4489\) d) \(82^2 = 6724\)
   e) \(72^2 = 5184\) f) \(51^2 = 2601\)
   g) \(83^2 = 6889\) h) \(80^2 = 6400\)
   i) \(99^2 = 9801\) j) \(100^2 = 10000\)
\[ k) \quad 89^2 = 7921 \quad l) \quad 85^2 = 7225 \]
\[ m) \quad 58^2 = 3364 \quad n) \quad 84^2 = 7056 \]
\[ o) \quad 91^2 = 8281 \]

**Assessment**
Check that pupils understand that a square number is a number multiplied by itself and that they can square any given number.

**Extension activity**
Find the areas of squares with the following side lengths: 12 cm, 23 cm, 4 cm and 39 cm.

**Homework activity**
Worksheet 11 page 22 Question 3.

**Lesson 2**  
*Pupil’s Book page 72*

**Preparation**
You will need to have:
- Pupil’s Book
- Charts of whole numbers more than 50 and perfect squares greater than 400
- Paper (for square charts).

**Starter activity**
Draw several geometric squares of various sizes on a photocopiable hand out. Each square should have its area written on the inside. Ask pupils to work out what the dimensions of each of the squares are. They should look for a number which was multiplied by itself to give the area. For example, if the area is 4 cm\(^2\), then the dimensions must be 2 \(\times\) 2. Avoid giving areas that are not perfect squares.

**Lesson focus**
Before working with square roots, make sure pupils know the difference between a square and a square root. Emphasis that the processes of obtaining these are inverse processes of each other. Work through the example in the PB on page 72. Show pupils that the square root of 900 can be obtained by finding the square root of 9 i.e. 3 and then multiplying the answer by 10. Thus, obtaining 30. Complete Exercise 2 on page 72 PB.

**Answers**

**Exercise 2**

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<td>3</td>
<td>6</td>
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<td>4</td>
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</tbody>
</table>

<table>
<thead>
<tr>
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<th>Side length</th>
<th>Model</th>
<th>Verbal description of model</th>
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</thead>
<tbody>
<tr>
<td>9</td>
<td>10 rows of 10 squares</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\sqrt{64})</td>
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</tbody>
</table>

**Assessment**
Make sure that pupils know the difference between a square and a square root and can find the square root of a given number. Give extra practice of easy examples if needed.

**Extension activity**
If \(\sqrt{25} = 5\), it can represented in a model like the one below.

Now complete the table below.

**Homework activity**
Worksheet 11 page 22 Question 4.
Starter activity
Revise the perfect squares between 1 and 100 from Lesson 1.

Lesson focus
Guide pupils through the quantitative reasoning and revision exercises. Ensure that they have grasped the concepts and that they understand how these inverse operations are related. Complete the Revision exercise on page 73.

Answers

Revision exercise

1. \( 6^2 = 36 \)  
2. \( 8^2 = 64 \)  
3. \( 36^2 = 1296 \)  
4. \( 11^2 = 121 \)  
5. \( 46^2 = 2116 \)  
6. \( 47^2 = 2209 \)  
7. \( 17^2 = 289 \)  
8. \( 10^2 = 100 \)  
9. \( 34^2 = 1156 \)  
10. \( 16^2 = 256 \)  
11. \( 50^2 = 2500 \)  
12. \( 19^2 = 361 \)  
13. \( 44^2 = 1936 \)  
14. \( 43^2 = 1849 \)  
15. \( 30^2 = 900 \)  
16. \( 42^2 = 1764 \)  
17. \( 35^2 = 1225 \)  
18. \( 23^2 = 529 \)  
19. \( 33^2 = 1089 \)  
20. \( 32^2 = 1024 \)  
21. \( \sqrt{484} = 22 \)  
22. \( \sqrt{784} = 28 \)  
23. \( \sqrt{841} = 29 \)  
24. \( \sqrt{900} = 30 \)  
25. \( \sqrt{1296} = 36 \)  
26. \( \sqrt{1764} = 42 \)  
27. \( \sqrt{1225} = 35 \)  
28. \( \sqrt{529} = 23 \)  
29. \( \sqrt{304} = 48 \)  
30. \( \sqrt{401} = 49 \)

Assessment
Check that pupils extract the correct mathematical information from the text. Can pupils apply an algorithm to solve the given problem?

Extension activity
Ask pupils to create more quantitative reasoning questions.
Unit 12: Dividing by 10s

**Objectives**

By the end of this unit, pupils will be able to:

- Divide whole numbers by 10 and its multiples up to 90
- Solve problems on quantitative reasoning involving division of numbers by 10 and multiples of ten up to 90.

**Suggested resources**

Charts on division of number of 10 and multiples of 10 up to 90; Multiplication chart; Number line; Place value tables

**Key word definitions**

- **litre:** metric unit of capacity, equal to 1 cubic decimetre
- **remainder:** the amount that is left over
- **multiples:** quantity that contains another number of times without a remainder

**Teaching this unit**

In this unit, pupils revise the relationship between multiplication and division. The pupils use their knowledge of multiplication tables to find products and divisions of larger numbers. Pupils revise the relationship between multiplication and division. They then use inverses to find missing numbers in multiplication and division sentences. Pupils learn division by 10 and use this skill to solve problems.

**Evaluation guide**

Pupils to:

1. Divide given numbers by 10 and multiples of 10.
2. Solve quantitative aptitude problems involving division of number by 10 and multiples of 10 up to 90.

**Lesson focus**

In this lesson pupils are taught how to divide whole numbers by 10, and they explore the changes in place value. Establish that the digits now move one place when dividing by ten, thereby making the number smaller in value. Show how this process is the inverse of multiplying by 10 and so on. Thus, when you divide a number by 10, the comma moves one place to the left e.g.
98.3 \div 10 = 9.83. Work through the example in the PB on page 74 then complete Exercise 1 page 74.

Answers

Exercise 1
1. 210 ÷ 10 = 21  2. 740 ÷ 10 = 74
3. 1,360 ÷ 10 = 136  4. 1,240 ÷ 10 = 124
5. 900 ÷ 10 = 90  6. 194 ÷ 10 = 19.4
7. 407 ÷ 10 = 40.7  8. 824 ÷ 10 = 82.4
9. 357 ÷ 10 = 35.7 10. 765 ÷ 10 = 76.5
11. Ido can make 680 ÷ 20 = 34 bags
12. 150 km ÷ 650 = 0.231 tanks of petrol for the journey.

Assessment
Pupils should be able to divide whole numbers by 10 and to understand what happens to whole numbers when they are divided by 10.

Extension activity
Ask pupils to complete the Challenge activity on page 75 of the PB.

Homework activity
Complete the following exercise.
1. A teacher has ₵3,500 to buy workbooks. If each workbook costs ₵5, how many workbooks can the teacher buy?
2. A soccer league has ₵35,000 to buy new soccer balls. If each ball costs ₵5, how many balls can the league buy?
3. A house painter has ₵2,700 to buy paint. If each can of paint costs ₵90, how many cans of paint can the painter buy?
4. A new science website has ₵600 to buy online ads. If each ad costs ₵200, how many ads can the website purchase?
5. There are 25,000 DVDs in a film store. Each rack holds 50 DVDs. How many racks does the store need to use to hold all the DVDs?

6. A farmer needs to ship 42,000 pumpkins to a grocery store. If each crate can hold 6 pumpkins, how many crates will the farmer need?
7. The Peterson Fruit Co. needs to ship an order of 7,200 bananas. If each box can hold 800 bananas, how many boxes will the company need?
8. Tamir bought some tins and decided to fill them with brownies to give to his friends. Tamir baked 300 brownies. He put 10 brownies in each tin and made sure to fill as many tins as he could. How many tins was Tamir able to fill with brownies?

Lesson 2 Pupil’s Book page 75

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Charts on division of number of 10 and multiples of 10 up to 90
• Multiplication chart.

Starter activity
Draw on some real life examples where division into equal parts are required. For example, 25 sweets have to be shared amongst 5 friends. Think of a few more examples each time working with bigger numbers.

Revision the long division method and explain to pupils again the steps involved.

Lesson focus
In this lesson pupils are taught how to divide whole numbers by multiples of 10. Work through the examples on page 75 of the PB. Show how the we can divide a large number by a multiple of 10 by breaking the multiple of 10 into its factors. For example, 840 divided by 30, where 30 is broken up into 10 and 3. Therefore, 840 divided by 10 = 84 which is divided by 3 to yield 28. Alternately, the long division method could also be used. Complete Exercise 2 page 76 of PB.
Unit 12: Dividing by 10s

Exercise 2
1. \(6480 \div 40 = 162\)  
2. \(2940 \div 70 = 42\)  
3. \(10500 \div 50 = 210\)  
4. \(7600 \div 40 = 190\)  
5. \(10980 \div 90 = 122\)  
6. \(720 \div 30 = 24\)  
7. \(7440 \div 30 = 248\)  
8. \(4080 \div 80 = 51\)  
9. \(6120 \div 60 = 102\)

Assessment
Check that pupils can split division into multiples of 10 and also use the long division method.

Extension activity
1. Which of these numbers are multiples of 10, 100 and 1000?
   a) 8,000  b) 6,500  c) 20,000  
   d) 8,790  e) 65,000  f) 5,000  
   g) 6,543  h) 2,000  i) 1,200  
   j) 3,000  k) 50,300  l) 75,000  
   m) 456  n) 7,000  o) 12,000  
2. Divide each of your multiples of 1,000 by ten.
3. Now divide each of your multiples of 1,000 by:
   a) 20  
   b) 30  
   c) 50

Homework activity
Worksheet 12 page 23 Questions 1,2,3.

Lesson 3  Pupil’s Book page 77

Preparation
You will need to have:
- Pupil’s Book
- Workbook
- Charts on division of number of 10 and multiples of 10 up to 90
- Place value tables.

Starter activity
Again revise the long division method by giving pupils a few easy numbers to divided into each other.

Assessment
Check that pupils can divide multiples of 10 into whole numbers that are not divisible by 10.
Extension activity
1. Change the following numbers into multiples of 10 and a factor.
   a) 45   b) 30   c) 82
   d) 14   e) 49
2. What is the smallest number that leaves a remainder of 1 when divided by 2, remainder of 2 when divided by 3, a remainder of 3 when divided by 4, and so on up to a remainder of 9 when divided by 10?

Homework activity
Ask pupils to complete the Quantitative Reasoning exercise on page 78 of the PB.

Lesson 4 Pupil’s Book page 78

Preparation
You will need to have:
• Pupil’s Book
• Workbook.

Starter activity
Revise the Quantitative reasoning exercise that pupils completed for homework.

Lesson focus
Pupils revise the concepts covered in this unit by working through the Revision exercise page 79 of PB. Check pupils’ progress and monitor carefully how they cope with integrating the content covered in this unit.

Answers
Exercise 5 (quantitative reasoning)
1. 820 ÷ 10 = 82
   2. 640 ÷ 20 = 32
   3. 560 ÷ 40 = 14
   4. 1380 ÷ 30 = 46
   5. 24 000 ÷ 580 = 41
   6. 270 ÷ 90 = 3

Revision exercise
1. 610 ÷ 10 = 61
   2. 900 ÷ 10 = 90
   3. 8 470 ÷ 10 = 847
   4. 4 560 ÷ 20 = 228
   5. 1 020 ÷ 20 = 51
   6. 1 710 ÷ 30 = 57
   7. 3 550 ÷ 50 = 71
   8. 3 780 ÷ 60 = 63
   9. 7 040 ÷ 80 = 88
   10. 8 370 ÷ 90 = 93
   11. 451 ÷ 10 = 45.1
   12. 678 ÷ 10 = 67.8
   13. 2 856 ÷ 20 = 142 remainder 16
   14. 1 016 ÷ 40 = 25 remainder 16
   15. 356 ÷ 60 = 5 remainder 56
   16. 259 ÷ 70 = 3 remainder 49
   17. 240 cm² ÷ 20 cm = 12 cm
   18. 4 874 ÷ 40 people = 121 candies each with a remainder of 34 candies.

Assessment
These exercises will indicate the extent to which the pupils have achieved the objectives stated at the beginning of this unit.

Extension activity
Challenge page 75.

Homework activity
Worksheet 12 page 23 questions 4, 5, 6.

Workbook answers worksheet 12
1. a) 12   b) 8
   c) 9   d) 50
   e) 121   f) 8
   g) 11.2   h) 72.3
2. 27
3. 37 and 25 remainder
4. 131.2 cm long, 25.4 cm wide and 2 cm deep
5. 29
6. 11
Objectives

By the end of this unit, pupils will be able to:

• Divide whole numbers by 100 and its multiples

• Solve problems on quantitative reasoning involving division of numbers by 100 and 200.

Suggested resources

Counting blocks; Calculators (optional); Charts containing worked problems involving division of number by 100 and 200; Dice; Paper

Key word definitions

express: make known in words or by gestures

cuboid: cube shaped

Frequently asked questions

Q What prior knowledge should the pupil have?
A Pupils should have a well developed idea of how to work with multiples and how to divide using the long division method. Pupils should also have an understanding of how division by 10 shifts a decimal comma to the left by one place, thus making the number smaller, and how multiplication by 10 shifts the decimal comma to the right by one place, thus making the number bigger.

Evaluation guide

Pupils to:

1. Solve given exercises on division by 100 and 200.

Lesson 1 Pupil’s Book page 80

Preparation

You will need to have:

• Pupil’s Book
• Workbook
• Counting blocks
• Calculators (optional)
• Dice
• Paper.

Starter activity

Divide the class into groups of 4-6 pupils and give each group a number of counting blocks that can divided evenly amongst each member of the group. Give the blocks to the group leader and instruct him/her not to reveal the total number of blocks received. Now ask him/her to divide the blocks amongst the group members so that each one has an equal number of blocks. Then ask pupils to use an inverse process to work out how many blocks the group leaders received. Repeat the activity, this time giving each group a number of blocks that cannot be divided equally amongst its members.

Lesson focus

Explain to pupils that division of a whole number moves the decimal comma 2 place to the left and making the original number even smaller than when we divided by 10. Refer to the examples on page 80 of the PB and illustrate how the comma moves 2 places to make 1500 become 15. Also point out to pupils that the number of zeroes in the divisor will guide us as to the number of places the comma will move. Furthermore, illustrate how applying the inverse of division (i.e. multiplication by 100) restores the number to its original value. Division by 100 will not yield remainders when the whole number being divided end in zeroes e.g. 5 900 (page 80 PB). However when we divide a number like 920 by 100 and the comma shifts 2 places, we get an answer of 9,2, i.e. a remainder of 2. Complete Exercise 1 on page 81 of the PB.

Answers

Exercise 1

1. 8 600 ÷ 100 = 86
2. 9 400 ÷ 100 = 94
3. 10 200 ÷ 100 = 102
4. 28 700 ÷ 100 = 287
5. 14 700 ÷ 100 = 147
6. 43 600 ÷ 100 = 436
7. \(19800 ÷ 100 = 198\)  
8. \(82700 ÷ 100 = 827\)
9. \(39600 ÷ 100 = 396\)  
10. \(8934 ÷ 100 = 89.34\)
11. \(6001 ÷ 100 = 60.01\)  
12. \(28056 ÷ 100 = 280.56\)
13. \(29321 ÷ 100 = 293.21\)  
14. \(30660 ÷ 100 = 306.6\)
15. \(699 ÷ 100 = 6.99\)  
16. \(828 ÷ 100 = 8.28\)
17. \(14789 ÷ 100 = 147.89\)  
18. \(906 ÷ 100 = 9.06\)

**Assessment**

Make sure that pupils have understood the previous unit on multiples of 10. Pupils should be confident with place values. Give extra practice with 10 and 100 if needed.

**Extension activity**

Ask pupils to do the Challenge activity on page 81 of the PB.

**Homework**

This investigation looks at dividing by 10, 100 and 1,000. You'll need dice, a calculator, a pen and paper. You're going to use the dice to make numbers to use in the investigation. You can do this in two steps. Here's an example:

Step 1: how many digits does the number have? Throw one die to decide.

If you throw a 3 the number has 3 digits. If you throw a 6 then it has 6 digits, etc.

Step 2: throw dice to find each of the digits.

**Example**

Step 1 gives a 4

Step 2 is to find 4 digits

Now:

1. Put your numbers into the first column and then fill in the rows by dividing your numbers by 10, 100 and 1,000. (The first row has been filled in for you.)
2. Fill in the first 4 rows of the table.
3. Check your answers with a calculator.
4. Can you see a quick way to work out the answers?

5. Try completing the last 6 rows to fill the whole table.

<table>
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<th>NUMBER</th>
<th>÷ 10</th>
<th>÷ 100</th>
<th>÷ 1000</th>
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**Lesson 2  Pupil’s Book page 81**

**Preparation**

You will need to have:
- Pupil’s Book
- Workbook
- counting blocks
- calculators (optional).

**Starter activity**

Revise division by 100 which yields no remainder and remainders. Do a few carefully selected examples that pupils have not encountered previously, but which are not too difficult. You may wish to refresh their memories by illustrating a few on the board for them. Alternatively, call out a few numbers that are easily divisible by 10 and 100 e.g. 1000, 120, 150, 2000, etc. and ask for the answers mentally.

**Lesson focus**

This lesson extends the concept of division by focusing on division by 200. Show the pupils that when we divide a whole number by 200, we split the divisor, 200, up into its factors 100 and 2. Refer to the example on page 81 of the PB and explain how 4600 is divided by 100 to give 46, which is in turn divided by 2 to give 23. If the whole number which is divided by 200 gives a remainder, it will be easier if pupils use the long division method. The example on page 82 of the PB shows that when 9282 is divided by 200 gives an answer of 46.41. However, note that splitting the 200 into factors is still an option which pupils can employ i.e. 9282 divide by 100 gives 92,82 divided by 2 = 46.41. Complete Exercise 2 on page 82 of the PB.
Answers

Exercise 2

1. \(36 400 \div 200 = 182\)
2. \(25 600 \div 200 = 128\)
3. \(6 300 \div 200 = 31\) remainder 100
4. \(96 000 \div 200 = 480\)
5. \(81 600 \div 200 = 408\)
6. \(53 500 \div 200 = 267\) remainder 100
7. \(41 200 \div 200 = 206\)
8. \(29 400 \div 200 = 147\)
9. \(33 900 \div 200 = 169\) remainder 100
10. \(17 700 \div 200 = 88\) remainder 100
11. \(28 280 \div 200 = 141\) remainder 80
12. \(25 680 \div 200 = 128\) remainder 80
13. \(41 800 \div 200 = 209\)
14. \(19 730 \div 200 = 98\) remainder 130
15. \(10 650 \div 200 = 53\) remainder 50

Assessment
Make sure that pupils are comfortable with moving the decimal point two places to the left.

Extension activity

The following exercise should be assigned for additional practice in division by 200. However, note that the dividend does not end in zero.

1. \(22 957 \div 200\)
2. \(94 962 \div 200\)
3. \(38 027 \div 200\)
4. \(86 445 \div 200\)
5. \(7 555 448 \div 200\)
6. \(12 836 \div 200\)

Homework activity

Worksheet 13 page 24 Question 1.

Lesson focus

Work through the example on page 83 of the PB and illustrate how the mathematical information is lifted from the text and the appropriate operation performed using the division drills taught in earlier lessons. Complete Exercise 3 on page 83.

Answers

Exercise 3

1. \(9 600 \text{ litres} \div 100 \text{ litres} = 96 \text{ drums}\)
2. \(13 420 \text{ bottle tops} \div 200 \text{ children} = 67 \text{ bottle tops for each child with 20 remaining}\)
3. A volume of \(12 320 \text{ cm}^3 \div \text{ a base area of } 200 \text{ cm}^2 = \text{ a height of } 61.6 \text{ cm}\)
4. \(10 463 \text{ notebooks} \div 200 \text{ per box} = 52 \text{ boxes with 63 notebooks remaining}\)
5. \(17 600 \div \text{ a factor } 100 = 176 \text{ as the other factor}\)
6. \(17 040 \text{ pencils} \div 200 \text{ pupils} = 85 \text{ pencils each with 40 pencils remaining}\)

Assessment
Make sure that pupils are familiar with long division of large numbers. Give extra practice if required.

Extension activity

The country of Sierra Leone extends for approximately 334 km from East to West. Algeria extends about ten times further. Approximately how far is Algeria from East to West?

Homework activity

The following exercise can be assigned for homework.

1. How many times larger is 4 300 than 43?
2. 380 people wish to go to a soccer match by bus. Only one bus is available and it has a capacity of 60 passengers. How many trips will the bus have to make?
3. How many times smaller is 4 than 800?

Lesson 4  

Preparation

You will need to have:
- Pupil’s Book
- Workbook
- Counting blocks
- Calculators (optional)
- Charts containing worked problems involving division of number by 100 and 200.

Starter activity

Revise the processes of division by 10, 100 and 200 with pupils. Use examples from real life which involve fairly simple numbers for pupils to work with mentally. E.g. take examples from a shopping context, number of people a bus can transport, etc.
**Starter activity**

Call out a few numbers that are easily divisible by 10 and 100 e.g. 1 000, 120, 150, 2 000, etc and ask for the answers mentally. Depending on the size of the class you might want to get each pupil to give an answer.

**Lesson focus**

Before asking pupils to work through the Quantitative reasoning exercise on page 84 and the Revision exercise on page 85, go through the summary on page 85 and recap the essential points contained in it. Check the homework assignments while moving around the class and make sure that all pupils are familiar with the processes required for division by 100 and 200. Complete Exercise 4 on page 84 of the PB.

**Answers**

**Exercise 4**

1. 1 700 ÷ 100 = 17
2. 3 600 ÷ 100 = 36
3. 7 200 ÷ 100 = 72
4. 4 200 ÷ 300 = 14
5. 8 650 ÷ 500 = 173
6. 56 700 ÷ 900 = 63

**Assessment**

Pupils should be familiar with multiples of 100 and 200.

**Extension activity**

The population of Gambia in Africa is approximately 1.7 million people. About ten times fewer people live in Telford in the UK? Estimate how many people live in Telford.

**Homework activity**

Worksheet 13 page 24 Question 2.

**Lesson 5 Workbook page 24**

**Preparation**

You will need to have:
- Pupil’s Book
- Workbook.

**Revision exercise**

1. 12 000 ÷ 100 = 120
2. 16 200 ÷ 100 = 162
3. 6 400 ÷ 100 = 64
4. 4 800 ÷ 100 = 48
5. 28 800 ÷ 100 = 288
6. 10 500 ÷ 200 = 52 remainder 100
7. 50 480 ÷ 200 = 252 remainder 80
8. 19 800 ÷ 200 = 99
9. 17 100 ÷ 200 = 85 remainder 100
10. 42 500 ÷ 200 = 212 remainder 100
11. 22 800 ÷ 200 = 114
12. 16 200 grams ÷ 100 small packs = 162 grams per pack

**Assessment**

Collect in the answers to mark them, identify any problem areas and revisit those areas if necessary.

**Extension activity**

Pupils to make up their own questions.

**Workbook answers worksheet 13**

1. a) 96   b) 212   c) 405
   d) 313   e) 543   f) 314
   g) 15.56  h) 21.69
2. a) 4 m   b) 3.16 m   c) 0.88 f
   d) 75.66 m   e) 0.2 m   f) 178.062 ha
   g) 13.50   h) 2   i) 32.5
   j) 1 055 m
3. 26 400   4. 13   5. 0.75
Objectives

By the end of this unit, pupils will be able to:

• Divide decimals by 10
• Divide decimals by multiples of 10 up to 90
• Solve quantitative aptitude problems on decimals.

Suggested resources

Calculators; Copies of place value tables

Frequently asked questions

Q What is the difference between long and short multiplication and division?
A Short multiplication and division is when the multiplier and divisor are single digits. In long multiplication and division, the multiplier and divisor have more than one digit. Go back over the Unit 4 work if necessary.

Evaluation guide

Pupils to:
1. Solve given problems on division decimals by multiples of 10.
2. Solve quantitative aptitude problems involving division of decimals by multiples of 10.

Lesson 1  Pupil’s Book page 86

Preparation

You will need to have:
• Pupil’s Book  • Workbook
• Calculators  • Copies of place value tables.

Starter activity

Revise multiplication and division of whole numbers by 10. Ask the pupils to use inverses to undo the results of a chosen operation.

Lesson focus

In this unit we continue the same operation, dividing by 10 but working with decimal numbers. We apply the same principle we used with whole numbers when we divide the decimal number by 10 i.e. the comma shifts one space to the right so that the given number becomes smaller. Refer to the examples on page 86 of the PB in which long division is used to derive the answers. While pupils have to be familiar with the long division method, point out to pupils that if they apply the shifting rule, division by 10 is very quick and easy. Complete Exercise 1 page 87 of PB.

Answers

Exercise 1
1. 4.8; 2. 24.7; 3. 23.8; 4. 4.57; 5. 1.215; 6. 51.2; 7. 0.82; 8. 0.78; 9. 26.85; 10. 4.96; 11. 0.059; 12. 8.267; 13. 4.23; 14. 21.1; 15. 19.7

Assessment

Make sure that pupils understand the principle of dividing by a power of ten will make a number smaller. Give extra practice examples if needed.

Extension activity

Complete the challenge on page 89.

Lesson 2  Pupil’s Book page 87

Preparation

You will need to have:
• Pupil’s Book  • Workbook
• Copies of place value tables.

Starter activity

Revise the 2 different methods of division by 10 i.e. long division and shifting the comma. Also revise how to divide a whole number by multiples of 10.
by breaking the multiple of 10 apart into its tens component and units component.

Lesson focus
Show pupils how to use long division when we divide a decimal number by a multiple of 10. Ensure that pupils are familiar with powers of 10 and that dividing by any power of ten makes the number smaller. Refer to the examples on page 87 of the PB. Also show how we break the multiple of 10 apart into its factors e.g. The factors of 20 are 10 and 2. Therefore if we divide 35.4 by 20, we start by first dividing 35.4 by 10 = 3.54 and dividing again by 2 = 1.77. Complete Exercise 2 on page 88.

Answers
Exercise 2
1. \(85 \div 50 = 1.7\)
2. \(352 \div 80 = 4.4\)
3. \(20.9 \div 20 = 1.045\)
4. \(135.8 \div 40 = 3.395\)
5. \(943.2 \div 30 = 31.44\)
6. \(996.5 \div 50 = 19.93\)
7. \(138 \div 60 = 2.3\)
8. \(32.2 \div 70 = 0.46\)
9. \(86.4 \div 90 = 0.96\)
10. \(19.2 \div 60 = 0.32\)
11. \(46.8 \div 20 = 2.34\)
12. \(90.8 \div 40 = 2.27\)
13. \(50.4 \div 70 = 0.72\)
14. \(72.24 \div 80 = 0.903\)
15. \(41.4 \div 90 = 0.46\)

Assessment
Revise long division with any pupils who need extra help.

Extension activity
Workbook page 24 Question 6.

Homework activity
Worksheet 14 page questions 1 and 2.

Lesson 3  Pupil’s Book page 89

Preparation
You will need to have:
- Pupil’s Book
- Workbook.

Starter activity
Give pupils some large numbers to divide by 1000 and 2000 and challenge them to see how quickly they can find the answer in their heads and shout out the answers.

Lesson focus
This lesson should complete Unit 14. Briefly revise lessons 1 and 2 and then complete Exercise 3 on page 88 with pupils. Walk around the classroom to check that pupils are managing.

Answers
Exercise 3
1. \(102 \div 40 = 2.55\)
2. \(43.8 \div 20 = 2.19\)
3. \(11.5 \div 50 = 0.23\)
4. \(68.4 \div 90 = 0.76\)
5. \(82.7 \div 30 = 2.09\)
6. \(41.6 \div 80 = 0.52\)
7. \(18.6 \div 60 = 0.31\)
8. \(108.2 \div 70 = 1.56\)

Assessment
Check the pupils’ answers to the Quantitative reasoning exercise. Check that pupils are all on track in terms of attaining the outcomes of this unit.

Homework activity
Worksheet 14 page questions 3, 4 and 5.

Workbook answers Worksheet 14
1.  a) \(0.375\)  b) \(\frac{3}{4}\)  c) \(3.75\)  d) \(3.75\)
2.  a) \(3.875\)  b) \(\frac{133}{400}\)  c) \(0.3875\)  d) \(0.3875\)
3.  a) Pupils to mark on number line  b) \(0.015\)  c and d) Pupils to mark on number line
4.  Pupils to mark on number line
5.  a) \(0.314\)  b) \(0.57\)  c) \(0.036\)  d) \(14.14\)  e) \(10\)  f) \(7.77\)
g) \(0.004\)
6.  \(12.5\) cm
Objectives
By the end of this unit, pupils will be able to:
• Divide decimals by 100 and 200
• Divide whole numbers by 2-digit numbers.

Suggested resources
Colour coded beans/tiles to represent different place values; Place value tables similar to ones used in Unit 14 but with more decimal place values; Division charts of worked examples on division of decimals.

Key word definitions
place value: the position of the digit within the number

Frequently asked questions
Q  What prior knowledge should the pupils have?
A  By now pupils should have a very good understanding of the concept of place value and should be able to identify different place values with ease. Pupils should also know how the process of division works. In particular, they should know how to long divide and should also know how to use the factor method of division. Pupils must also know how the comma moves when a whole number is divided by 10, 100, 200 or multiples of 10.

Common errors that pupils make
Pupils tend to move the decimal comma too many places to the left. In these cases the teacher should take care to point out that division by 10, 100, 1,000, etc will move the comma the same number of places as there are zeroes in the divisors, i.e. 10 comma moves once, 100 comma moves twice, etc.

Evaluation guide
Pupils to:
1. Divide given decimals by 100 and 200.
2. Solve problems on division by 2-digit numbers.
### Answers

**Exercise 1**

1. \(148 \div 100 = 1.48\)
2. \(330 \div 100 = 3.3\)
3. \(445 \div 100 = 4.45\)
4. \(842 \div 100 = 8.42\)
5. \(445 \div 100 = 4.45\)
6. \(89.3 \div 100 = 0.893\)
7. \(27.8 \div 100 = 0.278\)
8. \(45.6 \div 100 = 0.456\)
9. \(3.2 \div 100 = 0.032\)
10. \(1.7 \div 100 = 0.017\)
11. \(34.2 \div 100 = 0.342\)
12. \(3.2 \div 100 = 0.032\)
13. \(1.7 \div 100 = 0.017\)
14. \(5.13 \div 100 = 0.0513\)
15. \(34.2 \div 100 = 0.342\)

**Assessment**

Check that pupils understand place value from thousands to tens and then through decimal points to tenths, hundredths and thousandths.

**Extension activity**

Ask pupils to attempt the Challenge questions on page 91 of the PB for homework.

**Homework activity**

Worksheet 15 page 26 Question 1.

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**Lesson 2**  
**Pupil’s Book page 91**

**Preparation**

You will need to have:
- Pupil’s Book
- Workbook
- Place value tables similar to ones used in Unit 14 but with more decimal place values.

**Starter activity**

Check the homework Challenge by asking a few pupils to give their answers. Also find out who struggled with the Challenge exercise. Check particularly, that pupils understood what they were required to do.

**Lesson focus**

When we divide a decimal number by 200, we can again break the 200 into its factors i.e, 100 and 2. First divide the given decimal number by 100, i.e. shift the comma 2 places left so that the number becomes smaller. Then divide the answer by 2, i.e. halve the answer. Also show pupils how to use long division to divide a number by 200. Refer to the examples on page 91 of the PB and work through these to illustrate how each procedure is performed. Also explain to pupils the principle of rounding to a set number of decimal places. Work through some examples to illustrate when we round up i.e. when the following decimal is a number 5 to 9, or rounding down i.e. when the following number is a value of 0 to 4. Ask pupils to do Exercise 2 on page 92 using both methods taught. Move around the class to ensure that all the pupils have a good grasp of what to do and how to perform the procedures.

### Answers

**Exercise 2**

1. \(634 \div 200 = 3.17\)
2. \(892 \div 200 = 4.46\)
3. \(961.1 \div 200 = 4.806\)
4. \(456 \div 200 = 2.28\)
5. \(1,165 \div 200 = 5.825\)
6. \(2,184 \div 200 = 10.92\)
7. \(541.8 \div 200 = 2.709\)
8. \(368 \div 200 = 1.84\)
9. \(473.7 \div 200 = 2.369\)
10. \(1,054.8 \div 200 = 5.274\)
11. \(675.5 \div 200 = 3.378\)
12. \(713.6 \div 200 = 3.568\)
13. \(104.4 \div 200 = 0.522\)
14. \(289 \div 200 = 1.445\)

**Assessment**

Make sure that pupils understand the ordering of steps in dividing decimals by 200; first divide by 100 move the decimal point and then complete the division. Give extra practice in rounding off numbers to 2 decimal places if needed.

**Extension activity**

The following exercise can be given as homework in order to give pupils practice in rounding decimal numbers. Round the following decimal numbers to 2 decimal places.

1. 0.459  
2. 3.931  
3. 7.775  
4. 9.382  
5. 0.007  
6. 8.884  
7. 4.455  
8. 0.036  
9. 6.666  
10. 5.118

**Homework activity**

Worksheet 15 page 26 Question 2.
**Lesson 3**  Workbook page 26

**Preparation**
You will need to have:
- Pupil’s Book
- Workbook.

**Starter activity**
Give an informal quiz on rounding off numbers to 1, 2 or 3 decimal places. Pupils can check their own answers.

**Lesson focus**
Use this lesson to focus on place values and rounding off of decimals. Look at the example on page 92 of the PB and then work through the Quantitative reasoning exercise with them.

**Answers**

**Exercise 3**

1. \( \frac{894}{100} = 8.94 \)
2. \( \frac{68}{100} = 0.68 \)
3. \( \frac{825}{100} = 8.25 \)
4. \( \frac{270}{1000} = 0.27 \)
5. \( \frac{348}{1000} = 0.348 \)
6. \( \frac{1092}{1000} = 1.092 \)
7. \( \frac{585}{900} = 0.65 \)
8. \( \frac{202.4}{728.0} = 0.278 \)

**Assessment**
Some pupils may struggle with the concepts in the Quantitative reasoning exercise. Use this as a fun lesson or allow pupils to work in groups and find the answers together. This allows quicker pupils to help slower pupils.

**Extension activity**
Pupils can make up more examples similar to those in the Quantitative reasoning exercise.

**Homework activity**
Worksheet 15 page 26 questions 3, 4 and 5.

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**Lesson 4**  Page 93 Pupil’s Book

**Preparation**
You will need to have:
- Pupil’s Book
- Workbook.

**Starter activity**
Give a few short questions changing fractions into decimals, as a reminder activity. Then give a few quick examples of rounding off decimal places.

**Lesson focus**
This lesson consolidates the work in Unit 15. Pupils should complete the Revision exercise on page 93 on their own.

**Answers**

**Revision exercise**

1. \( 156 \div 100 = 1.56 \)
2. \( 440 \div 100 = 4.4 \)
3. \( 243 \div 100 = 2.43 \)
4. \( 956 \div 100 = 9.56 \)
5. \( 345 \div 100 = 3.45 \)
6. \( 2162 \div 200 = 10.81 \)
7. \( 631.8 \div 200 = 3.16 \)
8. \( 358 \div 200 = 1.79 \)
9. \( 477.6 \div 200 = 2.388 \)
10. \( 1056.8 \div 200 = 5.284 \)

**Assessment**
Check pupils’ answers to the Revision exercise and identify any pupil that needs extra practice.

**Workbook answers Worksheet 15**

1. a) 15  b) 37.5  c) 1.5  d) 0.375  e) 0.00056  f) 0.27  g) 3.63  h) 0.0063  i) 0.125  j) 0.0002
2. a) 0.7  b) 18.75  c) 12.5  d) 0.042  e) 0.1902  f) 0.0048  g) 0.0244  h) 0.000225  i) 0.0028
3. 12.89 Naira  4. 6.45 m  5. 6.84 m  6. 1.536 ha  7. 0.025 mm
Objectives
By the end of this unit, pupils will be able to:
• Find the missing number in open sentences
• Use letters to represent boxes in open sentences
• Find the missing numbers that the letters represent
• Interpret each box in a mathematical statement representing a letter that can be found
• Use letters to represent the missing numbers in quantitative aptitude problems and find their values.

Suggested resources
Counting tiles/beads; Flash cards; Sweets (for sharing)

Key word definitions
expression: a term used to describe any combination of the various mathematical symbols
number sentence: an equation using numbers and symbols
represent: stand for or correspond to
equation: making equal

Common errors that pupils make
Pupils struggle with solving equations because they tend to have a poor understanding of the concept of inverse operations. When an equation like \( x + 2 = 5 \) has to be solved, pupils might have an intuitive understanding that the only number that can be added to 2 to give 5 is 3. However, when the operations involved are explicated, they tend to get lost. The actual solution to equations involves the use of inverses i.e. \( x + 2 - 2 = 5 - 2 \). When we use the inverse of addition viz. subtraction, we apply the operation on both sides of the equation in order to maintain the equilibrium.

Evaluation guide
Pupils to:
1. Use letters to represent open sentences.
2. Solve problems on open sentences.
3. Solve given quantitative aptitude problems on open sentences.

Lesson 1
Pupil’s Book pages 94 and 95

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Flash cards with numbers available; some cards should have a blank block only
• Sweets.

Starter activity
Share 20 sweets between 2 pupils by handing out 10 sweets to the first pupil. Explain that the other 10 sweets can be referred to as the remainder and we can call this \( x \). They should be able to see what the remaining out is. Point out that they have now found a value for \( x \), i.e. 10.

Lesson focus
Explain how we find the answers by using mathematical procedures. Where the open sentence involves addition, they are required to use the inverse operation viz. subtraction. Therefore, \( 76 - 47 = 29 \). Where the sum given involves multiplication, the inverse viz. division, is used. Therefore, \( 216 ÷ 13.5 = 16 \). Explain how inverses are applied to subtraction and division problems. Explain to pupils that instead of using boxes all the time, we can use letters to represent unknown numbers. Refer to the example on page 94 of the PB and explain how the box is replaced by the letter \( x \) so that the sum becomes \( 6 + x = 18 \). Also work through the examples on page 95 of the
It is important that pupils are shown how the variable is made the subject of the equation. Now work through Exercise 1 page 94 of the PB with the class giving them 5 minutes to find solutions as intuitively as they can.

**Answers**

**Exercise 1**

1. \(29 + 47 = 76\)
2. \(16 \times 13.5 = 216\)
3. \(43 + 157 = 200\)
4. \(40 \times 45.2 = 1808\)
5. \(4.45 + 2.55 = 7\)
6. \(12.5 \times 30 = 375\)
7. \(121 - 28 = 93\)
8. \(44 ÷ 4 = 11\)
9. \(686 - 227 = 459\)
10. \(728 ÷ 13 = 56\)
11. \(145 - 96 = 49\)
12. \(148.5 + 27 = 5.5\)

**Extension activity**

Challenge page 95.

**Homework activity**

Worksheet 16 page 27 Question 1.

**Lesson 2** Pupils Book pages 96 and 97

**Preparation**

You will need to have:
- Pupil’s Book
- Workbook
- Flash cards with numbers available; some cards should have a blank block only.

**Starter activity**

Use a few verbal real-life problems for pupils to solve mentally. For example, a shop sells chocolates at £3 per bar. I paid £15. How many bars of chocolate did I buy?

**Lesson focus**

Explain to pupils how certain key words are used in word sums to indicate a particular mathematical operation.

Also demonstrate the example on page 95 of the PB showing pupils how the mathematical information is extracted from the text to construct an equation. Emphasise that the key to solving word problems is to read the question carefully. Pupils must now attempt Exercise 2 in the PB on page 95.

**Answers**

**Exercise 2**

1. \(x + 47 = 76\)
2. \(y \times 13.5 = 216\)
3. \(p + 157 = 200\)
4. \(40 \times a = 1808\)
5. \(4.45 + z = 7\)
6. \(b \times 30 = 375\)
7. \(x - 28 = 93\)
8. \(44 \div q = 11\)
9. \(n - 227 = 459\)
10. \(c \div 13 = 56\)
11. \(y - 96 = 49\)
12. \(z \div 27 = 5.5\)
13. a) \(u + 2 = 13\)
    \[\begin{align*}
    u &= 11 \\
    \end{align*}\]
    b) \(q - 10 = 18\)
    \[\begin{align*}
    q &= 28 \\
    \end{align*}\]
    c) \(27 + m = 41\)
    \[\begin{align*}
    m &= 14 \\
    \end{align*}\]
    d) \(a + 1.8 = 4.6\)
    \[\begin{align*}
    a &= 2.8 \\
    \end{align*}\]
    e) \(x - 45.3 = 4.7\)
    \[\begin{align*}
    x &= 50 \\
    \end{align*}\]
    f) \(35 - r = 29\)
    \[\begin{align*}
    r &= 6 \\
    \end{align*}\]
    g) \(9 + r = 22\)
    \[\begin{align*}
    r &= 13 \\
    \end{align*}\]
    h) \(18 - f = 13\)
    \[\begin{align*}
    f &= 5 \\
    \end{align*}\]
    i) \(m - 5 = 16\)
    \[\begin{align*}
    m &= 21 \\
    \end{align*}\]
    j) \(k - 11 = 22\)
    \[\begin{align*}
    k &= 33 \\
    \end{align*}\]
    k) \(d + 45 = 68\)
    \[\begin{align*}
    d &= 23 \\
    \end{align*}\]
    l) \(29 + g = 36\)
    \[\begin{align*}
    g &= 7 \\
    \end{align*}\]

**Assessment**

Make sure that pupils are familiar with open sentences before moving on to lesson three. Pupils should be able to calculate the answer both when the answer is unknown and when one of the variables is unknown.

**Extension activity**

Ask pupils to make up some questions to ask each other.

**Homework activity**

Worksheet 16 page 27 Question 2.
Lesson 3  Pupil’s Book pages 98 and 99

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Flash cards with numbers available; some cards should have a blank block only.

Starter activity
Use the questions that pupils made up as an extension activity in Lesson 2 as a starter activity.

Lesson focus
This lesson introduces fractions into open sentences. Explain to pupils that they will apply exactly the same operations as in the previous 2 lessons. Work through Exercise 3 page 96 of the PB with pupils.

Answers
Exercise 3
1. \( y + 6 = 9 \)
   \( y = 3 \)
2. \( 8 + a = 23 \)
   \( a = 15 \)
3. \( \frac{7}{2}x = 2\frac{1}{3} \)
   \( x = \frac{4}{25} \)
4. \( r - 2.8 = 6.8 \)
   \( r = 9.6 \)
5. \( a - 7 = 23 \)
   \( a = 30 \)
6. \( 13 + r = 23 \)
   \( r = 10 \)
7. \( m + 15 = 34 \)
   \( m = 19 \)
8. \( 12 + y = 30 \)
   \( y = 18 \)
9. \( x - 5\frac{1}{4} = 4\frac{3}{6} \)
   \( x = 10\frac{1}{12} \)
10. \( 9x = 414 \)
    \( x = 46 \)
11. \( 27m = 378 \)
    \( m = 14 \)
12. \( a \times 7 = 32.9 \)
    \( a = 4.7 \)
13. \( \frac{x}{8} = 35 \)
    \( x = 280 \)
14. \( \frac{3}{25} \times 30 \)
    \( = no valid answer \)
15. \( \frac{33}{m} = 13 \)
    \( m = 27 \)

Assessment
Pupils should be able to work through open sentences which include fractions. Some pupils may experience difficulty with this and need extra help. Monitor progress during this exercise and identify any pupils who struggle to correctly work through the examples.

Extension activity
Quantitative Reasoning exercise page 9 of PB.

Answers
Exercise 5
1. \( \triangle 15 \)
2. \( \triangle 21 \)
3. \( \triangle 88 \)
4. \( \triangle 342 \)
5. \( \triangle 168 \)
6. \( \triangle 144 \)

Homework activity
Worksheet 16 page 28 questions 3–6.

Lesson 4  Workbook page 27

Preparation
You will need to have:
• Workbook
• Pupil’s Book.

Starter activity
Use a few verbal real-life problems for pupils to solve mentally. For example, I have 20 sweets and must share them with my three brothers, how many will we each have? Leave time to go through the Quantitative reasoning exercise on page 98.
Lesson focus
This lesson demonstrates how open sentences can be used to solve real life problems. Explain to pupils that we can create equations to solve real life problems and demonstrate how to do this, using some simple problems and the board. Make sure that pupils understand how to write a problem using a number sentence/an equation. Work through the example on page 97. Once pupils are familiar with this, complete Exercise 4 on page 96 of the PB.

Answers

Exercise 4

1. \(x = 19\)  
2. \(y = 18\)  
3. \(a = 26\)  
4. \(b = 15\)  
5. \(y = 16\)  
6. \(x = 918\)  
7. \(a = 43\)  
8. \(b = 23\)  
9. \(y = 13\) and \(4y = 52\)  
10. \(x = 533\)

Assessment
Make sure that pupils are able to create an equation from a word problem. Check that they use logical steps in solving the problem.

Homework activity
Worksheet 16 page 28 Questions 7-10.

Lesson 5 Page 99 Pupil’s Book

Preparation
You will need to have:
* Pupil’s Book.

Starter activity
Recap briefly on lessons 1–4 of this unit.

Lesson focus
This lesson consolidates the unit. Pupils should undertake the Revision exercise on page 99 of the PB as an assessment task in order to identify any problems that exist.

Revision exercise

1. a) \(y + 9 = 17\)  
   \(y = 8\)  
   \(r = 6 = 13\)  
   \(r = 19\)  
   \(r = 11\)  
   \(a = 11\)  
   \(g = 9\)  
   \(h = 11\)  
   \(k = 14\)  
   \(l = 8\)  
   \(m = 96\)  
   \(n = 205\)  
   \(o = 199\)  
   \(p = 21\)  
   \(q = 21\)  
   \(r = 202, 201, 200, 199, 198\)

Assessment
Set aside at least 30 minutes for pupils to complete the Revision exercise. Pupils must work on their own, but while they are busy move around and check they are not making glaring errors. Give assistance in cases where pupils are still experiencing difficulties. Check that pupils are all on track in terms of attaining the outcomes of this unit.

Extension activity
Pupils can make up some word problems using open sentences if time permits.

Workbook answers Worksheet 16

1. a) \(9 \ 110\)  
   b) \(54\)  
   c) \(36\)  
   d) \(7\)  
   e) \(72\)  
   f) \(18\)  
   g) \(13\)  
   h) \(363\)  
   i) \(70\)  
   j) \(840\)  
2. a) \(f = 6\)  
   b) \(k = 14\)  
   c) \(m = 61\)  
   d) \(y = 14\)  
   e) \(z = 75\)  
   f) \(v = 46\)  
   g) \(v = 473\)  
   h) \(b = 8208\)  
   i) \(p = 21\)  
   j) \(q = 21\)  
3. \(33\)  
4. \(264\)  
5. \(10\)  
6. \(9\)  
7. \(24 + 6\)  
8. \(60\)  
9. \(40\)  
10. \(202, 201, 200, 199, 198\)
Objectives
By the end of this unit, pupils will be able to:
• Compare Nigerian units of money with pounds sterling, American dollars and some West African countries.

Suggested resources
Nigerian bank notes and coins (naira and kobo), foreign currencies, pictures or charts showing currency rates; Stamps; Models of money; Charts of solved examples on quantitative reasoning problems on money; Newspapers with currency information

Key word definitions
rate of exchange: the value of one currency for the purpose of conversion to another
currency: the system of money in general use in a particular country
bureau de change: an establishment at which customers can exchange foreign money

Frequently asked questions
Q What prior knowledge should the pupil have?
A Pupils need a good understanding of addition, subtraction, multiplication and division of numbers. They need knowledge of buying and selling of articles.

Q How can I ensure that the pupils understand the concepts well?
A Provide the pupils with real money and pictures of other currencies if real examples are not available. Make the pupils draw the various coins or notes in their books and display images in the classroom. Give pupils enough practical work as possible.

Common errors that pupils make
Pupils find it difficult to know whether to multiply or divide when changing currencies. Encourage pupils to write down the same currencies underneath each other, and ask themselves, whether they will get more (then multiply) or less (then divide). E.g. If exchange rate is 240 = £1 then $X = £5 (240 × 5, as there will be more) 120 = X (£1 ÷ 2, as there will be less). They need also to be careful when deciding what multiplying factor to use. Remind them of the work they did earlier on ratio. In the above example, the number of £s has been multiplied by 5, so the number of Naira must also be multiplied by 5.

Evaluation guide
Pupils to:
1. Identify various currencies.
2. Convert one currency to another.

Lesson 1 Pupil’s Book pages 100-102

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Nigerian bank notes and coins (naira and kobo), foreign currencies, pictures or charts showing currency rates
• Newspapers with currency information.

Starter activity
Bring Nigerian currency denominations to the class for pupils to see and remind them that the notes have higher values than the coins but all are in naira except the 50k coin which is just 1/2 of a naira. Ask pupils to hold the coins and compare the weights with the notes. Notes are lighter but higher in value.
Lesson focus

Explain to the pupils that as we have the naira and kobo as Nigerian currency so we have different currencies for different countries except for some countries that use the same currency. Show the pupils the common types of currencies used in other countries, for example Ghana, Sierra Leone, Gambia, Togo, Liberia, Republic of Benin, Japan, United States of America (USA), Britain and Europe (euro). Display images of other currencies in the classroom.

Let pupils know that there is an exchange rate which may change over time. Refer to the exchange rates on page 101 and demonstrate to pupils how we convert local currency into foreign currency using the exchange rates given in the table. Also work through the examples on the same page before asking pupils to complete Exercise 1 on page 102 of the PB.

Answers

Exercise 1

1.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Naira</td>
<td>Dollar</td>
<td>Pound</td>
<td>Cedis</td>
<td>Leone</td>
</tr>
<tr>
<td>15 000</td>
<td>94</td>
<td>58</td>
<td>75 000</td>
<td>394 737</td>
</tr>
<tr>
<td>2 500</td>
<td>16</td>
<td>10</td>
<td>12 500</td>
<td>65 789</td>
</tr>
<tr>
<td>28 450</td>
<td>178</td>
<td>109</td>
<td>142 250</td>
<td>784 684</td>
</tr>
<tr>
<td>8 500</td>
<td>53</td>
<td>33</td>
<td>42 500</td>
<td>223 684</td>
</tr>
<tr>
<td>37 500</td>
<td>234</td>
<td>144</td>
<td>187 500</td>
<td>986 842</td>
</tr>
</tbody>
</table>

2. a) £6.90 = N1 794  
   b) £5.13 = N1 334  
   c) £12.50 = N3 250  
   d) $12 = N1 920  
   e) $1.99 = N3 18  
   f) $250 = N4 000  
   g) c800 = N1 160  
   h) 600 Rands = N1 500  
   i) Le312 = N1 2  
   j) Le1 300 = N4 9

3. a) £5 192  
   b) $8 438  
   c) 54 000 Rands  
   d) N915 800 = $5 724

4. N7 250 = 290 Rands

5. a) Biola received more cash  
   b) They received N266 000 together

Assessment

Make sure that pupils understand why currencies need to be exchanged and how to read the exchange rate of one currency for another.

Extension activity

Pin or write the exchange rates for currencies on the board and change it every day for a week. Pupils can monitor the changes in rates and comment about it.

Homework activity

Ask pupils to do some research in order to answer the Challenge activity on page 101 of the PB. In order to extend pupils a little more you may want to add a few other countries to the list e.g. South Africa, China, etc.

Lesson 2 Pupil’s Book page 103

Preparation

You will need to have:
- Pupil’s Book
- Newspapers with currency information.

Starter activity

Check the answers to the Challenge activity and get feedback from pupils. See if pupils can remember the names of some of the main currencies.

Lesson focus

Make sure that pupils understand how to convert one currency to another. Ask pupils to complete the Revision exercise on page 103 of the PB. If there is time available also ask pupils to complete the Extension activity below.

Answers

Revision exercise

1. £18.50 = N4 810  
2. c360 = N7 2  
3. $26 = N4 160  
4. Le10 500 = N3 99  
5. 58 Rands = N1 450  
6. N1 050 = $6.56  
7. N7 250 = 290 Rands  
8. N32 214 = £123.90
**Unit 17: Converting currency**

**Assessment**
Pupils should be able to do simple currency conversions. Give extra examples to any pupils who need them. Check that pupils can name the currencies of Nigeria, its immediate neighbours and countries such as the USA.

**Extension activity**
At the end my recent travels around the world I came home with the following amounts of foreign currency:

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>CURRENCY</th>
<th>NAIRA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>885</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>England</td>
<td>8,75</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>22,50</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>South Africa</td>
<td>120</td>
<td></td>
</tr>
</tbody>
</table>

TOTAL: 

Change all the different amounts of currencies in the table into Nigerian Naira and calculate how much Naira I came home with in total.

**Homework activity**
Pupils to research and find the names of currencies of as many African countries as they can.

---

**Lesson 3 Workbook page 29**

**Preparation**
You will need to have:
- Workbook
- Pictures of flags of different countries.

**Starter activity**
Hold up the flags of the different countries and ask pupils to call out the correct currency.

**Lesson focus**
In this lesson Pupils will complete Worksheet 17 in the WB. The focus is on how well pupils have understood and assimilated the content of this unit. Pupils work on their own in trying to find solution to the problems.

**Answers**

Workbook answers Worksheet 17

1. a) dollar  
   b) pound  
   c) euro  
   d) cedi  
   e) leone  

2. a) ₦2460  
   b) ₦1100  
   c) ₦48  
   d) ₦3780  
   e) ₦4034.4  
   f) 1713.6  
   g) ₦0.22  
   h) ₦68.75  
   i) ₦15368  
   j) ₦4364.06  

3. a) £0.0545  
   b) €1.77  
   c) $3048.78  
   d) 778 GHS  
   e) 2091.8 GHS  
   f) SLL 714  
   g) £0.442  
   h) $2.846  
   i) SLL1700  
   j) €0.845  

4. ₦59860  
5. ₦17530
Objectives

By the end of this unit, pupils will be able to:

• Solve problems on profit and loss, simple interest, commission, discount and transactions in the post office and market, etc.

Suggested resources

Price list of shopping goods (advertising supplements in newspapers will do); Calculators; Nigerian bank notes; Items such as packets of sweets, milk

Key word definitions

profit: excess of returns over outlay
loss: something sold for less than what you paid for it
selling price: the price at which something is offered for sale
cost price: the price at which goods are bought
dozen: twelve
score: set of twenty
principal: an original sum invested or lent
rate: a fixed amount paid or charged for something
discount: the amount deducted from the full or normal price
commission: a sum, typically a set percentage of the value involved, paid to an agent

Common errors that pupils make

Pupils find it difficult to work backwards when they know the selling price and the profit, but need to know the cost price. Encourage pupils to read word problems carefully, and start by defining the information they know, and then deciding what they need to find out. They should be competent in finding profit and loss, being familiar with profit making things bigger, and a loss making them smaller, before tackling the inverse problems. Pupils find the percentage profit as a percentage of the selling price instead of the cost price.

Evaluation guide

Pupils to:

1. Solve problems on profit and loss, simple interest, commission, discount and transactions in the post office and market, etc.

Lesson 1 Pupil’s Book page 104

Preparation

You will need to have:

• Pupil’s Book
• Workbook
• Calculators.

Starter activity

Ask pupils to subtract one number from the other up to 1 000. See which of the pupils can supply answers fastest. Let the class clap for correct and quick responses. Ask what is the symbol of percentage and how is it calculated. Give some examples to illustrate and remind pupils of the concept. Pupils should be able to explain that we put
the difference over the original number and multiply by 100 to obtain percentage increase or decrease.

**Lesson focus**

Remind the pupils that to obtain the gain or loss on an article bought we find the difference between the selling price and the cost price. If the selling price is more than the cost price, we have gain, or profit, but if the cost price is more than the selling price, we have a loss. Use a few concrete examples to illustrate how the Profit and Loss formulae are applied. Give pupils 10–15 minutes to work through Exercise 1 on page 104. Check their answers at the end of the allocated time.

Work through the example on page 105 in the PB with the pupils and give a few more examples if pupils are struggling to understand. Pupils now work on Exercise 2 on page 105 of the PB.

**Answers**

**Exercise 1**

1. 12 notebooks cost = ₦306
   12 notebooks sold for 12 × ₦28 = ₦336
   The profit was ₦336 – ₦306 = ₦30

2. Sales price of television = ₦105 200
   Cost price of television = ₦93 500
   Profit = ₦11 700

3. Sales price of clothing = ₦8 500
   Profit = ₦2 349
   Cost of clothing = ₦6 151

4. Cost of radio = ₦9 200
   Loss = ₦3 155
   Sales Price = ₦6 045

5. Cost = 5 × 12 = 60 oranges = ₦2 400
   Sales = 60 – 18 = 42 oranges × ₦60 each
   = ₦2 520
   Profit = ₦120

**Exercise 2**

1. | Cost price | Selling price | Profit/Loss | % Profit/Loss |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>₦7 200</td>
<td>₦8 000</td>
<td>₦800 Profit</td>
<td>11%</td>
</tr>
<tr>
<td>₦4 000</td>
<td>₦3 800</td>
<td>₦200 Loss</td>
<td>5%</td>
</tr>
<tr>
<td>₦8 300</td>
<td>₦10 000</td>
<td>₦1 700 Profit</td>
<td>20.5%</td>
</tr>
<tr>
<td>₦12 600</td>
<td>₦18 270</td>
<td>₦5 670 Profit</td>
<td>45%</td>
</tr>
<tr>
<td>₦8 000</td>
<td>₦6 600</td>
<td>₦1 400 Loss</td>
<td>17.5%</td>
</tr>
</tbody>
</table>

2. Cost of 900 eggs = ₦21 000
   Sales = 900 – 90 = 820 eggs at ₦30 each
   = ₦24 600
   Profit = ₦3 600
   % = 17%

3. Cost of trousers = ₦4 500
   Sale of trousers = ₦5 400
   Profit = ₦900
   % = 20%

4. Cost = 3 × 20 = 60 notebooks × ₦60 each
   = ₦3 600
   Sales = 30 × ₦40 each and 30 × ₦55 each
   = ₦2 850
   Loss = ₦750
   % = 20.8%

5. Cost of 10 mugs = ₦3 150
   Sales = 10 × ₦325 each = ₦3 250
   Profit = ₦100
   % = 3.17%

**Assessment**

Ensure that pupils understand how to calculate a percentage profit or loss. Revise with pupils how to calculate percentages and give extra practice if needed.

**Homework activity**

Complete the unfinished problems from Exercise 2.

**Lesson 2 Pupil’s Book page 106**

**Preparation**

You will need to have:
- Pupil’s Book
- Workbook
- Calculators.

**Starter activity**

In groups, allow the class to practise borrowing, lending and charging interest. For example, a boy borrows 10 and after using it for two weeks pays back 12, the extra 2 paid on the 10 is the interest.
Lesson focus
This lesson focuses on how to calculate simple interest. Explain to pupils that the terms such as principal, rate and time are used when calculating simple interest. Principal refers to the amount borrowed or loaned; rate is the percentage at which the interest is to be calculated while time is the period of borrowing or using the principal. Explain how to calculate simple interest, year by year, or by using the formula:

Simple interest = principal × rate × time

Work through the given example on page 106 of the PB with the pupils and give them a few more examples if necessary. Pupils can the work through Exercise 3.

Answers

Exercise 3
1. \( \text{₦}48\,000 × 15\% × 3.5 \text{ years} = \text{₦}25\,200 \)
2. \( \text{₦}52\,000 × 10 \% × 4 \text{ years} = \text{₦}20\,800 \)
3. \( \text{₦}50\,000 × 20\% = \text{₦}10\,000 \)
4. \( \text{₦}63\,000 × 21\% × 3 \text{ years} = \text{₦}39\,690 \)
5. \( \text{₦}60\,000 × 6.25\% × 2 \text{ years} = \text{₦}7\,500 \text{ interest} \)
\( + \text{₦}60\,000 = \text{₦}67\,500 \)
6. \( \text{₦}15\,000 × 5\% = \text{₦}750 \)
\( \text{₦}20\,000 × 4\% = \text{₦}800 \)
7. \( \text{₦}300\,000 × 7\% = \text{₦}21\,000 \)
\( \text{₦}350\,000 × 8\% = \text{₦}28\,000 \)

Assessment
Check that pupils know the formula for simple interest and can work with it.

Extension activity
Pupils to complete the Challenge activity on page 104.

Lesson 3 Pupil’s Book page 107

Preparation
You will need to have:
- Pupil’s Book
- Calculators.

Starter activity
Revise the work covered on equations. In particular, revise the inverse processes we used to change the subject of the equation. Work through a few simple examples involving mainly multiplication and division.

Lesson focus
This lesson is an extension of the previous lesson. It still deals with the topic of simple interest, but instead of work out how much interest is earned or how much the principal amount has grown, pupils have to find values for the other variable viz. the principal itself, the interest rate or the time period. This involves having to make one of these variable the subject of the equation. In order to do so we have draw on or knowledge of how to use inverse processes to change the subject of the equation. Refer to the example on page 107 of the PB and explain step by step how each of the variables, P, R and T, are made the subject of the equation in turn. Now work through the examples on page 108 of the PB in which you demonstrate the types of problems pupils will be expected to solve. Complete Exercise 4 on page 108 of the PB.

Answers

Exercise 4
1. \( \text{₦}20\,000 ÷ 3 \text{ years} = \text{₦}6666.67 \text{ interest per annum} ÷ 10\% = \text{₦}6666.70 \text{ principal amount} \)
2. \( \text{₦}7\,200 ÷ 2 \text{ years} + 6\% = \text{₦}60\,000 \)
3. \( \text{₦}12\,800 \text{ interest} ÷ 4 \text{ years} = \text{₦}3\,200 \text{ per annum} + \text{₦}40\,000 \text{ principal amount} = 8\% \text{ interest} \)
4. \( \text{₦}34\,000 ÷ 4 \text{ years} + \text{₦}272\,000 = 3.12\%5. \)
\( \text{₦}45\,000 × 3\% = \text{₦}1\,350 \text{ per annum} \)
\( \text{₦}4\,050 ÷ \text{₦}1\,350 = 3 \text{ years} \)
5. \( \text{₦}576\,000 \text{ total amount} – \text{₦}480\,000 \text{ principal amount} = \text{₦}96\,000 \text{ interest accumulated} \)
\( \text{₦}480\,000 × 8\% \text{ per annum} = \text{₦}38\,400 \text{ annual interest} \)
\( \text{₦}96\,000 \text{ total interest} + \text{₦}38\,400 \text{ annual interest} = 2.5 \text{ years} \)
Assessment
Make sure that pupils understand the difference between principal, rate and time and understand how to use two of the variables to find the third. This is quite a difficult unit for pupils so extra time and practice may be needed.

Lesson 4  Pupil’s Book page 109

Preparation
You will need to have:
• Pupil’s Book
• Calculators
• Nigerian bank notes
• Items such as packets of sweets, milk, etc.

Starter activity
Provide the pupils with items such as packets of sweets, milk, etc. to ‘sell’. Give pupils a small reward from the sales made. This is commission. Also, give the pupils a real-life market situation where a discount is collected for paying in cash or buying in bulk.

Lesson focus
Let the pupils know the importance of paying commission. It encourages the salesmen to want to sell more so that his/her commission will be more. The lesson also shows how to calculate discounts for paying either in cash or buying so many of an item. Work through the example on page 109 to demonstrate to the pupils how discounts are calculated and give a few more if necessary to prepare them to answer. Also work through the example on page 110 to demonstrate how commissions are calculated. Do a few extra examples if necessary and then ask pupils to complete Exercise 5 page 109 and 6 page 110.

Answers

Exercise 5
1. N14 000 less 8% = N12 880
2. N2 000 plus 20% = N2 400
3. N850 000 less 6.5% = N794 750
4. N120 000 reduced to N85 000 = 29.2% discount
5. N32 000 less N2 240 = 7% discount

Exercise 6
1. a) Profit is the amount gained on cost
   b) Discount is the amount reduced from the original price
   c) Loss is a sale for less than the cost
   d) Commission is a percentage of a sale paid to an agent
   e) Simple interest is a percentage added to a loan over a fixed period

2.

<table>
<thead>
<tr>
<th>Value of goods sold</th>
<th>Commission received</th>
<th>Percentage commission</th>
</tr>
</thead>
<tbody>
<tr>
<td>N58 000</td>
<td>N3 770</td>
<td>6.5%</td>
</tr>
<tr>
<td>N120 000</td>
<td>N6 000</td>
<td>5%</td>
</tr>
<tr>
<td>N25 500</td>
<td>N1 402.50</td>
<td>5.5%</td>
</tr>
<tr>
<td>N600 000</td>
<td>N30 000</td>
<td>5%</td>
</tr>
<tr>
<td>N972 000</td>
<td>N53 460</td>
<td>5.5%</td>
</tr>
</tbody>
</table>

3. The percentage of N35 000 on N700 000 = 5%
4. a) 80 bags × N1 120 × 3% = N2 688
    b) 80 bags × N1 120 = N89 600 – N2 688
       = N86 912
5. a) N350 sales – N200 cost = N150 × 27
     crates = N4 050 Profit
    b) N4 050 × 7% = N283.50 commission

Assessment
Check pupil’s answers to make sure they understand the steps involved in calculating commission.

Extension activity
Quantitative reasoning exercise page 111.

Homework activity
Revision exercises on page 112 of the PB. Answers can be checked at the start of the next lesson.

Lesson 5  Workbook page 31

Preparation
You will need to have:
• Workbook.
Starter activity
Check the pupils’ answers to the Quantitative reasoning and Revision exercises.

Lesson focus
This lesson consolidates and assesses work completed in the earlier lessons of Unit 18. Pupils should complete Worksheet 18 in the WB during the lesson time.

Answers

Quantitative reasoning
1. \((N\times 3.2) \div 100 = N25.60\)
2. \((N\times 3 \times \times 3) \div 100 = N18\)
3. \((N\times 24) \div 100 = N96\)
4. \((N\times 2 \times 10) \div 100 = N70\)
5. \((N\times 3 \times 5.5) \div 100 = N49.50\)
6. \((N\times 4 \times 3) \div 100 = N77\)
7. \((N\times 20 \times 2) \div 100 = N2000\)
8. \((N\times 3.5 \times 5.5) \div 100 = N300\)

Revision exercise
1. a) Sale of pencils = N5400
   Cost of pencils = N4240
   Profit = N1160
   b) N1160 + N5400 = 21.5%
2. a) Cost of rulers = N780
   Sale = 12 – 3 = 9 rulers \times N55 = N495
   Loss = N285
   b) Percentage loss = 36.5%
3. N116000 \times 7.5\% \times 3 years = N26100
4. a) N205000 reduced to N185000 = 9.8% discount
   b) A sale of N205000 on a cost of N162000 = 21% profit
   c) A sale of N185000 on a cost of N162000 = 12.4% profit
5. N900000 \times 8\% \times 8.5 years = N612000
   interest + N900000 principal amount = N1512000 payable
6. N20000 \times 12\% = N2400 per annum
   N3600 will accrue after 1.5 years
7. N6500 less 15\% discount = N5525

Assessment
This assessment tests the extent to which the pupils have achieved the objectives stated at the beginning of this unit.

Extension activity
Pupils can create their own questions involving commission.

Homework activity
Correct any wrong answers from Worksheet 18.

Workbook answers Worksheet 18
1. a) N72000
   b) N630
   c) N2520
   d) N9.07
   e) N0.33
   f) N18.71
   g) N5872.50
   h) N24532.20
   i) N1212
   j) N699.3
2. a) 8%
   b) N30000
   c) 21 years
   d) N12000
   e) 0.15 years
3. N76623
4. N46240
5. 1%
6. 20 years
7. N20000
8. N5001
9. N702000
Objectives
By the end of this unit, pupils will be able to:
• Solve quantitative reasoning problems on transactions involving money such as bank cheques and
  bank drafts, mail, postal orders and money orders.

Suggested resources
Examples of cheques, bank deposit and withdrawal slips postal orders mail orders; Nigerian bank notes

Common errors that pupils make
Pupils cannot interpret the information given in the tables. Pay particular attention to the way the post office charges for multiples of 20 g, and always rounds up the masses to the next multiple, rather than charging by each gram. Explain that the additional charge is an administration charge, so if three separate orders are bought, there will be three additional charges. Discuss with the class whether it is better to buy two postal orders for 50, or one for 100. If they are sending the money to a single person then it would be better to send a single order.

Evaluation guide
Pupils to:
1. Solve quantitative reasoning problems on transactions involving money such as bank cheques and bank drafts, mail, postal orders and money orders.

Lesson 1  Pupil’s Book page 114

Preparation
You will need to have:
• Pupil’s Book  • Workbook
• Nigerian bank notes
• Examples of cheques, bank deposit and withdrawal slips postal orders mail orders.

Starter activity
Ask pupils to carry out some buying and selling exercises using Naira values up to N100, involving making change. Also show pupils how cheques, deposit and withdrawal slips and postal/mail orders are filled out.

Lesson focus
Read through the text on page 114 of the PB. Work through the example on page 115 and check that pupils understand the mathematical operations involved. Complete Exercise 1 on page 115 of the PB. Give pupils the following rates of exchange: £1 = N260, $1 = N160, €1 = N226, R1 = N15.34. Have pupils complete the Challenge on page 115.

Answers
Exercise 1

Assessment
Pupils should be able to calculate the value of one currency in terms of another.

Homework activity
Worksheet 19 page 33 questions 1 and 2.

Lesson 2  Pupil’s Book page 115

Preparation
You will need to have:
• Pupil’s Book  • Workbook
• Nigerian bank notes
• Examples of cheques, bank deposit and withdrawal slips postal orders mail orders.
Lesson focus
Read through the table about postal charges on page 116 of the PB and explain how to read the information to decide how much it would cost to post a letter or parcel. Give lots of examples, using different weights. Ask pupils to work through Exercise 2.

Answers
Exercise 2

Assessment
Check that pupils understand that there is a commission which is paid on postal and money orders and that this must be factored into the cost of purchasing the postal or money order. Give extra examples if needed.

Homework activity
Worksheet 19 page 33 questions 5 and 6.

Lesson 4 Pupil’s Book page 118

Starter activity
Talk to pupils about why we use money, and we can transfer money from one person to another.

Lesson focus
Hand out photo copied cheques and postal orders and ask pupils to fill them in for a specific amount and person. Remind pupils of the charges involved in sending money. Ask pupils to calculate the weight of a parcel to send to a relative. Then ask pupils to complete the Revision exercise on page 118 of the PB (pupils can use the exchange rates on page 29 of the WB).

Answers
Revision exercise
1. N41 320; 2. N110; 3. a) N210 650, b) N97 180, c) N192 050, d) N200 050, e) N1 11730

Assessment
The revision exercise tests the extent to which the learners have achieved the objectives stated at the beginning of this unit.

Homework activity
Worksheet 19 page 33 questions 7, 8, 9 & 10.

Workbook answers Worksheet 19
Objectives
By the end of this unit, pupils will be able to:
• Find the perimeter of given shapes by measurement
• Calculate the perimeter of rectangle and square.

Suggested resources
Rulers, string; Cardboard/wooden/plastic geometric shapes of all sizes (as many as possible); Pencils; Scrap paper; Measuring wheel; Tape measure

Key word definitions
perimeter: circumference or outline of an area (also called the fence)
rectangle: a four sided figure with four right angles
square: a four sided figure with four right and all sides of equal length

Frequently asked questions
Q What prior knowledge should the pupils have?
A Pupils need a good understanding of the concept of length. They need to be able to measure the length of straight and curved lines. Pupils also need to understand and be able to choose the most appropriate unit of length.

Q How can I make sure that the pupils do not confuse perimeter with other concepts, such as area?
A Give the pupils as much practice as possible. Give them opportunities to explore shapes that are cut out of, or are drawn on paper. You can also give pupils the chance to walk on the school grounds to practically measure perimeter.

Evaluation guide
Pupils to:
1. Find perimeter of regular shapes.

Lesson 1 Pupil’s Book page 119

Preparation
You will need to have:
• Pupil’s Book
• Workbook

Starter activity
Provide the pupils with the cut out geometric shapes (triangles, circles, squares, etc). Ask them to use a length of string and to wrap it all around the outside edges of the given shapes. They must then place the string along a ruler to measure the length of the string as it fitted along the edges of the shapes.

Lesson focus
This lesson focuses on two aspects:
1. Measuring to work out perimeter.
2. Perimeters of rectangles.

The lesson builds the pupils’ skill of measuring length. Show pupils how we can use a ruler to measure the lengths of the two dimensional shapes on page 119 of the PB. All the measured sides of the shapes can be added to find the perimeter. When pupils complete Exercise 1 on page 119 of the PB it is advisable that they only use a ruler to measure the sides. The use of string may prove awkward and inaccurate.

Answers
Exercise 1
Pupils conduct measurements.

Assessment
Make sure that pupils are able to correctly measure with both thread and a ruler.
Lesson 2  Pupil’s Book page 119

Preparation
You will need to have:
• Pupil’s Book  • Rulers, string
• Cardboard/wooden/plastic geometric shapes of all sizes (as many as possible).

Starter activity
Check the answers to the previous exercise.

Lesson focus
Introduce the formula for calculating the perimeter of the rectangle and explain the process of substitution again. Show pupils that if they add one length and one width of a rectangle, then the answer is half the perimeter of the rectangle. This will help them to understand why they need to multiply the sum of the length and the width by 2, giving the formula $2(l + w)$. It is also important that the pupils understand that the letter $l$ represents the length of the rectangle and $w$ represents the width. Point out to the pupils that we leave out the multiplication sign in front of brackets.

Work through the examples on page 121 of the PB paying particular attention to how we extract the mathematical information from all the words. Pupils now complete Exercise 2.

Exercise 2
1.

<table>
<thead>
<tr>
<th>Length (l)</th>
<th>Width (w)</th>
<th>Perimeter</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 cm</td>
<td>13 cm</td>
<td>68 cm</td>
</tr>
<tr>
<td>1.52 m</td>
<td>1.2 m</td>
<td>5.44 m</td>
</tr>
<tr>
<td>28.5 cm</td>
<td>18.5 cm</td>
<td>94 cm</td>
</tr>
<tr>
<td>3.5 m</td>
<td>2.2 m</td>
<td>11.4 m</td>
</tr>
<tr>
<td>1.3 m</td>
<td>0.8 m</td>
<td>4.2 m</td>
</tr>
<tr>
<td>35 cm</td>
<td>21 cm</td>
<td>112 cm</td>
</tr>
</tbody>
</table>

2. The rope must be 63 m long
3. The width of the farm is 500 m
4. Malik walked 300 m

Assessment
Make sure that pupils are able to correctly measure with both thread and a ruler.

Lesson 3  Pupil’s Book page 122

Preparation
You will need to have:
• Pupil’s Book  • Workbook.

Starter activity
Give pupils some easy objects to measure the perimeter of using a ruler such as their note books and their desks. Introduce the lesson by telling pupils that there is an easier way of finding the perimeter of objects using a formula.

Lesson focus
This lesson is a continuation and extension of the previous lesson. This lesson introduces the skill of determining the perimeter of squares by using formulae. For pupils to understand the formula to find the perimeter of a square, it is important that you go through the examples in the PB carefully. Make sure that you work through the worked examples at a pace that the pupils can manage, with the opportunity to ask questions as you go along. Motivate pupils to work through all the questions in Exercise 3 page 123 PB.

Answers

Exercise 3
1. a) 11.2 cm  b) 21.2 cm  c) 39.2 cm  
   d) 22 cm  e) 32.8 cm  f) 26 cm

2.

<table>
<thead>
<tr>
<th>Sides (s)</th>
<th>4 cm</th>
<th>10.5 cm</th>
<th>12.1 cm</th>
<th>14 cm</th>
<th>77 mm</th>
<th>6.48 m</th>
<th>1.03 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perimeter</td>
<td>16 cm</td>
<td>42 cm</td>
<td>48.4 cm</td>
<td>56 cm</td>
<td>3.08 cm</td>
<td>25.92 m</td>
<td>4.12 m</td>
</tr>
</tbody>
</table>

3. The perimeter of the carpet is 16 m
4. The sides are 7.4 m
Assessment
Revise measurement of rectangles and ensure that pupils understand how to use the short cut method of calculating the perimeters of rectangles.

Lesson 4  Pupils Book page 124

Preparation
You will need to have:
• Pupil’s Book  • Workbook.

Starter activity
Go through the summary on page 124 of the PB, reminding pupils of what they have learned in lessons 1 to 3.

Lesson focus
Lesson 4 checks that pupils have correctly assimilated the new knowledge and understand how to correctly measure perimeters of rectangles and squares. Pupils are to complete questions 3–7 of Worksheet 20 on their own. Collect in their WBs at the end of the lesson to mark. (omit Question 2 and use for extension as it is quite hard.)

Answers
See WB answers at the end of this unit.

Assessment
This assessment tests the extent to which the pupils have achieved the objectives stated at the beginning of this unit.

Extension activity
Pupils who finish early can attempt Question 2 from the worksheet on page 35 on their own.

Workbook answers Worksheet 20

1. a) 12 m  b) 26 cm  c) 12 m  d) 9 cm  e) 12 m
2. Pupils to draw
3. 8m
4. Pupils to measure BC and then add $9 + 3 + 5 + 6 (BC) = 23 cm$
5. Pupils to draw rectangle 10 cm long and 5 cm wide
6. 20m
7. Pupils to draw triangle with 15 cm perimeter.

Revision exercise

<table>
<thead>
<tr>
<th>Length</th>
<th>Breadth</th>
<th>Perimeter</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 cm</td>
<td>2.2 cm</td>
<td>20.4 cm</td>
</tr>
<tr>
<td>16.4 cm</td>
<td>5 cm</td>
<td>42.8 cm</td>
</tr>
<tr>
<td>13 cm</td>
<td>11 cm</td>
<td>48 cm</td>
</tr>
<tr>
<td>41 cm</td>
<td>26.2 cm</td>
<td>134.4 cm</td>
</tr>
<tr>
<td>17 cm</td>
<td>12.7 cm</td>
<td>59.4 cm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sides</th>
<th>Perimeter</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.5 cm</td>
<td>26 cm</td>
</tr>
<tr>
<td>10 cm</td>
<td>40 cm</td>
</tr>
<tr>
<td>16.25 cm</td>
<td>65 cm</td>
</tr>
<tr>
<td>7.5 cm</td>
<td>30 cm</td>
</tr>
<tr>
<td>8.8 cm</td>
<td>35.2 cm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length</th>
<th>Breadth</th>
<th>Perimeter</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 cm</td>
<td>2.2 cm</td>
<td>20.4 cm</td>
</tr>
<tr>
<td>16.4 cm</td>
<td>5 cm</td>
<td>42.8 cm</td>
</tr>
<tr>
<td>13 cm</td>
<td>11 cm</td>
<td>48 cm</td>
</tr>
<tr>
<td>41 cm</td>
<td>26.2 cm</td>
<td>134.4 cm</td>
</tr>
<tr>
<td>17 cm</td>
<td>12.7 cm</td>
<td>59.4 cm</td>
</tr>
</tbody>
</table>
Objectives

By the end of the unit, pupils will be able to:

- Find the circumference of a circle when the radius is given
- Establish the relationship between \( \frac{c}{d} \) and \( \pi \) and find the circumference.

Suggested resources

String, rope, objects with circular faces, pairs of compasses, pins, nails, pencils; Cardboard cut-outs of various sizes of circles; Chart containing regular shapes; Concrete objects that are circular in shape, such as a wall clock, oranges, coins; Charts containing circle and its properties

Key word definitions

diameter: straight line passing from side to side through the centre of a circle
radius: straight line from centre to circumference of circle
semi-circle: half of circle or of its circumference
circumference: line enclosing circle

Frequently asked questions

Q What prior knowledge should the pupil have?
A Pupils need a good understanding of the concept of circles. They need to be able to measure length and distance round a circle. They also need to understand and be able to choose the appropriate unit of circumference.

Q How do I ensure that pupils learn the concept of circumference effectively?
A Give pupils as much practice as possible. Make them draw circles and measure round them. You can also allow pupils to practise measuring of circumference on the school playing ground and on paper.

Common errors that pupils make

Some pupils may find it difficult to measure the circumference with string. Ensure that pupils mark the starting point on the edge of the circle so that they know when the have completed a circuit. Also they need to edge around the circle carefully, keeping the string firm, but not stretching it. Make sure that all have come to the same conclusion – that the circumference is always just over three times the diameter. If anyone does not get this ratio, observe how they have made their measurement and advise them on where they may have gone wrong.

Pupils are inaccurate in finding the diameter of a sphere. Ensure that pupils are using perpendicular lines when placing the sphere against the ruler, when following the instructions.

Pupils fail to find the radius of a sphere. They may find this difficult as they cannot find the centre of the sphere without cutting it open. They need to understand that if the measure the diameter as described, then all they have to do, is find half of this measurement.

Pupils find it confusing that there are two values for the ratio \( \pi \). Explain that 3.14 and \( \frac{22}{7} \) are both merely approximations of the ratio. Each gives an estimate for the circumference. If the diameter is a multiple of 7 units, then we usually use the value of \( \frac{22}{7} \) as this avoids the use of decimals, and gives a whole number answer. If numbers aren’t multiples of 7 we can use either approximation.

Evaluation guide

Pupils to:

1. Find the circumference of a circle when the radius is given.
2. Establish the relationship between \( \frac{c}{d} \) and \( \pi \) and find the circumference.
Lesson 1 Pupil’s Book page 126

**Preparation**
You will need to have:
- Pupil’s Book
- String, rope, objects with circular faces, pairs of compasses, pins, nails, pencils
- Cardboard cut-outs of various sizes of circles
- Chart containing regular shapes
- Concrete objects that are circular in shape, such as a wall clock, oranges, coins.

**Starter activity**
Provide the pupils with cardboard cut outs of circles of different sizes. Pupils use string to find the circumference (perimeter) of a few circles. Provide pupils with objects like a tin of milk, a wall clock, coins and oranges and show the circular faces of the objects to the pupils. Again pupils use string to measure the circumferences. This time they also measure the diameters of the objects.

**Lesson focus**
This lesson focuses on the relationship between the length of the diameter of a circle and its circumference. Use the measurements pupils obtained during the started activity and ask them to calculate circumference divided by diameter. Ask pupils to measure the circumferences of several circles and record them with their corresponding diameters. They can then do Exercise 1 on page 126 of the PB.

**Answers**

**Exercise 1**
Learners conduct measurements.

**Assessment**
Make sure that the pupils notice that each circumference is a little more than three times its diameter. In fact, the circumference is 3.14 ($\pi$) times the diameter of the circle.

**Extension activity**
Challenge page 126 of PB.

**Homework activity**
Pupils to complete any unfinished questions from Exercise 1.

Lesson 2 Pupil’s Book page 128

**Preparation**
You will need to have:
- Pupil’s Book
- String, rope, objects with circular faces, pairs of compasses, pins, nails, pencils
- Ruler.

**Starter activity**
Check the Homework/Extension exercise and verify whether the pupils have been able to work out that the circumferences could be found by multiplying the diameters by $\pi$.

**Lesson focus**
In this lesson we find the circumference by means of calculation. From the starter activity, pupils should understand that a formula can be derived i.e. Circumference = $\pi \times$ diameter. We now have to explain the relationship between diameter and radius. Make sure that pupils understand that the radius is half the length of the diameter. Thus, the circumference formula can be modified to Circumference = $\pi \times 2 \times$ radius ($C = 2\pi r$). Work through the examples on page 128 in the PB and make sure pupils have understood the procedures before asking them to complete Exercise 2 on page 128 PB. Let pupils complete Worksheet 21 page 38 Question 1 together in groups.

**Answers**

**Exercise 2**
1.

<table>
<thead>
<tr>
<th>Diameter (D)</th>
<th>5 cm</th>
<th>9 cm</th>
<th>11 cm</th>
<th>21 cm</th>
<th>13 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circumference</td>
<td>15.71 cm</td>
<td>28.29 cm</td>
<td>34.57 cm</td>
<td>66 cm</td>
<td>40.86 cm</td>
</tr>
</tbody>
</table>

2.

<table>
<thead>
<tr>
<th>Radius (r)</th>
<th>3.5 cm</th>
<th>84 m</th>
<th>1 438 m</th>
<th>147 cm</th>
<th>35 cm</th>
<th>42.7 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circumference</td>
<td>6.29 cm</td>
<td>528 m</td>
<td>9 039 m</td>
<td>924 cm</td>
<td>220 cm</td>
<td>268.4 cm</td>
</tr>
</tbody>
</table>

3. a) 163.43 cm  
   b) 113.14 cm  
   c) 264 cm  
   d) 207.43 cm  
   e) 226.29 cm  
   f) 174.43 cm

4. a) (i) 56 cm (ii) 28 cm  
     b) (i) 294 cm (ii) 147 cm  
     c) (i) 42 cm (ii) 21 cm  
     d) (i) 345 cm (ii) 172.5 cm  
     e) (i) 106.9 cm (ii) 53.5 cm
Unit 21: Circumference

5. 176 cm

Assessment
Make sure that pupils are able to understand the concept of π and work with it. Use board work to explain the relationship between π and circumference and also to give extra examples of how to calculate circumference using the formula.

Extension activity
Ask pupils to use \( C = \pi \times d \) where \( \pi = \frac{22}{7} \) to find the circumference of a circle with:
a) \( d = 2.8 \) cm  
b) \( d = 15 \) cm  
c) \( d = 77 \) cm

Homework activity
Pupils to complete the Worksheet Question 1 if not completed in class.

Lesson 3  Pupil's Book page 129

Preparation
You will need to have:
- Pupil’s Book
- Workbook.

Starter activity
Go over Worksheet 21 Question 1 with pupils. Ask pupils if they can remember the formula and then write it on the board. Recap lessons 1 and 2 of this unit.

Lesson focus
This lesson recaps and tests the new learning in this unit. Go through the unit summary with pupils and then ask them to complete the Revision exercise on page 129 of the PB.

Answers

Revision exercise
1.  a) 220 cm  
   b) 176 cm  
   c) 110 cm  
   d) 440 cm  
   e) 308 cm  
   f) 396 cm  
   g) 1 144 cm
2. The circumference of the garden is 509 m
3. 302 cm  
4. 239 cm

Assessment
Make sure that pupils are able to complete the Revision exercise independently and check for any pupils who have not grasped this section of work.

Extension activity
Pupils to create word problems involving circumference.

Lesson 4  Workbook page 38

Preparation
You will need to have:
- Workbook.

Starter activity
Go over the homework from Lesson 3.

Lesson focus
In this lesson pupils must complete the remainder of Worksheet 21 on page 38.

Assessment
Collect in the answers to mark them, identify any problem areas and revisit those areas if necessary.

Extension/Homework
Pupils to measure the radius of 3 circular objects at home such as saucepans and work out their circumference.

Workbook answers Worksheet 21
1. Pupils to complete
2.  a) 21.99  
   b) 17.64  
   c) 10.99  
   d) 26.39  
   e) 3.99  
   f) 28.59
3. 17.59 cm
4.  a) 31.4  
   b) 50.24  
   c) 9.42  
   d) 67.82  
   e) 18.84  
   f) 81.64
Objectives
By the end of this unit, pupils will be able to:
• Solve word problems on weight
• Solve problems on quantitative aptitude involving weight.

Suggested resources
Objects that have a mass of about 1 g (for example a teabag and a paperclip), an object that has a mass of about 1 kg (for example a bag of 5 or 6 tomatoes or bananas); Line with ten divisions, each division is further divided into ten; Products that have different masses (for example 500 g, 2.5 kg and 1 kg); A poster with pictures of different products with their masses written on them; Scales for measuring the mass of objects; A bag of cement; A bag of groundnut; A bag of rice; Dot poster (optional)

Key word definitions
tonne: metric ton of 1 000 kg
scale: an instrument that you use to measure the weight of an object
metric: based on the metre

Frequently asked questions
Q What prior knowledge should the pupil have?
A The pupils should have a good understanding of the units the kilogram and the gram. They should also know that 1 000 g = 1 kg. Pupils should know that to convert kilograms to grams, they need to multiply by 1 000, and to convert grams to kilograms they need to divide by 1 000. The pupils should be able to explain why they are multiplying or dividing. Pupils should be able to add, subtract, multiply and divide within the number range for the grade. The better their skill at the four basic operations, the better their confidence will be when engaging with the problems. Pupils will also need to be able to read and interpret the problems.

Common errors that pupils make
Pupils do not know how many grams are in a kilogram and vice versa. Pupils often confuse the different units of measurement. Use visual clues and ideas of association to help them remember. For example, design a poster of a balance scale with 1 000 g on one side and 1 kg on the other. The scale should be balanced. Design a poster with an elephant sitting on a scale. As a caption for the poster you could write something like ‘Killer-grams!’ Pupils do not multiply or divide by 1 000 correctly. Explain again how to multiply by 1 000. You could do this by giving the pupils an investigation and allowing them to work with a calculator. Then make a general rule for multiplying and dividing by 1 000.

Evaluation guide
Pupils to:
1. Add the weights of given objects.
2. Solve problems on quantitative aptitude involving weight.

Lesson 1  Pupil’s Book page 130

Preparation
You will need to have:
• Pupil’s Book
• Workbook
• Objects that have a mass of about 1 g (for example a teabag and a paperclip), an object that has a mass of about 1 kg (for example a bag of 5 or 6 tomatoes or bananas)
• Products that have different masses (for example 500 g, 2.5 kg and 1 kg)
• Scales for measuring the mass of objects
• Dot poster (optional).
Starter activity
Remind the pupils how many grams make up 1 kg. Remind them how much 1 000 is. You could create a 1 000 dot poster by grouping 10 groups of 100 dots on a poster. Explain that each dot represents 1 g. This will give pupils a mental image of just how many grams make 1 kg. You could ask the pupils to help you create the 1 000 dot poster. Revise with them how to multiply and divide by 1 000. You could ask them these questions or make up your own.
7 × 1 000; 4.5 × 1 000; 6 000 ÷ 1 000; 13 500 ÷ 1 000; 18 000 ÷ 1 000; 25 × 1 000; 25 600 ÷ 1 000.

Lesson focus
In this lesson, pupils are taught to convert between grams and kilograms and vice versa. They are also required to converting using decimal numbers. Work through the examples on page 130 in the PB explaining to convert grams to kilograms, we divide by 1 000 and to convert kilograms to grams, we multiply by 1 000. Emphasise the importance of understanding and working with inverses. When working through the worked examples, pay special attention to converting with decimal numbers. This may challenge the pupils at first. Allow them to work through all the questions as this skill requires practice. Complete Exercise 1 on page 131 of the PB.

Assessment
Make sure that pupils are confident at changing grams into kilograms and vice versa. Give extra examples to convert if needed. Allow pupils to spend time weighing various objects using the scales.

Extension
Pupils find ways of measuring, for example using a bathroom scale; they could first weigh themselves and then hold the chair while they are on the scale. They then subtract their own mass from the combined mass.

Homework activity
Worksheet 22 page 40 questions 1 and 2.

Answers
Exercise 1
1. a) 4.2 kg  b) 5.3 kg  c) 6.972 kg
d) 0.6 kg  e) 0.57 kg  f) 4.05 kg
g) 2.015 kg  h) 0.020 kg  i) 0.005 kg
j) 0.201 kg
2. a) 5 000 g  b) 2 450 g  c) 7 658 g
d) 123 g  e) 1 240 g  f) 700 g
g) 630 g  h) 12 060 g
3. a) 600 g = \frac{3}{5} kg  b) 1 899 g < 2 kg
c) \frac{1}{2} kg > 250 g  d) \frac{2}{5} kg = 400 g
e) 7.5 kg > 6 000 g  f) 0.001 kg < 0.25 kg

Also revise the 4 mathematical operations with decimals. Demonstrate a few examples on the board in order to refresh pupils’ memories.

Lesson focus
This lesson will cover the 4 basic mathematical operation with weights. Refer to the examples on addition and subtraction of weights on page 131 of the PB. Explain to pupils how we use the column method when adding and subtracting weights.
Advise them that it is best that all the weights are in the same units e.g. 0.45 kg can be converted to grams and they same can be done with other items before adding or subtracting them. Also refer to the examples on multiplication and division on page 132 of the PB and work through these examples on the board. Now ask the pupils to complete Exercise 2 on page 132 in the PB.

**Answers**

**Exercise 2**

1. 1.02 kg + 1.35 kg + 1.1 kg + 1.2 kg = 4.67 kg
2. 3 kg + 1 500 g + 1 kg 750 g + 1 kg 600 g = 7.85 kg
3. 0.5 kg + 0.55 kg + 0.575 kg = 1.625 kg
4. 8 kg 657 g – 4 kg 520 g = 4.137 kg
5. 5 kg 40 g – 2 kg 501 g = 2.539 kg
6. 13,206 kg – 9.825 kg = 3.381 kg
7. 65 kg + 55.3 kg + 60 kg + 61.9 kg + 47.2 kg + 59 kg = 384.4 kg + 6 pupils = 58.1 kg average weight
8. 1.25 kg – 0.93 kg = 0.32 kg of meat left
9. 9,287 kg – 7.655 kg = 1.632 kg heavier
10. a) 3 180 kg truck + 35 × 88 kg mugs = 6 260 kg total weight (or 6 tonnes 260 kg)
    b) 3 180 kg truck – 3 080 kg mugs = 100 kg weight difference

**Assessment**

Pupils should be able to add and subject weights. Pupils should be able to use the column method when adding and subtracting weights.

**Extension activity**

Challenge activity on page 130 in the PB.

**Homework activity**

Worksheet 22 page 40 questions 3 and 4.

**Lesson 3**  *Pupil's Book page 134*

**Preparation**

You will need to have:
- Pupil’s Book
- Workbook.

**Starter activity**

Give pupils some examples of real life problems involving the multiplication and division of weights, such as “if a box of chocolates weighs 0.35 kg how much will 8 boxes weigh in total?”

**Lesson focus**

Pupils need to be able to multiply and divide weights. Use the example on page 133 to explain the method for multiplying and dividing weight to pupils. Complete Exercise 3 on page 134 of the PB with the class.

**Answers**

**Exercise 3**

1. 6.073 kg × 6 = 36.438 kg
2. 0.682 kg × 8 = 5.456 kg
3. 12.34 kg × 4 = 49.36 kg
4. 6 kg 73 g × 9 = 60.57 kg
5. 3.142 kg ÷ 2 = 1.571 kg
6. 4.104 kg ÷ 9 = 0.456 kg
7. 2.622 kg ÷ 3 = 0.874 kg
8. 87 kg 857 g ÷ 7 = 12.551 kg
9. 60 bags × 22 kg 501 g each = 1 350.06 kg of onions
10. a) 2.5 kg ÷ 50 g = 50 candies
    b) 3.5 kg ÷ 50 g = 70 candies
    c) 5.25 kg ÷ 50 g = 105 candies
11. 1.08 kg of pencils ÷ 8 packets = 135 g per packet
12. 1 800 litres of petrol × 0.78 kg per litre = 1 404 kg

**Assessment**

Revise units of weight with pupils to be absolutely sure pupils understand them.

**Extension activity**

Pupils to make up word problems involving weight.

**Homework activity**

Worksheet 22 page 41 questions 5 and 6.
Lesson 4  Pupil’s Book page 134

Preparation
You will need to have:
• Pupil’s Book
• Workbook.

Starter activity
Discuss the summary on page 134 of the PB with pupils.

Lesson focus
Use the lesson for pupils to complete the Revision exercise on page 134 of the PB.

Answers

Revision exercise
1. a) 900 g = 0.9 kg
   b) 061 g = 3.061 kg
   c) 18% of 75 kg = 13.5 kg
   d) 25% of 45 kg = 11.25 kg
   e) $\frac{3}{5}$ kg = 600 g
   f) $6\frac{3}{5}$ kg = 6375 g
   g) 1.2 kg = 1200 g
   h) 18$\frac{3}{4}$ kg = 18750 g
2. a) 1.74 kg + 3.658 kg = 5.398 kg
   b) 8.006 kg – 5.885 kg = 2.121 kg
   c) 17.34 kg × 8 = 138.72 kg
   d) 30.824 kg ÷ 8 = 3.853 kg
3. 7000 kg ÷ 40 bags = 175 kg per bag
4. 3 × 51 kg = 153 kg + 55.7 kg + 57.3 kg = 266 kg ÷ 5 pupils = 53.2 kg average weight
5. a) 160 000 kg can be carried (this is equal to 400 logs of 400 kg each)
   b) 265 rice bags × 25 kg each = 6625 kg
      which leaves 153 375 kg for logs ÷ 400 kg each = 383 logs
6. Imagine the nine coins in three stacks of three coins each. In one move we can find which of the three stacks is lighter (i.e. the one containing the lighter coin). It then takes only one more move to identify the light coin from within that lighter stack. So in two weighings we can find a single light coin from a set of 3 × 3 = 9.
7. 1st = 36 kg, 2nd = 72 kg and 3rd = 48 kg
8. Mrs Abu = 162 kg, Mrs Martins = 166.5 kg and Mrs Omi = 157 kg.

Assessment
Check pupil’s answers to the Revision exercise to ascertain who is having difficulties. Create extra practice for any pupil needing help.

Homework activity
Worksheet 22 page 41 questions 7 & 8.

Workbook answers Worksheet 22
1. 8.8 kg
2. a) No
   b) Because it is a very large weight
   c) 31.5 kg
3. 24500 kg = 22685.18 litres
4. 800 kg, no this is more than 0.75 of a tonne
5. 990 kg, yes this is less than a tonne
6. Imagine the nine coins in three stacks of three coins each. In one move we can find which of the three stacks is lighter (i.e. the one containing the lighter coin). It then takes only one more move to identify the light coin from within that lighter stack. So in two weighings we can find a single light coin from a set of 3 × 3 = 9.
7. 1st = 36 kg, 2nd = 72 kg and 3rd = 48 kg
8. Mrs Abu = 162 kg, Mrs Martins = 166.5 kg and Mrs Omi = 157 kg.
Objectives
This project teaches pupils the basics of being an entrepreneur because they must buy and sell for a profit. Pupils will practice setting prices, calculating total costs and also calculating change.

Preparation
You will need to have:
- Pupil’s Book
- Calculators
- Objects for sale such as fruit, groceries, rice, beans, beverages, cool drinks etc.
- Provide improvised money by cutting up sheets of paper and writing different denominations on them. Improvise coins by using buttons or boiled sweets.

Guidelines
Set up 4 different stalls and price all the objects. Provide measuring spoons and scales where suitable. Allow pupils to buy and sell in groups. They should also give discounts. Pupils should keep a record of their sales when it is their time to be the seller.

This is a fun activity that pupils will enjoy so allow plenty of time and it can be extended over more than one lesson if time permits.

Starter activity
Talk to pupils about shopping. Find out which pupils are allowed to go shopping on their own for their families to buy things for themselves. Talk to pupils about checking change and why it is important. See if any pupils volunteer information about having received the wrong change.

If time permits create a quick game by telling pupils the price of an item you want to buy, e.g. apples, the price of the apples and how much money you are handing over to the shopkeeper. Pupils can shout out the correct amount of change that you should be given. This will help pupils to think quickly about money and subtraction of one amount from another.

Lesson focus
Explain to pupils that they will be buying and selling in a class market. Demonstrate how the shops are to be set up and show pupils the pretend money. Make sure that the prices of goods are clearly displayed. Pupils should be divided into groups and take turns in being the shopkeeper. The shopkeeper should have spare paper for prices so that they can change the prices and add discounts. Monitor the time during the lesson and get pupils to change roles regularly. This lesson may become quite noisy.

Assessment
Check on the different groups during the lesson and monitor any pupils who are having difficulty with change or discounts. Pupils should be able to give and receive the correct change. Shopkeepers should be able to calculate simple discounts.

Extension activity
Pupils to make a list of items on which they think discounts should be offered and why.

Homework activity
1. Ask pupils to create a list of prices of different objects when they next go to the shops.
2. Ask pupils to make a list of items being offered with a discount and to write down the amount of the discount offered.
Objectives
- To assess the extent to which pupils have understood and mastered the content of Units 11–22
- To provide feedback on areas in which intervention is needed.

Guidelines
The questions in this test cover Units 11–22, and so includes questions on perimeter, weight, currencies, interest and word problems amongst other topics. Pupils should work through the questions on their own, taking as much time as they need. Encourage pupils not to spend too much time on a question if they get stuck. Instead, they should go on to the next question, and come back to the question they were struggling with if they have time. Encourage all pupils who have completed the task to spend at least five minutes checking their work. You may need to allocate more time for this assessment than usual for a lesson and you will need a follow up lesson to go through the assessment with the class.

Lesson 1
Pupils will need paper or note books to work in. Explain to pupils how much time they will be allowed. Collect in paper or books for marking at the end of the allocated time. Mark each pupils work individually and assess areas that may need extra practice.

Answers
1. a) 28 b) 40 c) 57
d) 15 e) 93
2. a) 29 b) 42 c) 38
d) 44.5 e) 26.5
3. a) 15, 7.5, 5 b) 200, 100, 66.6
c) 180, 90, 60 d) 408, 204, 136
e) 164, 82, 54.6
4. a) 0.567, 0.283 b) 4.883, 2.4417
c) 0.642, 0.321 d) 0.983, 0.491
e) 1.0425, 0. 5212
5. a) 97 b) 13 c) 13.7 d) 15.4
e) 11 f) 11 1/4 g) 9 h) 2 4/8
i) 4 1/2 j) 1.5
6. ? 7. 100 8. 400 9. 0.5
10. Fr40 11. N 1824 000
12. Nigeria = naira and kobo = N & k
   Gambia = dalasi = D & b
   Sierra Leone = Leone & cents = Le & c
   Britain = pounds and pence = £ & p
   Ghana = cedi and cents = c & p
   U.S.A = dollars and cents = $ & c
   Togo = Francs and cents = fr & c
   Japan = yen = ¥
13. a) 800 b) 16%
17. N 9408 18. 72 m 19. 8.9, 6.28 5, 6.6, 14
20. 1 836 ℓ 21. 9.152 ℓ
22. 9.4 ℓ
23. a) 6 3/4 ℓ b) 12.375
24. 165 ℓ 25. 505.07 litres left

Lesson 2
Lesson focus
Use this lesson to go through the assessment answers and also to encourage pupils to ask questions if there are any answers that they do not understand.

Assessment
Use the results of the assessment to identify pupils who need extra help. Organise groups to work on specific areas of the content of Units 11–22, as needed.
Objectives
By the end of this unit, pupils will be able to:
• Calculate the average speed of a moving object.

Suggested resources
Stop watches; A poster that shows the units of time and how to convert them; Drawing of a speedometer; Cardboard showing some examples of average speeds

Common errors that pupils make
Pupils get confused between units of time and those of speed and distance. Ensure that pupils know the difference between the units, and use the units appropriately. Explain the meaning of ‘per’ in ‘kilometres per hour’, as telling you how many kilometres can be travelled in any one hour, if the speed is constant.

Pupils confuse actual speed, with average speed. Discuss real-life situations, describing a journey by bus, with several stops for picking up and dropping off passengers. The average speed takes into account the time when the bus is standing still, to give you an idea of how long the journey will take (on average). While the bus may be travelling at varying speeds of say 50 km/h or 80 km/h, the average speed will be considerably less, as it slows down and stops for passengers.

Evaluation guide
Pupils to:
1. Find average speed of given word problems.

Lesson 1  Pupil’s Book page 141

Preparation
You will need to have:
• Pupil’s Book  • Stopwatches
• A poster that shows the units of time and how to convert them
• Drawing of a speedometer
• Cardboard showing some examples of average speeds.

Starter activity
Ask pupils to estimate distances. Ask them what time it might take to cover such distances. Guide the pupils to check whether their estimates are sensible. As a fun alternative, you could take the pupils onto the playing fields and measure a distance of 40 or 50 metres. Ask a few pupils to run the distance while their classmates time them on the stopwatches. This data can be used in class later in the lessons.

Lesson focus
The lesson focuses on the calculation of average speed, time and distances. Explain that if 10 km is covered in 2 hours then 5 km will be covered in one hour. This is usually written as 5 km/hr (kilometres per hour) and is the average speed. Let the pupils know that average speed is distance covered divided by time taken to cover the distance. Speed = \frac{\text{Distance covered}}{\text{Time taken}}.

Explain also that this formula can be used to find distance and time i.e. Distance = Speed × Time and Time = \frac{\text{Distance}}{\text{Speed}}. Work through the example on page 142 in the PB with the pupils to make sure
the pupils understand the concept. Give a few more examples if necessary. The data collected during the starter activity could serve as further examples i.e. you can calculate the speed at which each of the pupils ran. Then ask the pupils to work through Exercise 1 on page 142.

Answers

Exercise 1
1. \(78 \text{ km} \div 3 \text{ hours} = 26 \text{ km/h}\) average speed
2. \(140 \text{ km} \div 3 \text{ hours} = 47 \text{ km/h}\)
3. a) Hare = \(16 \text{ km} \div 0.5 \text{ hours} = 32 \text{ km/h}\)
   Horse = \(20 \text{ km} \div 0.75 \text{ hours} = 26.7 \text{ km/h}\)
   b) The horse runs faster
4. Bus = \(255 \text{ km} \div 3 \text{ hours} = 85 \text{ km/h}\)
   Car = \(200 \text{ km} \div 2.5 \text{ hours} = 80 \text{ km/h}\)

Assessment
Check whether pupils can define and calculate average speed and also find time, distance and average speed. Make sure pupils understand the concept of average speed and why we use it to calculate the time taken to travel a distance.

Extension activity
Complete the following extension exercise by completing the table.

<table>
<thead>
<tr>
<th>Distance = 614 km; time = 12 hrs</th>
<th>Distance = 648 km; time = 24 hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed =</td>
<td>Speed =</td>
</tr>
<tr>
<td>Distance = 825 km; time = 35 hrs</td>
<td>Distance = 1 024 km; time = 42 hrs</td>
</tr>
<tr>
<td>Speed =</td>
<td>Speed =</td>
</tr>
<tr>
<td>Distance = 557 km; time = 18 hrs</td>
<td>Distance = 258 km; time = 11 hrs</td>
</tr>
<tr>
<td>Speed =</td>
<td>Speed =</td>
</tr>
<tr>
<td>Distance = 985 km; time = 31 hrs</td>
<td>Distance = 1 125 km; time = 25 hrs</td>
</tr>
<tr>
<td>Speed =</td>
<td>Speed =</td>
</tr>
<tr>
<td>Distance = 18 km; time = 0.5 hrs</td>
<td>Distance = 7 km; time = 0.25 hrs</td>
</tr>
<tr>
<td>Speed =</td>
<td>Speed =</td>
</tr>
</tbody>
</table>

Homework activity
Ask pupils to do find out about some real life situations in which being able to calculate average speed would be useful. They should also find out how average speed is used to calculate travelling distances and travelling times e.g. how do we able to tell exactly when a bus or train would arrive?

Lesson 2  Pupil’s Book page 141

Preparation
You will need to have:
- Pupil’s Book
- Stopwatches
- A poster that shows the units of time and how to convert them.

Starter activity
Get feedback from pupils about the homework research and have a brief discussion about travelling times to places near to the location of your school. Ask pupils how long they estimate it would take to travel to the nearest large town.

Lesson focus
In this lesson we concentrate on manipulating the Distance, Speed and Time formula i.e. instead of calculating speed only, we can use the formula to calculate distance or time. Work through the example on page 143 in the PB and show pupils how we change the subject of the equation by means of inverse operations. Below is a useful diagram which contains the three variations of the formula.

\[
\begin{align*}
D &= \text{speed} \times \text{time} \\
\text{Speed} &= \frac{\text{distance}}{\text{time}} \\
\text{Time} &= \frac{\text{distance}}{\text{speed}}
\end{align*}
\]

Ask pupils to complete the exercise on page 143 of the PB.
**Answers**

**Exercise 2**

1. a) 2 hours  
b) 3 hours  
c) 2.5 hours  
d) 5 hours  
e) 8.75 hours  
2. a) 12 km  
b) 6 km  
c) 20 km  
d) 9 km  
e) 2 km  
3. a) 135 km  
b) 112.5 km  
4. 580 km + 200 km/h = 2.9 hours  
   (2 hours and 54 minutes)  
5. 5 600 km ÷ 1 400 km/h = 4 hours

**Assessment**

Check that pupils are able to use the formula to find distance rather than speed. Pupils should understand that knowing any two of the three variables will enable them to find the third. If pupils have difficulty, give them extra practice.

**Homework activity**

Ask pupils to complete the Revision exercise on page 144 in the PB.

**Lesson 3 Workbook page 42**

**Preparation**

You will need to have:
- Workbook.

**Starter activity**

Complete the challenge on page 143 of the PB.

**Lesson focus**

Check the answers to the Revision exercise before commencing the assessment task. Pupils have to complete Worksheet 23 in the WB.

**Answers**

**Revision exercise**

1. | Distance | Time | Average speed |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>200 cm</td>
<td>10 s</td>
<td>20 cm/s</td>
</tr>
<tr>
<td>150 cm</td>
<td>5 s</td>
<td>30 cm/s</td>
</tr>
<tr>
<td>15 cm</td>
<td>3 s</td>
<td>5 cm/s</td>
</tr>
</tbody>
</table>

2. 56 km ÷ 8 km/h = 7 hours

3. 100 m ÷ 4 hours = 25 m/h

4. 100 m ÷ 10 seconds = 10 m/s

5. | Distance | Time | Average speed |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4 km</td>
<td>2 hours</td>
<td>2 km/h</td>
</tr>
<tr>
<td>5 km</td>
<td>0.5 hours</td>
<td>10 km/h</td>
</tr>
<tr>
<td>12 km</td>
<td>6 hours</td>
<td>2 km/h</td>
</tr>
<tr>
<td>64 km</td>
<td>8 hours</td>
<td>8 km/h</td>
</tr>
<tr>
<td>42 km</td>
<td>1.5 hours</td>
<td>28 km/h</td>
</tr>
<tr>
<td>80 km</td>
<td>2.5 hours</td>
<td>32 km/h</td>
</tr>
<tr>
<td>1 200 km</td>
<td>30 hours</td>
<td>40 km/h</td>
</tr>
</tbody>
</table>

**Assessment**

This assessment tests the extent to which the pupils have achieved the objectives stated at the beginning of this unit. Check pupil’s answers and give extra help to any pupils that are experiencing difficulty.

**Extension/Homework activity**

Complete any worksheet questions that still need to be finished.

**Workbook answers Worksheet 23**

1. Done
2. Distance/time
3. 50 km
4. 60 km per hour
5. 6.28 km per hour
6. $4\frac{1}{2}$ hours
7. 5 $\frac{1}{10}$ kg
8. 4 km per hour
Objectives

By the end of this unit, pupils will be able to:
• Measure temperature of places, objects or body at different times
• Compare degrees of hotness of various objects in degrees Celsius
• Compare degrees of hotness of various areas in degrees Celsius
• Identify the usefulness of temperature to our daily life.

Suggested resources

Thermometer, fridge or refrigerator, warm water, ice, flask; Data on meteorological information on some towns (weather forecasts, etc.)

Key word definitions

thermometer: an instrument for measuring and indicating temperature

temperature: the degree or intensity of heat present in a substance or object

Frequently asked questions

Q What prior knowledge should the pupil have?
A Pupils should be able to say whether things are hot or cold.

Q How can I help the pupils to understand the concept?
A Refer pupils back to real-life situations where they use temperature.

Common errors that pupils make

Pupils cannot read a thermometer. Give plenty of practical experience in reading a thermometer, explaining how to read the scale. Remind them of the way they have learned to read scales on rulers and jugs, in earlier units. This is the same. Take the temperature of the air, and then hold a thermometer in some heated water, and allow the pupils to observe how the temperature rises, and how this is reflected on the position on the scale.

Evaluation guide

Pupils to:
1. Read temperature of given objects.
2. Compare temperatures of objects, town and locations.

Lesson 1  Pupil's Book page 145

Preparation

You will need to have:
• Pupil's Book
• Thermometer
• Warm water and ice
• Flask.

Starter activity

Ask the pupils to read the thermometer provided by the teacher. Tell the pupils that the thermometer is used to measure the temperature of objects or bodies. Provide some warm water and ask the pupils to feel how hot by trying to touch. If possible also provide some ice and ask the pupils to describe how cold it is.

Lesson focus

Show the thermometer and explain how to read it. Explain to the pupils what a boiling point is and also what a freezing point is. Provide hot objects and cold objects and allow the pupils to see the differences in them. Ask the pupils to touch their friend's body to feel the temperature. They will notice that body temperatures are slightly different from one person to the other, and they should know that a high body
temperature can be a symptom of sickness. Also explain to pupils that ambient temperature changes during the day i.e. peak temperatures are reached at midday and the lowest temperatures are reached late at night/early hours of the morning. Work through Exercise 1 on page 145 with the pupils and guide them through their thinking processes. Also ask pupils to complete Exercise 2 on page 146. Let each pupil feel the hotness or coldness of different temperatures during the day. Allow pupils to use the thermometer to find temperatures.

**Answers**

**Exercise 1**
1. A child can be hot or cold
2. a) a room can be hot or cold
   b) Boiling water is hot
   c) Iced water is cold
   d) Water for food is hot
   e) Mid-day is hot
   f) Rain is cold
   g) Air conditioning is cold
   h) A light bulb is hot when on
   i) A light bulb is cold when off
3. Pupils to record their findings.
4. Pupils to record their findings.
5. Pupils to record their findings.

**Exercise 2**
Class exercise to be done with pupils in class.

**Assessment**
Check that pupils can define, read and measure temperature. If extra practice is needed, record the daily temperature for a week and ask pupils to read it each day.

**Homework activity**
Ask pupils to complete the Challenge activity on page 146 in the PB. This can be done as a homework activity. Ask pupils to write three hot objects and three cold objects in their books. They should also find out the hottest and coldest town in Nigeria.

**Lesson 2 Pupil’s Book page 147**

**Preparation**
You will need to have:
- Pupil’s Book
- Data on meteorological information on some towns (weather forecasts, etc.)

**Starter activity**
Bring newspaper weather forecasts to school. These should preferably have weather reports for as many cities/towns as possible. If possible try and have weather reports for as many other countries across the globe. Ask pupils to examine the temperatures for their country’s cities and towns and to comment on any patterns or peculiarities they may notice e.g. why are high-lying areas colder than places close to the coast?

**Lesson focus**
Explain that towns, villages and cities have different weather conditions. The conditions also change from day to day, month to month and from country to country. Also explain the difference between maximum and minimum temperatures and why these occur. This part of the discussion should allow pupils to draw on the research they dealt with in the previous lesson. Give a weather forecast for a particular day and ask them questions. Ask the pupils to answer Exercise 3.

**Answers**

**Exercise 3**
1. a) Okada and Ifo are the coldest
   b) Okada and Ifo
   c) 32°
   d) Ikeja
   e) 2°
   f) Ifo, Agbowa, Agege, Shomolu
   g) 2°
2. 15°
3. a) June
   b) January
   c) March
   d) 4°
   e) 38°
   f) 28°
   g) June
4. a) Damascus
   b) Johannesburg
   c) 38°
   d) 18°
   e) 10°
Assessment
Check that pupils understand how temperatures differ throughout the world and during the course of the day. Pupils should be able to distinguish between hot and cold temperatures.

Extension activity
Complete the following exercise.

Study the table showing temperatures in different parts of the world and answer the questions.

<table>
<thead>
<tr>
<th>Place</th>
<th>Country/State</th>
<th>Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canberra</td>
<td>Australia</td>
<td>17</td>
</tr>
<tr>
<td>Bombay</td>
<td>India</td>
<td>30</td>
</tr>
<tr>
<td>McMurdo</td>
<td>Antarctica</td>
<td>–16.5</td>
</tr>
<tr>
<td>Ottowa</td>
<td>Canada</td>
<td>4.5</td>
</tr>
<tr>
<td>Nabesna</td>
<td>Alaska</td>
<td>–13</td>
</tr>
<tr>
<td>Cedarhurst</td>
<td>New York</td>
<td>12</td>
</tr>
<tr>
<td>Karasjok</td>
<td>Norway</td>
<td>–27</td>
</tr>
</tbody>
</table>

1. Put the temperatures in order from coldest to warmest.
2. How much colder is McMurdo than Nabesna?
3. How much warmer is Bombay than Ottowa?
4. Reykjavik in Iceland is 17 degrees colder than Cedarhurst. What is the temperature in Reykjavik?
5. How much colder is Nabesna than Canberra?
6. What is the difference in temperature between the warmest and coldest place?
7. The temperature in Tokyo is 46 degrees warmer than Karasjok. What is the temperature in Tokyo?

Homework activity
Ask pupils to complete the Revision exercise on page 149 of the PB.

Answers

Revision exercise
1. Boiling point is 100° and freezing point is 0°
2. Afternoon
3. Class exercise
4. Pupil’s to draw
5. Pupil’s to draw
6. Degrees Celsius
7. The liquid expands and moves up

Lesson 3 Workbook page 42

Preparation
You will need to have:
• Workbook.

Lesson focus
Check the answers to the Revision exercise before commencing the assessment task. Pupils have to complete Worksheet 24 in the WB.

Answers
WB Worksheet 24

Extension activity
Pupils can research and find out the body temperatures of different animals.

Workbook answers Worksheet 24
1. a) temperature  b) thermometer
c) centigrade d) 100 °C
e) 0 °C
2. 39 °C, 29 °C, 8 °C, 20 °C, 12 °C, 10 °C, 4 °C
3. Pupils to record
4. a) Umuahia  b) Benin City
c) 38 °C d) 27 °C
e) Benin City, Port Harcourt, Abeokuta & Ibadan, Lagos, Wari, Onne, Lapai, Umuahia
5. 13 °C
6. Lapai
7. Abeokuta
8. Pupils to give their own suggestions.
Objectives
By the end of this unit, pupils will be able to:
• Calculate the area of a right-angled triangle.

Suggested resources
Square grid paper, old newspaper; Marker; A chart/poster with shapes and columns of a rectangle and a square drawn on squared paper; A chart/poster with a rectangle divided into two right-angled triangles drawn on squared paper

Key word definitions
area: the amount of space that a shape covers
square centimetre (cm²): a square unit that has all four sides equal to 1 cm
height: the distance from the base of the triangle to the top point of the triangle
base: the length of the side of the triangle that is opposite the top point

Frequently asked questions
Q What prior knowledge should the pupil have?
A The pupils need to understand length and must be able to measure and calculate length.
Q How much time should I allow for teaching this unit?
A You need to do practical work in this unit, so it is important to allow yourself and the class plenty of time to engage with the topic. You should allow at least one full week for this work (at least 5 to 6 hours in total).

Common errors that pupils make
Pupils cannot apply the formula correctly. Evaluate whether the pupils understand how to find the area of a rectangle. If not, then revise the work in the previous lesson. Once you have established that the pupil can calculate the area of a rectangle using the formula, work through the starter activity for this lesson again. Ensure that the pupils understand why we say that the area of a triangle is half the area of a rectangle and how this relates to the formula.

Evaluation guide
Pupils to:
1. Find the area of given right-angled triangles.

Lesson 1 Pupil’s Book page 150

Preparation
You will need to have:
• Pupil’s Book
• Square grid paper, old newspaper
• Marker
• A chart/poster with shapes and columns of a rectangle and a square drawn on squared paper
• A chart/poster with a rectangle divided into two right-angled triangles drawn on squared paper.

Starter activity
Stick a large rectangle drawn on squared grid paper onto the board. Ask the pupils to calculate the area of the rectangle. Discuss the answers and the ways to check whether the answer is correct. Using a marker, draw a clear diagonal across the rectangle. Ask the pupils to name the type of triangles they see. They should recognise that the triangles are right-angled triangles. Ask the pupils what the area of one of the triangles will be. Pupils should be able to ‘see’ that the area of the triangle will be half the area of the rectangle. Discuss with the class why this is so and how they know the answer is half the area of the rectangle. Write the formula for finding the area of a triangle on the board. Explain to the pupils that this is the formula for finding the area of a triangle. Ask them if they agree that it is the correct formula and encourage pupils to reason their response. Pupils should recognise that the area will be \( \frac{1}{2} \times b \times h \). Allow pupils to discover that \( \frac{1}{2} \times b \times b \) and \( \frac{1}{2} \times b \times w \) are equivalent expressions.
Lesson focus

This lesson introduces the pupils to calculating the area of a right-angled triangle. In order that they understand the formula, it is important that the pupils see a right angled triangle as half of a rectangle. Work through the example on page 150 in the PB and ask pupils and check that pupils understand. Encourage questions and discussion. Pupils usually find this work quite difficult so allow plenty of time for them to work through the examples. Pupils should complete all the questions in Exercise 1 page 151 PB as it will help them to consolidate the content.

Answers

Exercise 1

1. Because AC bisects rectangle ABCD
2. h = height, b = base
3. No
4. Practical
5. a) 36 cm²  b) 45 cm²  c) 21 cm²
d) 20 cm²  e) 18 cm²
6. a) 72 cm²  b) 90 cm²  c) 42 cm²
d) 40 cm²  e) 36 cm²
7. a) 440 cm²  b) 170 cm²
8. a) 34.3 cm²  b) 30 cm²  c) 36 cm²
d) 22 cm²  e) 30 cm²  f) 36 cm²
g) 22 cm²
9. 15 plants

Assessment

This is a difficult section of work so check that pupils understand how to calculate the area of a triangle using grid paper.

Extension activity

Pupils investigate whether the formula for finding the area of a right-angled triangle will work for any triangle. They investigate different ways of finding the area of a parallelogram.

Homework activity

Ask pupils to complete the Challenge activity on page 153 in the PB.
Lesson 3  Pupil's Book page 156

Preparation
You will need to have:
- Pupil's Book
- Square grid paper, old newspaper
- Marker
- A chart/poster with shapes and columns of a rectangle and a square drawn on squared paper
- A chart/poster with a rectangle divided into two right-angled triangles drawn on squared paper.

Starter activity
Discuss real life situations where finding the area of a triangle would be useful. Revise the use of the formula to find the area of a triangle.

Lesson focus
This lesson is a continuation of the previous lesson and is centered around the Revision exercise. Go through the summary on page 155 and demonstrate how to find the area of a triangle again using board work. Provide pupils with lots of guidance and monitor their progress regularly. Pupils must complete the Revision exercise on page 156 in the PB. This will provide an assessment of pupil's progress. Take in their note books to mark at the end of the lesson.

Answers
Revision exercise
1. Area of rectangle = 400 m²;
   Area of triangle = 200 m²
2. a) 270 m²  b) 200 m²  c) 70 m²
3. 144 m²
4. Less
5. 
<table>
<thead>
<tr>
<th>Base</th>
<th>height</th>
<th>area</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 8 cm</td>
<td>3 cm</td>
<td>12 cm²</td>
</tr>
<tr>
<td>B 5 cm</td>
<td>4 cm</td>
<td>10 cm²</td>
</tr>
<tr>
<td>C 18 cm</td>
<td>6 cm</td>
<td>54 cm²</td>
</tr>
<tr>
<td>D 19 cm</td>
<td>18 cm</td>
<td>171 cm²</td>
</tr>
<tr>
<td>E 25 m</td>
<td>20 m</td>
<td>250 m²</td>
</tr>
<tr>
<td>F 10 m</td>
<td>18 m</td>
<td>90 m²</td>
</tr>
</tbody>
</table>

Lesson 4  Workbook page 45

Preparation
You will need to have:
- Workbook.

Starter activity
Go through the answers to the Revision exercise.

Lesson focus
Pupils have to complete Worksheet 25 in the WB. This forms an assessment that tests the extent to which the pupils have achieved the objectives stated at the beginning of this unit.

Answers
Worksheet 30

Assessment
Check that pupils can find the area of given right-angled triangles.

Extension/Homework activity
Pupils to complete corrections from the Revision exercise.

Workbook answers Worksheet 25
1. a) 32 cm²  b) 54 cm²  c) 24 cm²  d) 192 cm²  e) 63 cm²
   f) 91 cm²  g) 336 cm²  h) 63 cm²  i) 5 cm  j) 728 cm²
2. a) 84 cm²  b) 4.5 cm  c) 2.5 cm  d) 80 cm²  e) 270 cm²  f) 91 cm²  g) 336 cm²  h) 63 cm²  i) 5 cm  j) 728 cm²
3. a) 9 cm²  b) 17.5 cm²  c) 31 cm²  d) 63.7 cm²  e) 75 cm²
Objectives
By the end of this unit, pupils will be able to:
• Use cubes to find the volume of a cuboid and a cube
• Use a formula to find the volume of a cuboid
• Identify the difference between cubes and cuboids.

Suggested resources
Cubic centimetre cubes or similar, cuboids of various dimensions, 0.25ℓ, 0.5ℓ and 1ℓ containers, large cubes to demonstrate (optional); Cubic centimetre cubes or similar, cuboids of various dimensions; Packaging in various dimensions (optional)

Key word definitions
volume: the amount of space that an object takes up. It is the capacity of a container
cubic centimeter: a metric unit of measure equal to \( \frac{1}{1000} \) of a litre written as cm³
cuboid: a box shaped object

Frequently asked questions
Q What prior knowledge should the pupil have?
A Pupils should be able to estimate, measure and compare the capacity of containers and solve problems related to capacity. Pupils should also be able to use the four basic operations to calculate capacity.

Q How can I help my pupils understand volume and cubic capacity?
A Collect cuboid-shaped empty containers and let the pupils fill them with cubic centimetre cubes. Transparent, waterproof rigid containers are especially useful, as the cubes are visible and they can be filled with water, so that pupils can make the connection between litres and cubic centimetres.

Common errors that pupils make
Pupils get confused about the names of the dimensions and deciding which is which. By turning the boxes around, pupils can see that the height can become the width, the length the width and so on, so just keep practising naming the dimensions. When using pictures of cuboids made from centimetre cubes, pupils only count the cubes they can see. Give the pupils the opportunity to make the cuboids with individual cubes and to count them. Encourage them to work out where the hidden cubes are in the diagrams and to count the cubes in rows, rather than individually.

Evaluation guide
Pupils to:
1. Use cubes to find the volume of cuboids and cubes.
2. Use formulae to find volume of cuboids.
3. Identify the difference between cubes and cuboids.

Lesson 1  Pupil’s Book page 157

Preparation
You will need to have:
• Pupil’s Book
• Cubic centimetre cubes or similar, cuboids of various dimensions, 0.25ℓ, 0.5ℓ and 1ℓ containers, large cubes to demonstrate (optional)
• Cubic centimetre cubes or similar, cuboids of various dimensions
• Packaging in various dimensions (optional).
Starter activity
Find the perimeters and areas of various squares and rectangles (covered in Units 20 and 25). Ask the pupils questions such as ‘What is the perimeter/area of a square with 6 cm sides?’, ‘What does each side of a square field measure if its area is 25 m² (5 m)?’, ‘The dimensions of a rectangle are 5 cm and 8 cm, what is its area/perimeter (40 cm²/26 cm)?’ and ‘If a rectangle has a perimeter of 24 cm, what could its dimensions be (6 by 6, 10 by 2, 8 by 4, …)?’ Check that the pupils use the correct unit of measure in their answers.

Lesson focus
As this lesson introduces volume using cubic centimetres, spend some time allowing the pupils to experiment with the cubes and boxes of different dimensions. Allow them to compare the number of cubes with the capacity, and to see how many cubes fit along each of the dimensions. Explain that 1 cm³ is equal to 1 ml and that 1 000 cm³ = 1 ℓ. If you have the time and the resources, pupils could prove this by filling a 200 ml or 250 ml container with centimetre cubes. Four groups of pupils could each fill a 250 ml container, or five groups could each fill a 200 ml container, both of which equals 1 ℓ. Revise the properties of cubes and cuboids, showing the pupils some examples if available, for example cereal packets and dice. Allow the pupils to look into the empty containers to see the space inside, as you explain that volume is the space that an object takes up. Look at the worked example on page 158 of the PB. Use large demonstration cubes, if you have them, and put them in different arrangements, for example 3 by 2 by 2. Explain that there are 12 cubes in all of the arrangements and that all the cuboids have a volume of 12 cm³.

Show the pupils how to write cubic centimetres, explaining that the superscript 3 represents the third dimension, the height. Point out each dimension on the cuboids. Turn the shapes around, so that the length becomes the height and name the dimensions again. After the pupils complete Exercise 1, work through the example on page 159 of the PB, encouraging them to count in rows. Then ask the pupils to complete Exercise 2. For the Challenge, you could also give the pupils cubes to use, but advanced pupils will probably be able to work it out using multiplication facts.

Answers

Exercise 1
1. a) 20 cm³  
   b) 36 cm³  
   c) 60 cm³  
2. a) 8 cm³  
   b) 15 cm³  
   c) 20 cm³

Assessment
Assess whether pupils can use centimetre cubes to find the volume of a cuboid.

Extension activity
Pupils also complete the Challenge activity on page 159 of the PB if there is time available.

Homework activity
Ask the pupils to find some examples of cuboids to bring in for a class display to use later on.

Lesson 2 Pupil’s Book Page 159

Preparation
You will need to have:
- Pupil’s Book
- Cubic centimetre cubes or similar, cuboids of various dimensions, 0.25 ℓ, 0.5 ℓ and 1 ℓ containers, large cubes to demonstrate (optional)
- Cubic centimetre cubes or similar, cuboids of various dimensions
- Packaging in various dimensions (optional).

Starter activity
Repeat the starter activity of Lesson 1.

Lesson focus
As this lesson follows on from the previous lesson work through the example on page 159 of the PB, encouraging pupils to count in rows. Then ask the
pupils to complete Exercise 2. Give pupils addition cubes to work out, by drawing them plus their measurements, on the board.

**Answers**

**Exercise 2**

24 cm³

**Assessment**

Assess whether pupils can use centimetre cubes to find the volume of a cuboid.

**Extension activity**

Pupils to complete the additional cube questions drawn on the board.

**Homework activity**

Ask the pupils to sketch examples of cuboids in and around their home.

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**Lesson 3**  
*Pupil's Book page 160*

**Preparation**

You will need to have:

- Pupil's Book.

**Starter activity**

Ask the pupils to multiply three numbers together, for example 3 × 4 × 5; 20 × 2 × 5; 10 × 2 × 4. Include 2 × 2 × 2; 3 × 3 × 3 and 10 × 10 × 10. Also ask the pupils to find three numbers whose product is 24, 30, 60, 100 and 120.

**Lesson focus**

Remind the pupils that squares and rectangles have two dimensions: length and width. Explain that the third dimension of cuboid is called the height. This is why a cuboid is a 3-D shape and a rectangle is a 2-D shape.

Work through the example on page 160 of the PB, which shows the pupils how to use dimensions, instead of counting cubes. Encourage pupils to use the dimensions in Exercise 3, and then to check their answers by counting the cubes. For the Challenge, remind the pupils that a cube is a special cuboid in which the three dimensions are all the same. They may need to use a written method of multiplication for some calculations.

Now introduce the formula for finding the volume of a cuboid. First, revise the formula for the area of a rectangle, and then explain that the volume is found by multiplying this area by the third dimension, which is the height. This makes the formula: length × width × height, or l × w × h.

Ask pupils to complete Exercise 3. For the word problems, encourage the pupils to write down the calculation they are using, to reinforce the formula.

**Answers**

**Exercise 3**

1. a) 240 cm³  
   b) 360 cm³  
   c) 420 cm³  
   d) 432 cm³  
   e) 175 cm³  
   f) 343 cm³

2. 240 cm³

3. 120 000 cm³

4. 63 000 cm³

5. 249 600 m³

6. 6 480 m³

7. 2.7

8. 7.5 cm

**Assessment**

Pupils should be able to find the volume of a cuboid using a formula.

**Extension activity**

Complete the following exercise.

1. A water tank is 11 meters high, 11 meters long, and 5 meters wide. A solid metal box which is 9 meters high, 3 meters long, and 2 meters wide is sitting inside the tank. The tank is filled with water. What is the volume of the water in the tank?
2. Find the volume of each L-block.
   a) 
   b) 

Homework activity
Pupils should complete the Revision exercise on page 161 of the PB.

Lesson 4 Workbook page 46

Preparation
You will need to have:
• Workbook.

Lesson focus
Check the answers to the Revision exercise before commencing the assessment task. Pupils have to complete Worksheet 26 in the WB. This assessment tests the extent to which the pupils have achieved the objectives stated at the beginning of this unit. You should give the pupils a set time (30–40 min) in which to complete the assessment. Each pupil should work on their own. Encourage pupils not to spend too much time on one question if they get stuck. Instead, they should leave it and come back to it if they have time left. Encourage them to check their answers if they finish before the set time is over. Collect in the answers to mark them, identify any problem areas and revisit those areas if necessary.

Answers

Revision exercise
1. Practical
2. Practical
3. A cube is a box shape that has equal sides
   A cuboid is a box shape that may have different size sides

4. | Length | Width | Height | Volume   |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A 5 cm</td>
<td>3 cm</td>
<td>7 cm</td>
<td>105 cm³</td>
</tr>
<tr>
<td>B 8 cm</td>
<td>15 cm</td>
<td>1 cm</td>
<td>120 cm³</td>
</tr>
<tr>
<td>C 18 cm</td>
<td>2.4 cm</td>
<td>35 cm</td>
<td>1 512 cm³</td>
</tr>
<tr>
<td>D 6 m</td>
<td>9.5 cm</td>
<td>7.2 cm</td>
<td>410.4 m³</td>
</tr>
<tr>
<td>E 20 m</td>
<td>18 m</td>
<td>5.6 m</td>
<td>2 016 m³</td>
</tr>
</tbody>
</table>

5. 2 688 m³
6. 2.5 cm

Assessment
Pupils should be able to find the volume of a cuboid and also be able to define and recognize a cuboid.

Extension activity
Pupils to think of real life situations where it would be important to know the volume of a cuboid, for example a container ship or when packing a lorry.

Homework activity
Pupils to complete any corrections from the Revision exercise.

Workbook answers Worksheet 26
1. Pupils to record
2. 5 000 cm³ = 5 litres
3. 1 000 litres
4. 1 cubic centimetre
5. a) 480 cm³  b) 70 cm³
c) 1 200 cm³  d) 8 cm
e) 16.66 cm
Unit 27: Capacity

Objectives

By the end of this unit, pupils will be able to:

- Find the relationship between litres and cubic centimetres
- Identify the use of litres as a unit of capacity.

Suggested resources

A poster showing the conversion factor between litres and millilitres (1 ℓ = 1 000 ml), alternatively, write this on the board and refer to it throughout this unit; Drinking glasses, tea cups, mugs, milk bottles, measuring jugs or cylinders (pupils should bring; Their own items to school, but have spares on hand for those pupils who forget, or are unable to bring their own); A variety of items of different capacities; some should have very different capacities, for example a bucket and a thimble; some should be trickier to compare, for example a glass and a mug. You could include items from the resources listed in Lesson 1. Each pupil should have two cups of different capacities, as well as a large spoon; Labels with different capacities written on them, pins; Cube of dimension of 10 cm × 10 cm × 10 cm; Flash cards.

Common errors that pupils make

When comparing litres and millilitres, some pupils will simply compare the numbers and forget about the units. Remind the pupils that they need to convert all measurements either to litres or to millilitres before they can compare different capacities. Pupils often get confused about when to divide and when to multiply when they convert between units of measurement in general. Remind them that when they convert from a large unit to a small unit, they are making many small units from a larger unit, so they need to multiply. When they convert from a smaller unit to a larger unit, they are combining many smaller units together to form a larger unit, so they need to divide. Keep reminding them to refer to the conversion factor on the board. The word problems in Exercise 20.5 are simple, but some pupils will still claim that they are not sure what to do. As is always the case with word problems, encourage your pupils to read each problem through carefully and to identify the key facts, before deciding which operations to use.

Evaluation guide

Pupils to:
1. Find the relationship between litres and cubic centimetres.
2. Identify the use of the litre as a unit of capacity and the established relationship between litre and cubic cm³.

Lesson 1  Pupil's Book page 162

Preparation

You will need to have:
- Pupil's Book
- A poster showing the conversion factor between litres and millilitres (1 ℓ = 1 000 ml), alternatively, write this on the board and refer to it throughout this unit
- Drinking glasses, tea cups, mugs, milk bottles, measuring jugs or cylinders (pupils should bring their own items to school, but have spares on hand for those pupils who forget, or are unable to bring their own)
- A variety of items of different capacities. You could include items from the resources listed in Lesson 1. Each pupil should have two cups of different capacities, as well as a large spoon
- Labels with different capacities written on them, pins
- Flash cards.
**Starter activity**

Hold up two containers of very different capacities, for example a small plastic glass and a large plastic bottle. Ask your pupils to think of different ways in which they can find out how many of the small plastic glasses will fit into the big plastic bottle. One way is to fill the bottle with water and then count how many times you can fill the glass from the bottle. Another way is to fill the glass with water and empty it into the bottle, counting how many times this process must be repeated. Now place a measuring cylinder or a measuring jug next to the glass and the bottle. Ask the pupils questions such as ‘Does this give us new ways of doing this calculation?’, ‘Which way is easiest?’, ‘Which way is messiest?’ and ‘Which method do you prefer?’

**Lesson focus**

The focus of this lesson is the definition of capacity and measuring the capacity of everyday objects. Make sure that all your pupils understand what capacity is, as well as the relationship between litres and millilitres. Revise the basic conversion facts: $1\ 000\ ml = 1\ ℓ$ and $1\ ℓ = 1\ 000\ ml$. Revise how to multiply and divide by 1 000 quickly. Have five different-sized containers in the class. Write labels for each container, for example 1ℓ; 3 250 ml; 1 500 ml; 4.5ℓ and 2 500 ml. Paste the labels on the containers. Have flash cards with the converted amounts written on them: 1 000 ml; 3.2ℓ; 1.5ℓ; 4 500 ml and 2.5ℓ. Pupils need to match the flash card to the correct container. Discuss with the pupils why it is necessary to be able to convert millilitres to litres and vice versa. Work through the examples on page 162 of the PB and ask pupils to complete Exercise 1 on page 163 of the PB.

**Answers**

**Exercise 1**

1. a) $3 000\ cm^3$  
   b) $500\ cm^3$  
   c) $375\ cm^3$  
   d) $2 500\ cm^3$  
   e) $5 750\ cm^3$

2. a) 2 litres  
   b) $5\frac{1}{2}$ litres  
   c) $1\frac{2}{3}$ litres  
   d) 7 litres  
   e) $8\frac{1}{10}$ litres

3. a) $4 000\ cm^3$  
   b) $500\ cm^3$  
   c) $8 000\ cm^3$  
   d) $2 500\ cm^3$  
   e) $1 625\ cm^3$

4. a) $1.5\ ℓ$  
   b) $0.4\ ℓ$  
   c) $9.8\ ℓ$  
   d) $6.5\ ℓ$  
   e) $4.45\ ℓ$

5. a) 2ℓ 968 ml  
   b) 3ℓ 250 ml  
   c) 5ℓ 600 ml  
   d) 7ℓ 208 ml  
   e) 1ℓ 600 ml

**Assessment**

Pupils should be able to convert correctly between units in capacity.

**Homework activity**

Pupils have to complete the Challenge activity on page 162 of the PB.

**Lesson 2  Pupil’s Book page 164**

**Preparation**

You will need to have:

- Pupil’s Book
- A variety of items of different capacities; some should have very different capacities, for example a bucket and a thimble; some should be trickier to compare, for example a glass and a mug. You could include items from the resources listed in Lesson 1. Each pupil should have two cups of different capacities, as well as a large spoon.

**Starter activity**

Think up a simple word problem of your own that involves capacity and write it on the board. Read through the problem with your pupils, and then ask each pupil to draw their own diagram to illustrate the basic facts. Walk round the class as they do this and identify a couple of different, though valid, diagrams. Ask these pupils to draw their diagrams on the board. The aim of this activity is to show your pupils that there can be more than one way to draw a diagram of a word problem.

**Lesson focus**

This lesson focuses on finding the capacities of various objects. These problems are presented as word problems. Therefore, you will have to remind pupils of the principles behind translating word sums into mathematics. Work through one or two
examples with your pupils. Make sure that your pupils understand each example, and advise them to refer back to these examples as they complete Exercise 2.

**Answers**

**Exercise 2**

1. \( \frac{360}{43} \times 8 \times 5 = 40 \) litres of petrol will be used for a 360 km journey

2. \( \frac{24}{48} = 5 \)

3. \( 345 + 568 + 1671 = 2584 \) cm\(^3\) = 2.584 ℓ

4. \( 540 + 480 + 432 + 908 = 2360 \) cm\(^3\) = 2.36 ℓ

5. \( 0.75 ℓ \times 35 = 26.25 ℓ = 26250 \) cm\(^3\)

6. a) \( 8 \times 250 \) ml = 2000 ml = 2 ℓ
    b) \( 31 \times 2ℓ = 62 ℓ \)
    c) \( 365 \times 2ℓ = 730 ℓ \)

7. \( 5950 \div 350 = 17 \)

8. \( 12000 - 250 - 9000 - 780 = 1970 \) ml = 1.97 ℓ

9. \( 5400 \) cm\(^3\) + 18 = 300 cm\(^3\) = 0.3 ℓ

10. \( 12.5 ℓ - 8.025 ℓ = 4.475 ℓ \)

**Assessment**

Assess the performance of pupil’s in the following. Can they:

- Add capacities correctly
- Subtract capacities correctly
- Multiply capacities correctly
- Divide capacities correctly
- Solve word problems that involve capacity.

**Extension activity**

Ask pupils to complete the Challenge activity on page 164 of the PB.

**Homework activity**

Ask pupils to list the capacity of five household containers at home.

**Lesson 3**  
*Pupil’s Book page 165*

**Preparation**

You will need to have:

- Pupil’s Book
- A variety of items of different capacities; some should have very different capacities, for example a bucket and a thimble; some should be trickier to compare, for example a glass and a mug.

**Starter activity**

Ask pupils to read out the containers they listed for homework and their capacities. Talk about common capacities for household items, for example 500 ml or 1 litre. Ask pupils to suggest why containers are similar sizes and not very large sizes such as 50 litres.

**Lesson focus**

Allow time for pupils to experiment with different size containers and then go through the unit summary on page 165 of the PB. Ask pupils to complete the Revision exercise on page 165.

**Answers**

**Revision exercise**

1. Capacity is the amount of space a container can hold in units of capacity

2. 1 000 cm\(^3\)

3. 1 cm\(^3\)

4. 1 000 ml

5. 1 ℓ

6. Learner draws measuring cylinder

7. 1 teacup holds 250 ml; therefore 1 litre is = 4 cups

8. A teaspoon holds 5 ml and an eyedropper holds approximately 1 ml so a teaspoon holds more liquid than an eyedropper

9. a) \( 450 \text{ ml} + 550 \text{ ml} = 1 ℓ \)
    b) \( 9 ℓ + 453 \text{ ml} - 6 ℓ 353 \text{ ml} = 3 ℓ 100 \text{ ml} \)

10. \( 500 \text{ ml} = 500 \text{ cm}^3 \)

**Assessment**

Pupils should be able to understand the meaning of capacity and how to solve problems involving capacity.
Homework activity
Pupils to use the following work sheet to continue measuring containers at home.

<table>
<thead>
<tr>
<th>Container or Fluid</th>
<th>Volume in ml, cl or ℓ</th>
<th>Is it MORE or LESS than 1 litre?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>200 ml</td>
<td>LESS than 1 litre</td>
</tr>
</tbody>
</table>

Lesson 4 Workbook page 49

Preparation
You will need to have:
- Workbook.

Starter activity
Go through the worksheet from Lesson 3 homework.

Lesson focus
Check the answers to the Revision exercise before commencing the assessment task. Pupils have to complete Worksheet 27 in the WB.

Answers
Worksheet 27 page 49.

Assessment
Pupils should be able to convert litres into cubic centimetres and also to compare various units of capacity.

Homework activity
Complete any corrections from the Revision exercise.

Workbook answers Worksheet 27
1. Capacity is the amount of liquid a container can hold.
2. ml
3. b) 1 000 cubic centimetres make one litre

<table>
<thead>
<tr>
<th>Cubic centimetres (cm³)</th>
<th>Litres (ℓ)</th>
<th>Millilitres (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1 000</td>
<td>1 000</td>
</tr>
<tr>
<td>B</td>
<td>200</td>
<td>0.2</td>
</tr>
<tr>
<td>C</td>
<td>2 098</td>
<td>2.098</td>
</tr>
<tr>
<td>D</td>
<td>8 532</td>
<td>8.532</td>
</tr>
<tr>
<td>E</td>
<td>5 680</td>
<td>5.680</td>
</tr>
<tr>
<td>F</td>
<td>3 500</td>
<td>3.5</td>
</tr>
<tr>
<td>G</td>
<td>180</td>
<td>0.18</td>
</tr>
<tr>
<td>H</td>
<td>2 800</td>
<td>2.8</td>
</tr>
<tr>
<td>I</td>
<td>1 400</td>
<td>1.4</td>
</tr>
<tr>
<td>J</td>
<td>4 375</td>
<td>4.375</td>
</tr>
</tbody>
</table>

1. a) Total = 133.8 litres
   b) 133 800 cm³
2. a) 250 ml + 750 ml = 1 ℓ
   b) 500 cm³ + 500 cm³ = 1 ℓ
   c) 1 ℓ – 350 ml = 650 ml
   d) 6 350 ml
3. a), b) Litres are useful for measuring petrol consumed, the amount of liquids used or needed for a recipe, the capacity of containers, tanks etc.
4. a), b) litres, centilitres, millilitres, kilolitres
5. 4 ℓ = 4 000 cm³
   4 000 + 6 = 666.67 cm³
6. a) 1 ml = 0.001 ℓ
   b) 5 ml = 0.005 ℓ
   c) 250 ml = 0.25 ℓ
7. 29 cl or cm³ = 2.9 ℓ
   35 cl or cm³ = 3.5 ℓ
8. 4 ℓ = 4 000
   4 000 + 6 = 666.67
9. a) 1 ml
   b) 5 ml
   c) 250 ml
10. 29 cl or = 2.9 ℓ
   35 cl or = 3.5 ℓ
11. a) 6  b) 11  c) \(\frac{1}{2}\)
Objectives
By the end of the unit, pupils will be able to:
• Describe the shape of the earth
• Compare volume of a sphere and cuboid.

Suggested resources
String, rope, objects with circular faces (oranges or apples), pairs of compasses, pins, nails, pencils, a globe of the earth; Cardboard box

Key word definitions
sphere: a round solid figure, or its surface, with every point on its surface equidistant from its centre
radius: a straight line from the centre to the circumference of a circle or sphere
hemisphere: a half of a sphere

Frequently asked questions
Q What prior knowledge should the pupil have?
A Pupils need a good understanding of the concept of circles. They need to be able to measure length and distance round a circle. They also need to understand and be able to choose the appropriate unit of circumference.

Q How do I ensure that pupils learn the concept of circumference effectively?
A Give pupils as much practice as possible. Make them draw circles and measure round them. You can also allow pupils to practise measuring of circumference on the school playing ground and on paper.

Evaluation guide
Pupils to:
1. Describe the shape of the earth.
2. Say which is bigger, the volume of the sphere or the volume of the cuboid that encloses it.

Lesson 1  Pupil’s Book page 166

Preparation
You will need to have:
• String, rope, objects with circular faces (oranges or apples), pairs of compasses, pins, nails, pencils, a globe of the earth
• Cardboard box
• Pupil’s Book.

Starter activity
Provide a globe to allow pupils to see the shape of the Earth. Compare this shape with orange shape and ball shapes and ask pupils to draw these shapes in their books.

Lesson focus
This lesson focuses on the shape of the earth and the volume of a sphere. Ask pupils to mention other objects that are spherical in shape. Explain to the pupils that a sphere has a centre just like an orange. Cut an orange into two equal halves and show to the pupils its centre. Tell them that each half of a sphere is called a hemisphere. Work through Questions 1 to 6 of Exercise 1 on page 166 and 167 of the PB and guide pupils in their thinking processes when they attempt to answer the questions.

Answers
Exercise 1
1. Learners give their own examples of spherical shapes
2. Spherical
3. Sphere
4. Learners draw 2 halves of sphere
5. Learners show the centre and radius
6. Hemisphere

Assessment
Pupils should be able to find diameter of a sphere and calculate the volume of a sphere. Give extra practice examples if needed.

Homework activity
Ask pupils to solve the Challenge problem on page 170.

Lesson 2 Pupil’s Book page 167

Preparation
You will need to have:
• Globe
• Various spherical objects
• Pupil’s Book.

Starter activity
Remind pupils of the previous lesson and work through the answers to the extension activity.

Lesson focus
Book and guide pupils in their thinking processes when they attempt to answer the questions. Ask pupils to compare the volume of a sphere and volume of a box. Show to the pupils by demonstration that the volume of a sphere is less than the volume of any box that it can fit inside. Work through the examples on page 167 of the PB with the pupils to prepare for Exercise 2. Complete Exercise 2 page 168 of the PB.

Answers

Exercise 2
1. a) \( \frac{4}{3} \times \frac{22}{7} \times 7^3 = 205\frac{1}{3} \text{ cm}^3 \)
   b) \( \frac{4}{3} \times \frac{22}{7} \times 3.5^3 = 179\frac{2}{3} \text{ cm}^3 \)
   c) \( \frac{4}{3} \times \frac{22}{7} \times (\frac{21}{2})^3 = 4851 \text{ cm}^3 \)
   d) \( \frac{4}{3} \times \frac{22}{7} \times 5^3 = 523.1 \text{ cm}^3 \)
   e) \( \frac{4}{3} \times \frac{22}{7} \times 2.5^3 = 65.48 \text{ cm}^3 \)
2. a) \( \frac{5}{2} \times \frac{4}{3} \times \frac{22}{7} \times 3^3 = 56.57 \text{ cm}^3 \)
   b) \( \frac{5}{2} \times \frac{4}{3} \times \frac{22}{7} \times 7^3 = 718.667 \text{ cm}^3 \)
   
   \[ \begin{align*}
   c) & \quad \frac{5}{2} \times \frac{4}{3} \times \frac{22}{7} \times (\frac{21}{2})^3 = 2425.5 \text{ cm}^3 \\
   d) & \quad \frac{5}{2} \times \frac{4}{3} \times \frac{22}{7} \times 6^3 = 452.571 \text{ cm}^3 \\
   e) & \quad V = \frac{4}{3} \times \frac{22}{7} r^3 \text{ so } 25 = \frac{88}{21} r^3; V = \frac{88}{21} r^3; \quad r = 2.04 \text{ cm} \\
   3. & \quad a) \quad V = \frac{4}{3} \times \frac{22}{7} r^3 \text{ so } 25 = \frac{88}{21} r^3; 25 = \frac{88}{21} r^3; \quad r = 1.814 \text{ cm} \\
   & \quad b) \quad 89.83 = \frac{4}{3} \times \frac{22}{7} r^3; 89.83 = \frac{88}{21} r^3; 89.83 \times \frac{83}{21} = r^3; \quad r = 7.22 \text{ cm}^3 \\
   & \quad c) \quad 108\pi = \frac{4}{3} \times \pi r^3; 108 \times \frac{3}{4} = r^3; \quad r = 6 \text{ cm}^3 \\
   & \quad d) \quad \frac{32}{3} = \frac{4}{3} \times \pi r^3; \quad \frac{32}{3} \times \frac{3}{4} = r^3; \quad r = 2 \\
   & \quad e) \quad 36\pi = \frac{4}{3} \times \pi r^3; 36 = \frac{4}{3} = r^3; \quad r = 3 \\
   
   \]

Assessment
Some pupils may struggle with this section of work. Make sure that they understand how to use the formula to calculate the volume of a sphere and hemisphere.

Extension/Homework activity
Challenge page 170 of PB.
Lesson 3 Workbook page 50

Preparation
You will need to have:
- Workbook.

Starter activity
Go through the challenge homework from Lesson 2. If time permits discuss the volume of different planets and compare them.

Lesson focus
Pupils have to complete Worksheet 28 in the WB.

Answers
Worksheet 28 at end of lesson.

Assessment
This assessment tests the extent to which the pupils have achieved the objectives stated at the beginning of this unit.

Extension/Homework activity
Pupils to list and draw as many spherical objects as they can think of.

Lesson 4 Pupils Book page 170

Preparation
You will need to have:
Pupil’s Book.

Starter activity
Go through the answers to Worksheet 28.

Lesson focus
This lesson concludes Unit 28. Go through the summary on page 170 with pupils and recap on the content of the unit. Pupils should then complete the Revision exercise.

Answers
Revision exercise
1. Shape of the earth is a sphere
2. Learner gives 3 examples of other spheres
3. Hemisphere
4. \( V = \frac{4}{3} \pi r^3 \)
5. \( V = \text{length} \times \text{breadth} \times \text{height} \)
6. Diameter = 1.4 m therefore radius = 0.7 m
   \( V = \frac{4}{3} \pi r^3 = \frac{4}{3} \times \frac{22}{7} \times 0.7^3 = 1.43733 \text{ m}^3 \)
7. Shere V = 100 cm\(^3\)
   \( V = \frac{4}{3} \pi r^3 = \frac{4}{3} \times \frac{22}{7} r^3; 100 \times \frac{3}{4} \times \frac{7}{22} = r^3; r = 2.389 \)
   \( \text{Radius } \frac{1}{2} \text{ of } 2.389 \text{ cm = } 1.1945 \text{ cm} \)
   \( V = \frac{4}{3} \pi r^3 = \frac{4}{3} \times \frac{22}{7} r^3 \times 1.1945^3 = 7.142 \text{ cm}^3 \)
8. Spherical bowl is a hemisphere
   \( V = l \times b \times h = 8 \times 7 \times 6 = 336 \text{ cm}^3 \)
   \( 336 \text{ cm}^3 - 134.095 \text{ cm}^3 = 201.905 \text{ cm}^3 \)

Workbook answers Worksheet 28
1. Spherical
2. a) onion b) orange c) apple d) globe e) ball
3. Yes
4. A hemisphere
5. A circle
6. Diameter
7. Radius
8. \( V = \frac{1}{3} \times \frac{22}{7} \times \left( \frac{7}{2} \right)^3 = 179.67 \text{ cm}^3 \)
9. \( V = \frac{1}{3} \pi R^3 = 179.67 \text{ cm}^3 \)
   \( 10\pi = \frac{4}{3} \pi R^3 \)
   \( 10 = \frac{4}{3} R^3 \)
   \( R^3 = 13.5 \)
   \( R = \sqrt[3]{13.5} = 2.38 \text{ cm} \)
10. Volume = \( \frac{1}{2} \times \frac{1}{3} \pi R^3 = 10\pi \text{ m}^3 \)
11. Volume of sphere = \( \frac{1}{3} \times \frac{22}{7} \times 7^3 = 1437.33 \text{ cm}^3 \)
   Volume of box = \( 14 \times 15 \times 16 = 3360 \text{ cm}^3 \)
   Volume of water = \( 3360 - 1437.33 + 1 = 1922.67 \text{ cm}^3 \)
Objectives
By the end of this unit, pupils will be able to:
• State the properties of three-dimensional shapes such as cuboid, pyramids, cubes and so on
• Solve quantitative problems on the three-dimensional shapes.

Suggested resources
Wall chart, a collection of 3-D shapes, a model of a tetrahedron; Graph paper; Paper, rulers, protractors, scissors, tape; Paper for drawing nets, glue, examples of the 3-D shapes; Different boxes, such as Toblerone boxes or cereal boxes

Key word definitions
three-dimensional shape (3-D): a figure that has three dimensions of length, width and height
flat surface: a surface that is straight
face: a flat surface
edge: a line where two faces meet
vertex: the point where two sides of an angle meet (the plural is vertices)
plane of symmetry: a flat surface that divides a 3-D shape into two identical shapes

Frequently asked questions
Q What prior knowledge should the pupil have?
A Pupils need to have knowledge of the following 2-D shapes: rectangle, square, triangle, circle, pentagon, hexagon, heptagon and octagons, and the following 3-D shapes: sphere, cylinder, cuboid, cube, cone, and pyramid. These were dealt with in earlier grades.
Q What skills do pupils need to do the work?
A Pupils need to be able to measure, draw and cut out shapes with precision. They also need to be able to paste neatly.

Evaluation guide
Pupils to:
1. Give the properties of 3-dimensional shapes.
2. Solve given quantitative aptitude problems relating to three-dimensional shapes.

Lesson 1 Pupil’s Book page 171
Preparation
You will need to have:
• Pupil’s Book
• Wall chart, a collection of 3-D shapes.

Starter activity
Discuss the properties of the 3-D shapes that the pupils learnt about in the previous grade. Use the wall chart showing the various shapes. Cover up the names of the shapes and ask the pupils to identify them. Allow volunteers to describe a particular 3-D shape. The rest of the class has to identify the shape using the pupil’s description.

Lesson focus
The focus is on identifying 3-D shapes. Emphasise the difference between 2-D and 3-D shapes. Start by going through all the technical terms (mathematical vocabulary) necessary for this unit. Try and have a model of each of the shapes covered in this unit available for the pupils to work with viz. Cube, triangular prism, rectangular prism, pyramid, cone, cylinder and sphere. Note that there are 2 different types of pyramids covered in this section i.e. triangular based and rectangular pyramids. Demonstrate how these shapes differ from each other by making clear reference to their edges, faces and vertices. Allow pupils to draw these shapes as this
will enhance their understanding of its properties. Complete Exercise 1.

**Answers**

**Exercise 1**

1. a) rectangular prism  
   b) triangular prism  
   c) cone  
   d) cylinder  
   e) cube  
   f) sphere  
   g) rectangular prism  

2. a) 4  
   b) yes  
   c) triangles  
   d) 6  
   e) Learner draws triangular based prism  

3. a) Learner names 2 of the shapes  
   b) Learner describes similarities of the 2 chosen shapes  
   c) Learner describes differences between the 2 chosen shapes  

**Assessment**

Pupils should be able to identify 3-D and draw 3-D shapes. Draw additional shapes on the board for pupils to identify.

**Extension activity**

Ask pupils to do the Challenge activity on page 172 of the PB if there is time available during the lesson. If there is not enough time, pupils should complete the Challenge for homework.

**Homework activity**

Ask the pupils to draw any four of the 3-D shapes. They could also bring an example of an object that is the same as each of their drawings to class.

**Lesson focus**

The focus of this lesson is on identifying the properties of shapes and then using these properties to sort and compare them. Refer to the example on page 174 of the PB and work through the example of the square based pyramid by going through the properties viz. edges, angles, faces, vertices and symmetry. The point of the example is to show pupils that different 3-D shapes differ with respect to these properties. Use a few simple examples to explain the concept of symmetry to pupils. Emphasise that if a shape has symmetry, mirror images can be obtained when the object is halved, for example. Ask pupils to complete Exercise 2 on page 175 of the PB.

**Answers**

**Exercise 2**

1. | Edges | Faces | Vertices |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cube</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Cylinder</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Triangular prism</td>
<td>9</td>
<td>5</td>
</tr>
</tbody>
</table>

2. | Feature            | Triangular based pyramid | Cone | Cuboid | Triangular prism |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Edges</td>
<td>6</td>
<td>1</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Surfaces</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Vertices</td>
<td>4</td>
<td>1</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Symmetry</td>
<td>4</td>
<td>-</td>
<td>9</td>
<td>2</td>
</tr>
</tbody>
</table>

3. a) A; E; G  
   b) D; F; H  
   c) B; C  
   d) A; B; C; D; E; F; G; H
4. a) Group 1 has circle planes  
b) Group 2 has circles and 2 surfaces  
c) Group 3 has 12 edges, 6 surfaces and 8 vertices  

5. a) Cylinder can be made with A & B; a cuboid can be made with B; a triangular prism can be made with C  
b) Cylinder $= 2 \times A \times 1 \times B$; Cuboid $6 \times B$; Triangular prism $4 \times C$

**Assessment**  
Pupils should be able to:  
- Sort 3-D shapes  
- Describe 3-D shapes  
- Compare 3-D shapes.

**Homework activity**  
Ask pupils to make paper/cardboard models of one of the following 3-D shapes: Cube, cuboid, Cylinder, Triangular based pyramid, rectangular based pyramid, Cone.

In order to extend your brighter pupils, you can download from the internet some more complex 3-D shapes e.g. dodecahedron, and ask pupils to build models of these.

**Lesson 3** Pupil’s Book page 177

**Preparation**  
You will need to have:  
- Pupil’s Book  
- Wall chart, a collection of 3-D shapes  
- Cardboard  
- Scissors, tape, glue  
- Protractors  
- Paper for drawing nets  
- Different boxes, such as Toblerone boxes or cereal boxes.

**Starter activity**  
Work with the 3-D models pupils had to make for homework. Start off by using a self prepared model of any of the 3-D models and carefully open it up so that all the faces are seen as 2-D shapes. Stick the opened model on the board and ask pupils to identify the 2-D shapes that constitute the model. Ask pupils to hold up their models and ask the pupils to identify the 3-D shapes. Write the names of the shapes on the board. Ask the pupils to open up their models in the same way you have opened up yours and ask the pupils to talk about what they notice about the net that is made by each model.

**Lesson focus**  
The lesson focuses on making models of 3-D shapes. This work should be done practically. You will need plenty of paper because the pupils will need practice getting the nets right. Follow the instructions on page 177 of the PB and ask pupils to follow the 5 steps outlined in the text. You may want to take a strong lead in this activity by giving the steps verbally to the pupils and making them to work at the pace you dictate. It is important that the pupils make all the models as this will help them understand the properties of the shapes better. Therefore, for additional practical exercise, it would be useful to bring boxes of different shapes and dimensions e.g. Tobelarone chocolate box, cereal boxes, etc., and to ask pupils to open them up and to sketch the nets for these shapes. It is important to allow the pupils to do all the practical work in this section which will help them understand both 2-D and 3-D shapes better. Complete Exercise 3.

**Answers**  

**Exercise 3**

1. Learners draw net of their Maggi wrapper  
2. Repeat using Omo packet  
3. Cube; cuboid; cone; square based triangular pyramid; triangular prism
Assessment
Pupils should be confident at making nets for models of 3-D shapes and also identifying the correct 3-D shape from a given net. They should be able to design a net for a given 3-D shape.

Extension activity
Challenge page 179
1. Pupils design a net for the house.
2. Pupils make a model of the house using their net.

Homework activity
Ask the pupils to choose two different 3-D shapes that they see at home. They should draw or sketch the shape and design nets for each of these shapes. They should then construct the models using their nets.

Lesson 4  Pupil’s Book page 178

Preparation
You will need to have:
• Pupil’s Book.

Starter activity
Discuss the challenge from the previous lesson and establish if pupils need more time. Pupils will enjoy making the model but may need help.

Lesson focus
Pupils should also complete the Revision exercise on page 178 of the PB.

Answers
Revision exercise
1. A is a cuboid; B is a square based triangular pyramid; C is a cylinder; D is a triangular based prism; E is a cone; F is a triangular prism; G is a cube; and H is a sphere.
2. Learners construct models
3. a) 6  b) 5
   c) 3  d) 4
4. a) 12  b) 8
   c) none  d) 4
5. Learners design a net for cuboid
6. Learners design net for cone
7. a) A & B  b) A & G
c) G & D

Assessment
Pupils should be able to identify different shapes and draw their nets. Make sure that pupils understand what is meant by edges and faces.

Extension activity
Continue with the challenge from the previous lesson if more time is needed.

Homework activity
No homework activity, pupils can continue drawing nets of shapes.

Lesson 5  Workbook page 51

Preparation
You will need to have:
• Workbook.

Lesson focus
Check the answers to the Revision exercise before commencing the assessment task. Pupils have to complete Worksheet 29 in the WB.

Answers
Worksheet 29

Assessment
Pupils should be able to identify a three-dimensional shape and understand how a net can be folded to create a specific three-dimensional shape.

Extension/Homework activity
Corrections from revision exercise.
Workbook answers Worksheet 29

1. Three dimensional shapes are shapes with length, width and height.

2. a) Cube  
b) Triangular prism  
c) Rectangular prism  
d) Triangular-based pyramid  
e) Rectangular pyramid  
   Answers can also include: cone, cylinder, sphere.

1. a)  
b)  
c)  
d)  
e)  

2. A pyramid is a 3-D shape whose base is a polygon.

3.  

4. a) tins of food  
b) drink cans  
c) mugs  
d) drinking glasses  
e) rolling pins

5. |        | Faces | Edges | Vertices |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Cylinder</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>b)</td>
<td>Triangular prism</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>c)</td>
<td>Cone</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>d)</td>
<td>Square-based pyramid</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>e)</td>
<td>Cuboid</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>f)</td>
<td>Cube</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>g)</td>
<td>Sphere</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

6. a) Cylinder  
b) Cone  
   Sphere or hemisphere are other possible answers.

7. a) i) Triangular-based pyramid  
     ii) Triangular prism  
   b) Only the triangular-based pyramid  
   c) i) Cube  
     ii) Cuboid/rectangular prism  
   d) i) Cube and cuboid  
     ii) Triangular prism and triangular-based pyramid

8. Cylinder – 3 2-D shapes  
   Cube and cuboid – 6 2-D shapes  
   Triangular prism – 5 2-D shapes  
   Triangular-based pyramid – 5 2-D shapes  
   Cone – 2 2-D shapes

6. a)  
b)  
c)  
d)  
e)  

8. Cylinder – 3 faces  
   Cone – 2 faces  
   Triangular-based pyramid – 5 faces  
   Cuboid/rectangular prism – 6 faces
Objectives
By the end of this unit, pupils will be able to:
• Identify parallel and perpendicular lines
• Identify the different types of triangles
• Solve quantitative problems on lines and triangles.

Suggested resources
Pencil, ruler, set squares, protractor, cardboard, scissors; Two- and three-dimensional shapes; Models of equilateral, isosceles, and right-angled triangles

Key word definitions
identify: establish or indicate who or what (someone or something) is the amount of space that an object takes up. It is the capacity of a container
straight: extending or moving uniformly in one direction only; without a curve or bend
vertical: straight up
square corner: the angle where a vertical line meets a horizontal line
perpendicular lines: two lines which are at right angles to each other

Common errors that pupils make
Pupils cannot draw parallel lines accurately. When constructing a pair of parallel lines pupils should be careful when measuring the distance perpendicular to the first line. Use set squares or other square corners (such as the edge of a sheet of paper or ruler) to make sure the measurements are perpendicular, and always mark at least three points to check that they are correctly aligned.

Evaluation guide
Pupils to:
1. Identify parallel and perpendicular lines.
2. Solve quantitative aptitude problems on parallel and perpendicular lines.
3. State two properties each of equilateral, isosceles and right-angled triangles.
4. Solve given quantitative aptitude triangle problems.

Lesson 1 Pupil’s Book page 180

Preparation
You will need to have:
• Pupil’s Book
• Pencil, ruler, set squares, protractor.

Starter activity
Ask pupils to use a ruler to draw horizontal lines measuring 5 cm, 2 cm, 15 cm and 20 cm in their books.
Ask them to draw vertical lines measuring 3.5 cm, 9 cm, 6 cm and 16 cm in their books. Ask pupils to draw a 4 cm horizontal line and 5 cm vertical line to begin from the same point and to measure the length of the line joining the two end points.

Lesson focus
This lesson focuses on the concept of parallel and perpendicular lines. Ask pupils to draw two horizontal lines measuring 5 cm that are 3 cm apart along the whole length. Guide the pupils to draw a parallelogram with AB parallel to CD and of 5 cm length with AD parallel to BC and of 4 cm length. Show how arrows are used to denote parallel lines and give pupils more practice work if necessary. Ask pupils to draw a vertical line and a horizontal line to touch each other at a point. The point at which they meet forms a perpendicular angle. The lines are therefore called perpendicular lines. Ask the pupils to draw rectangles PQRS with PQ = 6 cm and QR = 4 cm. Guide the pupils to identify the
perpendicular lines. Work through examples and activities to prepare the pupils for Exercise 1.

**Answers**

**Exercise 1**

1. Learners draw parallel lines 5 cm apart
2. Book; white board; ruler; table
3. Square, rectangle, rhombus, hexagon, trapezoid
4. Learners draw the shapes from Question 3
5. No

6.

- A
- B
- C
- D
- E
- F
- G
- H
- I
- J

![Images of geometric shapes]

**Exercise 2**

1. a) no  
   b) no  
   c) no  
   d) yes  
   e) no  
   f) yes  
   g) yes  
   h) no  
   i) yes  
   j) no

2. a) rectangle
   b) square
   c) a parallelogram does not have perpendicular angles
   d) a trapezium does not have perpendicular angles
   e) a kite does not have perpendicular angles
   f) a rhombus does not have perpendicular angles

![Images of geometric shapes]

**Assessment**

- Identify parallel and perpendicular lines
- Distinguish between parallel and perpendicular lines
- Draw parallel and perpendicular lines.

**Homework activity**

- Ask pupils to complete and unfinished problems from the given exercises. Ask pupils to revise the concepts of angles viz. acute, obtuse, reflex, revolution.

**Lesson 2**  *Pupil’s Book page 183*

**Preparation**

- Pupil’s Book
- Pencil, ruler, set squares, protractor, cardboard, scissors
- Two- and three-dimensional shapes
- Models of equilateral, isosceles, and right-angled triangles.

**Starter activity**

- Cut out lots of different types of triangles out of card, for use with the class. Ask a pupil to use a protractor to measure the angles of a few triangles. For each triangle they should add the three angles. Discuss with the pupils what they have observed about the sum of the three angles of each triangle.

**Lesson focus**

- Refer to page 183 of the PB and work through the properties of the four main types of triangles. Emphasise the similarities and differences between the 4 types of triangle. Ask pupils to use their
mathematical instruments to draw at least one of each of the different triangles as accurately as they can. Now ask the pupils to complete Exercise 3.

**Answers**

**Exercise 3**

1. Isosceles
2. Equilateral
3. a) Right-angled b) Equilateral c) Equilateral d) Isosceles e) Right-angled
4 & 5. a) Isosceles b) Equilateral c) Scalene d) Scalene
6. a) 2 b) 0 c) 4 d) 3

**Assessment**

Pupils should be able to recognise and name the different types of triangles. They should also be familiar with the properties of the different types of triangles.

**Homework activity**

Ask pupils to complete the Challenge activity on page 186 of the PB.

**Lesson 3 Pupil’s Book page 185**

**Preparation**

You will need to have:
- Pupil’s Book
- Two- and three-dimensional shapes
- Models of equilateral, isosceles, and right-angled triangles.

**Starter activity**

Check all outstanding homework. Briefly revise the concepts of lines and triangles.

**Lesson focus**

Ask pupils to complete the Revision exercise. Pupils should work on their own and the teacher should move around the class checking and monitoring the pupils’ progress.

**Answers**

**Revision exercise**

1. Lines drawn measuring 5 cm, 8 cm and 2 cm
2. and 3.

a) [Diagram]

b) [Diagram]

c) [Diagram]

d) [Diagram]

4. A triangle in which all sides are equal
5. An equilateral triangle has all sides equal and all angles equal
   An isosceles triangle has 2 equal sides and 2 equal angles
   A scalene triangle has no angles or sides equal
   A right-angled triangle has one of its angles at a right angle

6. Only the cuboid has parallel lines

**Assessment**

Make sure that pupils can distinguish between parallel and perpendicular lines and also recognise and name the different types of triangles. Pupils should be familiar with the properties of the different types of triangles and solve problems involving lines and triangles.

**Lesson 4 Workbook page 55**

**Preparation**

You will need to have:
- Workbook.

**Starter activity**

Check the answers to the Revision exercise before commencing the assessment task and go through any questions that caused problems.
Lesson focus

Pupils have to complete Worksheet 30 in the WB. This assessment tests the extent to which the pupils have achieved the objectives stated at the beginning of this unit. You should give the pupils a set time (30–40 min) in which to complete the assessment. Each pupil should work on their own. Encourage pupils not to spend too much time on one question if they get stuck. Instead, they should leave it and come back to it if they have time left. Encourage them to check their answers if they finish before the set time is over. Collect in the answers to mark them, identify any problem areas and revisit those areas if necessary.

Answers

WB Worksheet 30.

Assessment

Pupils should be able to identify parallel lines, perpendicular lines, names of different shapes and names of triangles. Make sure they are familiar with the terminology and can identify the angles of triangles and rectangles.

Workbook answers Worksheet 30

1. a) Slanted line  
   b) Vertical line  
   c) Horizontal line
2. a) parallel  
   b) perpendicular
3. Teacher to check that arrows are correctly used to show parallel lines.
4. a)  
   Trapezium has one pair of parallel lines
   b)  
   Rectangle has two pairs of parallel line
   c)  
   Square has two pairs of parallel lines

5. Teacher to check measurement of line drawn.
6. Parallel lines are lines that are the same distance apart along their whole length.
7. Perpendicular lines are lines which are at right angles to each other.
8. a) Desk  
   b) Board  
   c) Door  
   d) Walls  
   (there are other possible answers, such as book, rug, cupboard etc)
9. Teacher to check that perpendicular angles are correctly shown.
10. a) Scalene  
    b) Isosceles  
    c) Equilateral  
    d) Right-angled (in any order)
11. Isosceles triangle.
12. Scalene triangle.
13. a) Isosceles triangle  
    b) Equilateral triangle  
    c) Right-angled triangle
14. a) 4 triangles  
    b) 3 triangles
15. Right angle.
Objectives
By the end of this unit, pupils will be able to:
• Identify the components of a circle – radius, diameter, and circumference of a circle
• Differentiate between radius and diameter
• Solve quantitative problems on circles.

Suggested resources
Rulers marked in centimetres and millimeters, protractors; pairs of compasses, pencils, poster of the circle with the circumference, diameter and radius clearly marked and labelled; String, rope, objects with circular faces, pins, nails, pencils; Two- and three-dimensional shapes

Key word definitions
radius of a circle: a line from the centre of a circle to any part of the circumference
diameter: a line that joins two points on a circle and passes through the centre of the circle. It is twice the radius
circumference: this is the distance around a circle

Frequently asked questions
Q What prior knowledge should the pupils have?
A In Unit 21 pupils were introduced to the concepts associated with circles. They should, therefore, be able to draw on that knowledge confidently and apply it in this unit. However, it is advisable to revise these concepts again to help refresh their memories.

Evaluation guide
Pupils to:
1. Identify radius, diameter, and circumference of a circle.
2. Solve quantitative aptitude problems on circles.
3. Identify and determine radius of a circle.

Lesson focus
Introduce the lesson by discussing the difference between a free-hand sketch or drawing, and a drawing or construction made to specified dimensions. First show pupils how we can draw neat accurate circles by tracing around circular objects. Allow pupils to draw a few circles of their own and ask them to measure the diameters and radii of the circles they have drawn. Explain the different concepts of radius, diameter and circumference of a circle. Ensure that all pupils can measure correctly using a ruler and protractor and that they are comfortable using a compass. Demonstrate how to draw a circle using a compass when given a certain radius or diameter. Refer to the steps on drawing a circle on page 188 of the PB. Complete Exercise 1 page 187 PB.

Answers
Exercise 1
1. 4 circles traced showing radius and diameter
2. Learners give measurements
**Lesson 2**  
*Pupil’s Book page 189*

**Preparation**  
You will need to have:  
- Pupil’s Book  
- Workbook  
- Rulers marked in centimetres and millimeters, protractors; pairs of compasses, pencils, poster of the circle with the circumference, diameter and radius clearly marked and labelled.

**Starter activity**  
Discuss the different circles found by pupils for the scavenger hunt homework activity of Lesson 1.

**Lesson focus**  
Work through the example of how to draw a circle on page 188 of the PB. Pupils will have worked with circles previously and should be confident in finding the circumference of a circle. Ask pupils to complete Exercise 2 in the PB.

**Exercise 2**

1. a) 3 cm  
   b)–d) repeated with different size radii

2. a) 18.86 cm  
   b) 326.86 mm  
   c) 282.86 mm  
   d) 26.39 cm

**Assessment**  
Make sure that pupils are able to use a protractor and compass accurately.

---

**Lesson 3**  
*Pupil’s Book page 189*

**Preparation**  
You will need to have:  
- Pupil’s Book  
- Workbook  
- Rulers marked in centimetres and millimeters, protractors; pairs of compasses, pencils, poster of the circle with the circumference, diameter and radius clearly marked and labelled.

**Starter activity**  
Revise the Circumference formula taught in Unit 21. Ensure that pupils are familiar with the relationship between the radius and the diameter as well as the relationship between the diameter and the circumference. Revise the concept of pi again. Also revise inverse mathematical processes and how to change the subject of an equation.

**Lesson focus**  
Work through the examples on page 189 of the PB. Now they will have to manipulate the formula so that they are able to find the diameter or the radius. Ask pupils to complete Exercise 3 in the PB.

**Answers**

**Exercise 3**

1. a) 326.72 cm  
   b) 13.19 cm  
   c) 21.99 cm  
   d) 65.97 cm  
   e) 52.78 cm  
   f) 329.87 mm  
   g) 31.416 cm  
   h) 131.94 cm  
   i) 1.319 m  
   j) 659.73 mm

2. \( C = 2\pi r; \) 305 cm = \( 2 \times \frac{22}{7} r \); so \( 305 \times \frac{7}{22 \times 2} r \) or \( r = 48.5 \) cm

3. \( C = 2\pi r; \) 100 cm = \( 2 \times \frac{22}{7} r \); so \( 100 \times \frac{7}{22 \times 2} r \) or \( r = 15.9 \) cm and \( d = 31.8 \) cm

4. \( C = 2\pi r; \) 144 cm = \( 2 \times \frac{22}{7} r \); so \( 144 \times \frac{7}{22 \times 2} r \) or \( r = 22.9 \) cm and \( d = 45.8 \) cm
5. Circle with diameter 6 cm. radius is \( \frac{6}{2} = 3 \) cm
   
   \( C = 2 \pi r; \ C = 2 \times \frac{22}{7} \times 3 = 18.85 \) cm
   
   Sum of circumference and radius
   = 18.85 cm + 3 cm = 21.85 cm

**Assessment**

Pupils should be able to calculate the circumference of circles using a formula.

Give extra practice if needed.

**Extension activity**

Ask pupils to find some everyday object with a circular shape and to measure the diameter and find the circumferences using the formula.

**Homework activity**

Worksheet 32 page 57 questions 5, 6 and 7.

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### Lesson 4  
**Pupil's Book page 190**

**Preparation**

You will need to have:
- Pupil's Book
- Workbook
- Protractor and compasses.

**Starter activity**

Give pupils some circle radius measurements and ask them to draw the circles. The ask them to find the diameter and circumference.

**Lesson focus**

Go through the summary on page 190 and then ask pupils to complete the Revision exercise on their own.

**Answers**

**Revision exercise**

1. A circle is a set of points all the same distance from a fixed point

2. a) The radius is the distance from the centre of the circle to any point on the circle
   
   b) The diameter is a line that joins 2 points on a circle that passes through the centre of the circle
   
   c) The circumference the distance around the circle

3. 

<table>
<thead>
<tr>
<th>Radius</th>
<th>Diameter</th>
<th>Circumference</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 cm</td>
<td>10 cm</td>
<td>31.42 cm</td>
</tr>
<tr>
<td>7 cm</td>
<td>14 cm</td>
<td>43.98 cm</td>
</tr>
<tr>
<td>10.5 cm</td>
<td>21 cm</td>
<td>65.97 cm</td>
</tr>
<tr>
<td>2 cm</td>
<td>4 cm</td>
<td>12.57 cm</td>
</tr>
<tr>
<td>14.005 cm</td>
<td>28.01 cm</td>
<td>88 cm</td>
</tr>
</tbody>
</table>

4. Learners give their own list of circle shapes.

5. \( C = 2 \pi r; \) so 105 cm = \( 2 \times \frac{22}{7} \times r; \)
   
   \[ 105 \times \frac{7}{22 \times 2} = 16.7 \text{ and } d = 33.4 \text{ cm} \]

**Assessment**

Pupils should be able to draw and measure circles accurately and also find the circumference using the formula.

**Homework activity**

Worksheet 31 page 58 questions 8, 9 and 10.

**Workbook answers Workbook 31**

1. A 2-D shape
2. Pencil, ruler, pair of compasses
3. Pupils to complete
4. Radius, diameter, circumference
5. a) 1.5 cm  b) 2 cm
6. 2
7. a) 6 cm  b) 11 cm
c) 1 cm  d) 2.6 cm
e) 7.2 cm  f) 15.5 cm
g) 12\(\frac{1}{2}\) cm  h) 14 cm
i) 18 cm  j) 24 cm
8. Semi circle
9. Quarter
10. Pupils to draw
11. Pupils to give examples such as saucer, clock, plate, saucepan lid.
12. Pupils to give their own examples.
13. Pupils to give their own examples.
Objectives
By the end of this unit, pupils will be able to:
- Prepare a tally of data
- Draw bar graphs and pictograms of information collected locally.
- Data on test results, weather and elections
- Biological data.

Suggested resources
Examples of bar graphs, block graphs, pictograms, tables and tallies, with each example labelled clearly as to what type of graph or chart it is; Data on test results; Data on weather; Data on elections; Biological data.

Key word definitions
- tally: a recorded count of scores
- pictogram: a graph using pictures to represent numbers
- data: a set of facts or numbers
- table: information arranged in rows and columns
- graph: a diagram that represents data

Frequently asked questions
Q What prior knowledge should the pupil have?
A Pupils should have a good working knowledge of whole numbers and be comfortable with the four basic arithmetic operations of addition, subtraction, multiplication and division. Pupils should also be familiar with the concepts of tallies, tables, pictograms and block graphs.

Evaluation guide
Pupils to:
1. Find the mode of a given set of data.

Lesson 1  Pupil’s Book page 191

Preparation
You will need to have:
- Pupil’s Book
- Workbook
- Examples of bar graphs, block graphs, pictograms, tables and tallies, with each example labelled clearly as to what type of graph or chart it is

Starter activity
Ask pupils to gather information from each of the other pupils in the class. They could find out how many family members each pupil has. Ask them to create a visual display of the information they have gathered. They may choose to display the data in any form other than in the form of numbers. This activity requires quite a bit of time as pupils need to gather information.

Lesson focus
This lesson focuses on the interpretation and representation of data in tallies. Use the information the pupils have collected during the starter activity and show pupils how they can display their data using a tally table. Work through the examples on page 191 of the PB to show pupils how a tally is recorded. Ask pupils to complete Exercise 1 on page 192 of the PB.

Answers
Exercise 1
1. a) 
   b) 
   c) 
   d) 
   e) 
   f) 
   g) 
   h) 
   i) 
   j)
Unit 32: Data presentation

Assessment
Make sure pupils understand how to represent data using tallies. This lesson should not cause problems as it follows on from work in previous years.

Homework activity
Worksheet 32 page 59 questions 1, 2 and 3.

Exercise 2

2. a) 3  b) 14  c) 20  d) 29  
   e) 16  f) 17  g) 30  h) 22  
   i) 6  j) 14

3. 1s  ||||  2s  ||||  3s  ||||  
   4s  ||||  5s  ||||

 Assessment
Pupils should be able to:
- Represent data in tallies
- Represent data in a table
- Interpret data.

Extension activity
Ask pupils to do a tally of males and females in their extended family.
Lesson 3  Pupil’s Book page 196

Preparation
You will need to have:
- Pupil’s Book  •  Workbook
- Examples of pictograms.

Starter activity
Revise the concept of a table by showing pupils examples of different types of tables. Point out to pupils that tables are used to represent information. Tables also allow us to interpret the information easier. Hand out copies of tables that represent different types of information and ask pupils to explain what information each of their tables represent.

Lesson focus
This lesson focuses on the interpretation and representation of data in pictograms. The lesson also shows how the use of tally tables are extended. Work through the example on page 196 of the PB and show pupils how the information contained the tally and frequency tables are transformed into graphical form viz. a pictogram. Pictograms are normally colourful and visually appealing graphs. Ask pupils to complete Exercise 3 on page 196 of the PB.

Answers
Exercise 3
1. a) 20  b) 5  c) Pepsi  d) 60  e) Coco cola
Check pupil’s bar graphs.
2. a) 50  b) 60  c) Great Grace  d) 15  e) 19  f) 230
3. Number of calls received

Lesson 4  Pupil’s Book page 198

Preparation
You will need to have:
- Pupil’s Book  •  Workbook
- Examples of bar graphs, block graphs.

Starter activity
Draw a table on the board to summarise the ages of the pupils in your class. The table below is an example. Adapt the first column to reflect the actual ages of your pupils. Complete the table by asking your pupils to put up their hands for questions such as ‘How many of you are girls and are 11 years old?’ and so on. Make sure that the total number of pupils matches the number of pupils present in your class. If your class has narrower age gaps, adapt the first column to reflect the actual ages of your pupils. You should aim for about six age groups. If you have a narrower age range, then use smaller age divisions, for example six, four or three months apart. Now draw a bar graph for the girls and a block graph for the boys. Discuss the differences between the two graphs, not only in terms of bars versus blocks, but also in terms of the shapes of the graphs.

Lesson focus
This lesson focuses on the representation of data in bar graphs. This lesson is an extension of the previous lessons and teaches another method of representing data visually. Make sure pupils understand how the set of axes are to be drawn and that numbering of the axes are done uniformly.
i.e. they must not place random numbers on these axes. Also the axes must be labeled clearly. Take great care to show how a value on one axis is related to another value on the other axis. Work through the example on page 198 of the PB with your pupils, and then ask them to complete Exercise 4.

**Answers**

**Exercise 4**

1. 

<table>
<thead>
<tr>
<th>Number of materials made at different factories</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>25</td>
</tr>
</tbody>
</table>

2 & 3.

<table>
<thead>
<tr>
<th>Marks</th>
<th>Number of pupils</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>22</td>
</tr>
<tr>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>15</td>
<td>6</td>
</tr>
</tbody>
</table>

4. Check pupil’s bar graphs.

5. a) 12 b) 6 c) 5 d) 36 e) 12 f) 10 & 11

6. 

<table>
<thead>
<tr>
<th>Number of pupils</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>15</td>
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<tr>
<td>10</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>0</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joke</td>
<td>Bola</td>
<td>Christy</td>
<td>Love</td>
<td></td>
</tr>
</tbody>
</table>

7. 

<table>
<thead>
<tr>
<th>Number of children</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>0</td>
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</tbody>
</table>

<table>
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<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joke</td>
<td>Bola</td>
<td>Christy</td>
<td>Love</td>
<td></td>
</tr>
</tbody>
</table>

8. a) 45 b) 6 c) 12 d) 2

9. 60 b) 50 c) 65 d) Chess e) Draught

**Assessment**

Pupils should be able to represent and interpret data in tables, tallies and bar charts. Check to make sure they can correctly interpret data in these forms.

**Extension activity**

Ask pupils to complete the Challenge activity on page 201 of the PB.

**Homework activity**

Worksheet 32 page 59 questions 4, 5 and 6.

**Lesson 5**  Pupils Book page 201

**Preparation**

You will need to have:

- Pupil’s Book
- Workbook.

**Starter activity**

Go through the results of the challenge from the last lesson with pupils and recap on what they have learnt regarding pictograms and bar charts.

**Lesson focus**

This lesson consolidates Unit 32. Discuss the summary on page 201 with pupils and allow them to complete the Revision exercise during class time. Use the opportunity to walk around and check on pupil’s progress. Identify any pupils who are having problems with the work.

**Answers**

**Revision exercise**

1. A tally is a count

2. 

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

3. 

<p>| |</p>
<table>
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<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

4. a) 60 b) 50 c) 65 d) Chess e) Draught
5. Check pupil’s bar graphs.

**Assessment**
Collect in the answers to mark them, identify any problem areas and revisit those areas if necessary.

**Homework activity**
Worksheet 32 page 60 Question 7.

**Workbook answers Worksheet 32**

1. A tally is a recorded count of scores, votes or other information.
2. c) 5
3. a) [Tally] b) [Tally] c) [Tally]
d) [Tally] e) [Tally] f) [Tally]
4. A frequency table is a table showing the number of times a number or object occurs.

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paw paw</td>
<td>[Tally]</td>
<td>6</td>
</tr>
<tr>
<td>Apple</td>
<td>[Tally]</td>
<td>10</td>
</tr>
<tr>
<td>Pineapple</td>
<td>[Tally]</td>
<td>21</td>
</tr>
<tr>
<td>Strawberry</td>
<td>[Tally]</td>
<td>12</td>
</tr>
<tr>
<td>Orange</td>
<td>[Tally]</td>
<td>53</td>
</tr>
<tr>
<td>Mango</td>
<td>[Tally]</td>
<td>4</td>
</tr>
<tr>
<td>Cashew</td>
<td>[Tally]</td>
<td>17</td>
</tr>
<tr>
<td>Banana</td>
<td>[Tally]</td>
<td>2</td>
</tr>
</tbody>
</table>

2. a)

<table>
<thead>
<tr>
<th>Marks</th>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>[Tally]</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td>[Tally]</td>
<td>7</td>
</tr>
<tr>
<td>12</td>
<td>[Tally]</td>
<td>14</td>
</tr>
<tr>
<td>13</td>
<td>[Tally]</td>
<td>6</td>
</tr>
<tr>
<td>14</td>
<td>[Tally]</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>[Tally]</td>
<td>6</td>
</tr>
</tbody>
</table>

7. a) 40 b) 5 c) 9 d) the same amount of people.
Objectives
By the end of this unit, pupils will be able to:
• Find the mode of a given data
• Identify the mode as applicable in daily life activities
• Calculate the mean of a given data
• Identify mean of a set of data in daily life activities
• Solve quantitative aptitude problems on mode and mean of data.

Suggested resources
Sets of data (preferably taken from real-life situations); Data chart; Number cards

Key word definitions
mode: the number which appears most often in a set of numbers
mean: the average value of a set of numbers

Common errors that pupils make
Pupils sometimes give the frequency of the mode instead of the mode. This comes about when using frequency tables, as the pupils look to find the highest frequency, and simply write this down, instead of the number from the data. Make sure that they realise the mode has to be one of the original numbers in the set of data.

Evaluation guide
Pupils to:
1. Calculate mean of given data.
2. Calculate the mean from data received from the environment daily activities.
3. Solve quantitative reasoning problems on mode and mean of given data.

Suggested resources
Sets of data (preferably taken from real-life situations); Data chart; Number cards

Starter activity
Display number cards with figures as follows: 4 tens, 2 elevens, 5 twelves, 3 thirteens, 8 fourteens and 3 fifteens not arranged in order. Ask questions on the displayed number cards, like: How many number cards are displayed on the cardboard? Which number is the highest in the number cards? Which is the lowest? Which of the numbers appear most common? What is the total of all the numbers displayed?

Lesson focus
Explain to the pupils that in a set of data, the number that appears most is said to be the most often and called the MODE of the data. Give examples like “there are 5 cups, 3 bowls, 8 jugs and 4 saucers on a table. Which of the items is the most common?” The pupils say ‘jugs’ and jug is the mode of the items presented. Ask pupils to state their ages in years. The most common age given is the mode of the ages of the pupils in the class. Also work through the example on page 203 and the example on page 204 of the PB.

Ask your pupils to do Exercise 1 on page 204 of the PB.

Answers
Exercise 1
1. 4  2. 3  3. 10  4. 12
5. 6  6. 3 and 4  7. 15  8. 10
9. 0  10. 6
**Assessment**
Make sure pupils understand how to define and calculate mode of a data set.

**Extension activity**
Collect data: You and a partner find a busy traffic route and observe the passing cars from a safe distance. Record the make of all the cars that pass your observation point during a half an hour stint. Use the data collected to determine the most popular make of car.

**Lesson 2**  
**Pupil’s Book pages 204**

**Preparation**
You will need to have:
- Pupil’s Book
- Sets of data (preferably taken from real-life situations)
- Data chart
- Number cards.

**Starter activity**
Revise the last lesson and remind pupils of how to tally numbers.

**Lesson focus**
This lesson follows on from Lesson 1. Pupils must now draw up a frequency distribution table. Use a simple example such as the number of boys and girl in the class and demonstrate on the board how to draw up a frequency distribution table. Ask your pupils to do Exercise 2 on page 204 of the PB.

**Answers**

**Exercise 2**
1. The mode is 3
3. The mode is 15
5. The mode is 8
6. a) oranges  
   b) Babayaro  
   c) pigs  
   d) December  
7. a) 56–60  
   b) 22

**Assessment**
Make sure that pupils understand how to draw up a table. Remind pupils to check their numbers before counting up tallies.

**Homework activity**
Worksheet 33 page 63 questions 1–3.

**Lesson 3**  
**Pupil’s Book page 206**

**Preparation**
You will need to have:
- Pupil’s Book
- Workbook.

**Starter activity**
Explain the concept of “average” to pupils. Tell them that in order to find an average, we add all the values in a data set and divide by the number of values that made up the data set. For example, to calculate the average mark pupils in the class scored on a test, all the pupils’ marks are added up and the total is divided by the number of pupils in the class.

**Lesson focus**
Ask the pupils to add together all the numbers in the list 1, 2, 1, 3, 2, 1, 3, 2, 2, 3 (20) and divide by the number of data items (10). Tell pupils this is the mean of the data. Make a frequency table with data and show to the pupils that the items that have the highest frequency is the mode. Demonstrate to the pupils how to find the mean using the tally table. Work through the example on page 206 of the PB and ask pupils to complete Exercise 3 of the PB.

**Answers**

**Exercise 3**
1. 5  
2. 5.5  
3. 12.375  
4. 3  
5. 5  
6. 5  
7. 5  
8. 4  
9. 15  
10. 10
Assessment
Pupils should be able to define and calculate the mean of a data set.

Extension activity
Ask pupils to do the Challenge activity on page 207 of the PB.

Lesson 4  Pupil’s Book page 206

Preparation
You will need to have:
• Pupil’s Book
• Workbook.

Starter activity
Revise the work from the previous lesson on mean.

Lesson focus
This lesson follows on from Lesson 2. Examine the example on page 207 with pupils. Make a frequency table with data and remind pupils that the items that have the highest frequency is the mode. Demonstrate to the pupils how to find the mean using the tally table. Ask pupils to complete Exercise 4 page 207 of the PB.

Answers

Exercise 4

1. 

<table>
<thead>
<tr>
<th>X</th>
<th>F</th>
<th>Fx</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
<td>36</td>
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<td>7</td>
<td>35</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>

\[ \Sigma f = 30 \quad \Sigma fx = 113 \]

Average = \[ \frac{113}{30} \] = 3.766

2. 

<table>
<thead>
<tr>
<th>X</th>
<th>F</th>
<th>Fx</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
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<td>7</td>
<td>10</td>
<td>70</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>72</td>
</tr>
<tr>
<td>9</td>
<td>7</td>
<td>63</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>50</td>
</tr>
</tbody>
</table>

\[ \Sigma f = 45 \quad \Sigma fx = 339 \]

Average = \[ \frac{339}{45} \] = 7.533

3. 

<table>
<thead>
<tr>
<th>X</th>
<th>F</th>
<th>Fx</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
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<tr>
<td>15</td>
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<td>105</td>
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\[ \Sigma f = 25 \quad \Sigma fx = 334 \]

Average = \[ \frac{334}{25} \] = 13.36

4. 

<table>
<thead>
<tr>
<th>X</th>
<th>F</th>
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<td>11</td>
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<td>84</td>
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<td>15</td>
<td>6</td>
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</table>

\[ \Sigma f = 50 \quad \Sigma fx = 641 \]

Average = \[ \frac{641}{50} \] = 12.82

5. 

<table>
<thead>
<tr>
<th>X</th>
<th>F</th>
<th>Fx</th>
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<tbody>
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<td>20</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>25</td>
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</tbody>
</table>

\[ \Sigma f = 30 \quad \Sigma fx = 90 \]

Average = \[ \frac{90}{30} \] = 3
6. 22.857  
7. 5.25  
8. a) 7  
   b) 3  
   c) 20  
   d) 3.05  
9. a) 3  
   b) 20  
   c) 14  
   d) 3  
   e) 3.05  
10. a) 1  
    b) 29  
    c) E  
    d) 4.833

**Assessment**

Pupils should understand the difference between mode and mean and draw a simple bar graph.

**Extension activity**

Also ask pupils to complete the Quantitative Reasoning on page 210 of the PB.

**Homework activity**

Worksheet 33 page 61 questions 4 and 5.

---

**Lesson 5  Pupil’s Book page 210**

**Preparation**

You will need to have:
* Pupil’s Book  
* Workbook.

**Starter activity**

Give pupils real life situations of examples of mean. For example bring in the rainfall and temperature tables for your area over 12 months and demonstrate to pupils why such tables are useful.

**Lesson focus**

Check the answers to the Quantitative Reasoning exercise then ask pupils to complete the Revision exercise. Take in their answers and mark them.

**Answers**

**Revision exercise**

1. a) The mean is the average  
   b) The mode is the most common number  
   c) The frequency is the number of times a number occurs  
   d) The distribution is the spread of the data  
2. The mode on a graph is the one with the highest bar  
3. 2

4. Average  
5. a) Mode is between 3 and 5 = 4; mean = 3.5  
   b) Mode = 7; mean = 5.6  
6. A frequency table has the number of times a number occurs  
7. Mode = 1  
   Mean = $\frac{153}{60} = 2.55$  
8. Mode = 12  
   Mean = $\frac{172}{15} = 11.466$

---

**Workbook answers Worksheet 33**

1. a) The mean is the most common number or object in a set of data.
2. The mode
3. a) 2  
   b) 3  
   c) 10  
   d) banana
4. 10 years old
5. a) Pinto  
   b) Jim  
   c) Pinto  
   d) Cantara
6. a) Mean = 3.8  
   b) Mean = 5.5  
   c) Mean = 4.7  
   d) Mean = 3.3
7. Mean = $\frac{345 + 756 + 200 - 570 + 800}{5} = 534.2$
8. Mean = $\frac{12 - 15 - 18 + 21 + 24}{5} = 18$
9. a) Tuesday  
   b) Mean = 6 cm
10. Mean weight = $\frac{1.5 + 2.3 + 2.1}{3} = 1.97$ kg
11. Mean = $\frac{56000 + 45000}{7} = \text{N}14428.57$

---

130 Unit 33: Measures of central tendency
### Objectives
By the end of this unit, pupils will be able to:
- Record data from experiments with coins and dice
- Identify various chance events in daily life activities.

### Suggested resources
Coins, die

### Key word definitions
- **experiment**: a procedure carried out to verify the validity of a hypothesis
- **chance**: a possibility of something happening

### Evaluation guide
Pupils to:
1. Perform experiments as directed by the teacher, and record the result by tallying.

### Lesson 1  Pupil’s Book page 203

#### Preparation
You will need to have:
- Pupil’s Book
- Coins, die

#### Starter activity
Pair up pupils in the class and give each pair a coin and a die. Ask them to flip the coin at least 20 times and each time record the outcome. Check with them which coin toss had the greatest number of occurrences and which number was rolled the most on the die.

#### Lesson focus
This lesson focuses on the concept of chance using the toss of a coin. Which has two possible outcomes viz. heads or tails. Explain to pupils that each of these outcomes have an equal chance of occurring. This is called a 50-50 chance. Work through the example on page 211 of the PB. Ask pupils to complete Exercise 1 on page 211 of the PB.

### Answers
Pupils to record their own answers.

#### Extension activity
Ask pupils to attempt the Challenge activity on page 212 of the PB.

#### Homework activity
Complete the following exercise.
1. A fair die is rolled.
   a) Find the probability of showing factors of 6.
   b) Find the probability of showing factors of 4.
   c) Find the probability of showing factors of 3.
2. Two fair coins are simultaneously tossed.
   a) Find all possible outcomes.
   b) Find the probability of showing head on the first coin
   c) Find the probability of showing tail on the second coin.
   d) Find the probability of showing at least one head.

### Lesson 2  Workbook page 63

#### Preparation
You will need to have:
- Pupil’s Book
- Coins, die

#### Starter activity
Check the answers to Exercise 1 before commencing the assessment task.
Lesson focus

Pupils can complete Worksheet 34 in the WB.

Answers

Workbook answers Worksheet 34.
1. Heads and tails  
2. 1, 2 3, 4, 5, 6  
3. Dice  
4. Pupils to complete the chart with their results  
5. Pupils to draw the net.

Workbook answers Worksheet 34
1. Heads and tails  
2. 1, 2, 3, 4, 5 and 6  
3. Dice  
4. Teacher to check tally tables.  
5. Check pupil’s answers.  
6. Teacher to check tally tables.  
7. Possible outcomes = \{HH, TT, TH, HT\}  
8. Teacher to check sketch.  
9. Teacher to check sketch. 
10. Possible outcomes = \{HHH, HHT, HTH, HTT, TTT, TTH, THT, THH\}  
11. 8 possible outcomes.  
12. The weather forecast, lottery draws, card games etc.  
13. Many possible answers, teacher to check.
Design and make a Ludo game screen

This project allows pupils to combine their knowledge of a number of different topics, for example measurement and shape and space. It is also a way of engaging pupils to make a Ludo game to play with, especially in homes where toys and games may not be plentiful. Encourage pupils to engage with this project and they can practice measuring techniques while having a lot of fun! It is important that pupils are given sufficient materials to make the screen so that it can be played with. Also, once they have constructed their screen they will have a good understanding of the quadrilateral which will reinforce the work covered in 2-D shapes.

Suggested resources

Cardboard; Colour crayons; A ruler; A pencil; Eraser; 16 plastic discs (4 red, 4 blue, 4 green and 4 yellow); A sheet of hard paper or card

Guidelines

It will help if you allow pupils to work together. They can share materials and also help each other with the construction. It may be useful to have pupils help each other so that the task will be quicker to complete. For instance, while one or two pupils draw the squares another pupil could complete the construction of the die.

They should then be encouraged to suggest improvements to their construction. It is also important that pupils are given an opportunity to play the game when their game screens are done. An extension idea might include the construction of other game screens like snakes and ladders or draughts. If enough of these types of boards have been constructed and a sufficient variety has been made, these games could be donated to children’s hospitals or orphanages. In this way you could raise your pupils’ civic consciousness and develop in them a sense of sharing.
Objectives
The questions in this test cover Units 23–34, and so include questions on an array of topics covered in the units of this book. The questions follow the same order as the units, and so are not graded for difficulty, although in multi-part questions the easier questions are the first two. You may want to limit the questions for less able pupils, but ensure that they cover all the concepts in these units.

Lesson 1
Pupils should work through the questions on their own, taking the time they need. Encourage pupils not to spend too much time on a question if they get stuck. Instead, they should go on to the next question, and come back to the question they were struggling with if they have time at the end of the test. Encourage all pupils who have completed the test to spend at least five minutes checking their work. They should then have a quiet task to complete at their desks, so they do not disturb those who are still working.

Lesson 2
Hand back answer sheets to pupils. Go through the assessment with pupils and allow them to make corrections.

Answers to assessment 3
1. a) Two hundred and forty-three thousand five-hundred and seventy-six
   b) One million two thousand and ninety-one
   c) Three million one hundred and ninety thousand and two
2. a) 40 003  b) 9 569 500
3. a) 34 612 < 63 413  b) 607 987 > 67 087
   c) 1 260 211 < 2 167 002
   d) 90 000 005 > 9 009 009
4. 31; 33; 37; 41; 43; 47
5. a) 56 009  b) 8 984 621
6. |   | Ten Mill | Mill | Hundred Thousand | Ten Thousand | Thousand | Hundred | Tens | Units |
   |---|--------|-----|------------------|-------------|----------|--------|------|------|
   a) |        | 1     | 1   | 2                | 6           | 5        | 3      |
   b) |        | 9     | 0   | 4                | 6           | 7        | 2      |
   c) |        | 1     | 4   | 9                | 9           | 8        | 7      | 4    |
7. a) 36  b) 770  c) 315
8. a) 4:7  b) 34:85  c) 4:6:9
   d) 1:3
9. ₦30 000 was Bimbo’s share
10. a) ₦40  b) 100 kg  c) $60
11. 16%
12. | Fraction | Decimal number | Percentages |
    |----------|----------------|-------------|
    A  | 1/2      | 0.1            | 333/3%      |
    B  | 2/6      | 0.15           | 46%         |
    C  | 1/4      | 0.25           | 50%         |
    D  | 5/2      | 0.25           | 25%         |
    E  | 1/3      | 0.33           | 33%         |
    F  | 1/10     | 0.1            | 10%         |
    G  | 1/20     | 0.05           | 5%          |
    H  | 3/100    | 0.03           | 3%          |
    I  | 18/25    | 0.72           | 28%         |
    J  | 7/35     | 0.2            | 20%         |
13. 122 763
14. 75
15. ₦2 132.879
16. 50.706
17. 0
18. 23
19. $= 3136$
20. $= 37.96$
21. $= 45$
22. $= 23.5$
23. $= 320$ for Bode, $= 380$ for Jossy
24. a) $8310$ b) $11391$
25. a) $4547$ b) $4255$
26. $= \frac{143}{12}$
27. $= \frac{299}{63} \times \frac{3}{1}$
28. $= 8.214$
29. $= 1.654$
30. a) $60.03$ b) $6.003$
31. Move five spaces to the right $= -3$
32. $y$
33. $= 3116$
34. $= 2801.120$ Cedis
35. $= 26.64\%$
36. there was a $57.5$ discount
37. $= 19.9$ cm
38. $= 17.59$ cm
39. The diameter is 2 times the radius
40. a) Check pupil’s answers b) Check pupil’s answers
41. $137 - 79 = 58$ kg more than Bassey
42. $23$ kg and $300$ g all together
43. a) $= 40$ sets of $25$ g in $1$ kg b) $= 100$ sets of $25$ g in $2.5$ kg
44. $1$ packet $= 80$ g, $2$ packets $= 160$ g
45. $= 15$ kg of beans costs $= 2400$
46. $= 18.46$ km/h
47. $= 360$ km
48. $= 2.5$ hours
49. Bodija
50. To predict weather; to predict humidity
51. Equilateral, Isosceles, Right-angled, Scalene, Acute-angled, Obtuse-angled
52. Area of triangle $= \frac{1}{2}$ base $\times$ height $= \frac{1}{2} \times 6 \times 8$
53. If $1$ kl $= 1000$ℓ.
   $\therefore 1000 \times 4 = 4000$ ℓ in $4$ kilolitres
54. If he uses $45$ litres for $102$ km
   $\therefore 1$ km $= (102 \div 45 = 2.2666\ldots)$$\therefore 462 = 462 \times 2.2666\ldots$
55. Oval, Spheroid, Circle
56. $= 179.59$ cm$^3$
57. Parallel lines are equidistant, point in the same direction and will never meet. Perpendicular lines meet at $90$ degrees.
58. – Base angles are congruent – The angles opposite the equal sides are equal – There is one pair of equal sides
59. (from left to right)
   Cube, Rectangular cuboid, cube, rectangular cuboid, triangle – not $3D$
60. a) $6$ b) $6$
61. a) $6$ b) $5$
62. a) \[
\begin{array}{c}
\text{radius} \\
\text{diameter} \\
\text{circumference}
\end{array}
\]
63. $7.00 = r$
64. i) Check pupil’s tallies $1 = 4; 2 = 8; 3 = 17; 4 = 7; 5 = 6$.
   ii) Bar chart for class marks
   iii) Mode $= 3$
   iv) Median $= 3$
65. This question will be different for each student
Objectives
This practice examination is a summative assessment of work covered throughout the year.
It is important that it is completed by individuals and not with the support of other pupils as this
would not uncover any difficulties a learner may be having with particular concepts.
Encourage pupils to not spend too much time on one problem. They should rather move onto the
next problem and return to the difficult ones if they have time at the end of the examination.

Guidelines
Simulate examination conditions: tell the pupils that they have to work on their own and may not
discuss questions or answers with other pupils; ensure quiet in the classroom while pupils work;
write the start and end time of the examination on the board, with 10 minute intervals – cross out the
time interval as the session progresses to help pupils keep track on time.

Complete the practice examination over two class sessions. Complete questions 1–10 in Session 1 and
then questions 11–20 in Session 2.

Have pupils write their answers and workings out on loose sheets of paper so that you can take them in
for marking.

Answers
1. a) 7 712 b) 5 885 c) 8 060
d) 15 089 e) 257.43 f) 251.01
 g) 0.458 h) 22.83 i) \( \frac{287}{90} \)
j) \( \frac{473}{120} \) k) 25 7935 l) 11 0308
m) 10 735.2 n) 27.2 o) 18
p) 374 q) 13 r) 40.24
s) 17 t) 2.49

2. a) 4 624 b) 15 625 c) 62 500
d) \( 5\sqrt{65} \) e) \( 2\sqrt{634} \) f) \( 10\sqrt{94} \)

3. 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79

4. a) 0.4; 40% b) 0.96; 96% c) 0.48; 48%

5. a) \( \frac{8}{10} \) b) \( \frac{13}{20} \) c) \( \frac{21}{8} \)

6. a) 12 b) 30 c) \( \frac{16}{5} \)
d) 6.5 e) 8 f) \( \frac{1}{3} \)

7. 8. a) N 8 640 b) €21.94 c) $236.25
9. a) N 4 500 Profit in total b) 72% profit
10. a) N 4 885 b) 7.13% loss
14. 100.3 kg 15. 15.08 m
16. 15 kg and 950 grams 17. 14.89 hours
18. 30 cm²
19. a) 10.15 m² b) 22.33 m³
20. \( 3\ell = 3\ 000 \text{ cm}^3 \)

21. a) All sides equal; All angles equal b) Two equal sides; Two equal angles
c) One right angle; no sides equal

22. a) no values given b) no values given

23. a) Range Frequency

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<tr>
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<tr>
<td>4–9</td>
<td>3</td>
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<td>10–14</td>
<td>5</td>
</tr>
<tr>
<td>15–20</td>
<td>8</td>
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Pupils can make a frequency chart with each value but we decided to group them – if so then their bar chart will also look different. Both are correct.

b) check pupil’s bar graphs
c) \( \frac{19}{20} \) d) 14.5 e) 14

Assessment
On completion of the practice exam, look for correct answers and mistakes made by individuals.
You should also be checking to see if there is a pattern in terms of any particular question causing
a significant number of pupils’ difficulties.
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