Unit 1
Meaningful counting in thousands and millions

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. 

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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

**Answers**

**Exercise 4**

1. 

\[
\begin{align*}
1014897 \\
14897 & \quad 2014897 \\
2007354 & \quad 7354 \\
354678 & \quad 2354678 \\
413429 & \quad 3134209 \\
5134209 & \quad 5134209
\end{align*}
\]

**Lesson 4**

**Preparation**

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

**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. 

\[
\begin{align*}
1014897 \\
14897 & \quad 2014897 \\
2007354 & \quad 7354 \\
354678 & \quad 2354678 \\
413429 & \quad 3134209 \\
5134209 & \quad 5134209
\end{align*}
\]
Revision exercise

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

2.

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

4.

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

Extension activity
Challenge page 14.

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.
Unit 2: Writing and ordering large numbers

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

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 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

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

<table>
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<th>ANNUAL SALARY</th>
</tr>
</thead>
<tbody>
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<td>Tennis</td>
<td>Two million four hundred and eighty thousand</td>
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<td>Rugby</td>
<td>1 225 500</td>
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<td>Gold</td>
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<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
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

1. a) Two million forty eight thousand one hundred and twelve
b) Four million one hundred and ten thousand nine hundred and fifty
   c) Nine hundred and sixty thousand four hundred and seven

2. a) 152 918  
    b) 4 061 048
3. a) 643; 43 476; 45 296; 334 312; 432 321
    b) 6 500; 23 980; 24 000; 5 499 999
    c) 171 199; 171 296; 171 347; 171 692; 171 926
    d) 6 997 786; 7 433 742; 7 435 981; 7 535 001; 8 436 999
    e) 111 999; 999 567; 999 742; 11 401 359; 12 903 452

4. a) 1 430 298; 1 607 270; 1 983 202; 4 719 125; 4 947 952
    b) 4 453 336; 4 394 480; 2 059 844; 1 571 680; 1 451 082

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.

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.
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 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: $2 \times 5 = 10$, 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; 3; 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 × 2 × 3
   c) 48 prime factors are 2; 3 or 48 = 2 × 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.

1. 18  2. 55  3. 53  4. 41
5. 39  6. 69  7. 61  8. 4
9. 89  10. 75  11. 16  12. 96
13. 55  14. 100  15. 88  16. 36
17. 80  18. 65  19. 12  20. 66

**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 × 2 × 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.
Answers

Exercise 4
1. 5 35 70 14 2
2. 99 11 9
3. 96 24 4 8 96
4. 72 8 9
5. 84 42 21 21 4

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

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 1 155 3 385 5 231 7 165 11 105 15 77

1. a) ✓ tick
   b) ✓ tick
   c) ✗ cross
   d) ✓ tick
   e) ✓ tick
2. b) 24 = 2,2,2,3
   c) 30 = 2,3,5
   d) 45 = 3,3,5
   e) 84 = 7,3,2,2
   f) 450 = 3,3,5,5,2
   g) 2025 = 3,3,3,3,5,5
4. 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.
5. a) 15  b) 7  c) 15
d) 6  e) 24(12 × 2)  f) 6

Homework activity
Worksheet 3 page 10 Question 4.
Worksheet 3 page 10 Question 5.
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 (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.

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{9}{10})</td>
<td>0.9</td>
<td>90</td>
</tr>
<tr>
<td>(\frac{3}{4})</td>
<td>0.75</td>
<td>75</td>
</tr>
<tr>
<td>(\frac{17}{100})</td>
<td>0.17</td>
<td>17</td>
</tr>
<tr>
<td>(\frac{1}{5})</td>
<td>0.2</td>
<td>20</td>
</tr>
<tr>
<td>(\frac{38}{100})</td>
<td>0.38</td>
<td>38</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}) = (\frac{3}{5})</td>
<td>60</td>
<td>300</td>
</tr>
<tr>
<td>English</td>
<td>(\frac{3}{10})</td>
<td>30</td>
<td>150</td>
</tr>
<tr>
<td>Kikuyu</td>
<td>(\frac{1}{10})</td>
<td>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
1. a) 0.612  b) 0.205
2. a) \( \frac{381}{1000} = 0.381 \)  b) \( \frac{637}{1000} = 0.637 \)
3. a) \( \frac{4}{25} = 0.16 = 16\% \)  b) \( \frac{25}{25} = 1 = 100\% \)
   c) \( \frac{35}{100} = 0.35 = 35\% \)
   d) \( \frac{11}{20} = 0.55 = 55\% \)

4. a) \[ \begin{array}{|c|c|c|} 
\hline
\text{Sport} & \text{Fraction} & \text{Decimal fraction} \\
\hline
\text{Football} & \frac{45}{100} = \frac{9}{20} & 0.45 \\
\text{Netball} & \frac{35}{100} = \frac{7}{20} & 0.35 \\
\text{Cricket} & \frac{20}{100} = \frac{1}{5} & 0.20 \\
\hline
\end{array} \]

b)–d) Language spoken

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. a) 0.75  b) 0.76  c) 0.78  d) 0.79
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 \( \frac{2}{9} \% \)  b) 12
5. a) 100 mm  b) 25\%  c) No 30\% fell  d) Thursday and Sunday
Unit 5  Ratio

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 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.

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. ⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠⬠biased

Homework activity
Worksheet 5 page 14 questions 1 & 2.

Lesson 2  Pupil’s Book page 31

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. \(x:4 = 10:20\) \(
\frac{x}{4} = \frac{10}{20} = \frac{1}{2}; x = \frac{4}{2} = 2; x = 2
\)
2. \(6:7 = 24:m\) \(
\frac{6}{7} = \frac{24}{m}; m = \frac{24}{6} = \frac{4}{1}; m = 4 \times 7 = 28; m = 28
\)
3. \(16:5 = y:10\) \(
\frac{16}{5} = \frac{7}{10}; y = \frac{160}{5} = 32; y = 32
\)
4. \(r:2 = 36:72\) \(
\frac{r}{2} = \frac{36}{72}; r = \frac{36 \times 2}{72} = \frac{72}{72} = 1; r = 1
\)
5. \(2:3 = 24:k\) \(
\frac{2}{3} = \frac{24}{k}; k = \frac{24 \times 3}{2} = 36; k = 36
\)
6. \(p:5 = 14:35\) \(
\frac{p}{5} = \frac{14}{35}; p = \frac{2 \times 5}{5} = \frac{10}{5} = 2; p = 2
\)
7. \(18:x = 24:64\) \(
\frac{18}{x} = \frac{24}{64} = \frac{3}{8}; x = \frac{18 \times 8}{3} = 6 \times 8 = 48; x = 48
\)
8. \(3:10 = 24:n\) \(
\frac{3}{10} = \frac{24}{n}; n = \frac{24 \times 10}{3} = 8 \times 10 = 80; n = 80
\)
9. \(w:8 = 24:64\) \(
\frac{w}{8} = \frac{24}{64} = \frac{3}{8}; w = \frac{3 \times 8}{8} = 3; w = 3
\)
10. \(8:9 = h:45\) \(
\frac{8}{9} = \frac{h}{45}; h = \frac{8 \times 45}{9} = 8 \times 5 = 40; h = 40
\)
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 6:2400000 = 1:400000
4. Ratio 1:4 of 1500 is $\frac{2}{4} \times 1500 = 375$ and $\frac{3}{4} \times 1500 = 1125$
   therefore ratio of pearls is 375:1125
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 $4 \times 12 = 48$ and $11 \times 12 = 142$ angles are 48° and 142°
7. Ratio 2:5. Calculate 1:2.5 if 1 = 1400, 2.5 = 3500, Sheriff's share is 3500
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 $\frac{2}{3}, \frac{3}{5}$ N180 000 or $\frac{1}{5}$ N60 000, therefore if the first son collects $\frac{1}{5}$ it is $2 \times N60 000 = N120 000$.
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
Peter, the pumpkin eater, wanted to make two pies for a party. His mother, a professional pie maker, had a recipe for him to use. However, she always made 80 pies at a time. She used:
- 10 dozen eggs
- 27 litres of condensed milk
- 480 tablespoons of sugar
- 100 teaspoons of cinnamon
- 140 cups of pumpkin
Peter looked in the cupboard and found:
- 4 cups of pumpkin
- 2 eggs
- 112 teaspoons of cinnamon
- $\frac{23}{10}$ of a litre of condensed milk
- 15 tablespoons of sugar
Did Peter have enough ingredients to make two pumpkin pies for the party or did he need to buy more?

Homework activity
Worksheet page 14 questions 3 & 4.

Lesson 3 Pupil’s Book page 32

Preparation
You will need to have:
- Pupil’s Book and Worksheet
- Maps for scaling down
- House plan for scaling down.

Starter activity
Give pupils a few ratios that are expressed in everyday language and ask the pupils to write them in ratio form using numbers. For example, there is one white tile for every three black tiles.
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.

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. 2 1 2. 3 8 3. 2 3

2 32 16 24 64 40 60

4. 6 11 5. 5 7

18 33 80 112

Revision exercise

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

d) 9:56 e) 6:21

2. a) 6 2 9 3 b) 33 1 37 3 36 4
d) 2 3 4 4 e) 3 5 7 5 10

3. Square 14 cm. Ratio of length to breadth is 1:1. Rectangle 16 cm by 21 cm. Ratio 16:21

4. Ratio success to fail is 3:9. Therefore if 108 pupils $\frac{9}{12} \times 108 = 81$ failed

5. 2:11

6. 300 m:3 km = 300:3 000 = 1:10

7. Bus:cars = 21:9. If 450 people then $\frac{25}{30} = 0.7 \times 450 = 315$ people use buses

8. a) 2:6 = 1:3 b) 5:8 c) 4:10 = 2:5

Assessment
This revision exercise 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.

Extension activity
Ask pupils to make a scaled drawing of an object e.g. a cup, a block, a pen, etc. Ask them to measure the dimensions of the object and to reduce these measurements by a given ratio (which you determine). They should then use their scaled measurements to make their drawings.

Homework activity
Worksheet 5 page 14 questions 7, 8 & 9.

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
c) 1:6 d) 1:7

4. a) 1:100 b) 20:100 = 1:5
c) 4:10 d) 1:1 e) 1:400

5. x = 35

6. a) false b) true c) false d) true e) false

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

8. 225:100 = 45:20 = 9:4

9. 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.

Extension activity
Challenge: page 36 of the PB. This challenge can be assigned if there is time to spare in the lesson. Alternatively it can be set as a homework activity which can be checked the next day. The emphasis should not be whether answers are correct or not, but rather on how pupils went about finding solutions i.e. the methods they used.

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. ₤8567
10. ₤2443

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.

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**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

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) ₦17 011  
   b) ₦4 458  
   c) ₦9 332

**Extension activity**

1. Mrs. Hadi had ₦4,000 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 ₦4.25 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 ₦12 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 ₦1.50 each and a jar of peanut butter that costs ₦4. A jar of jam is ₦2.75, but you don’t need any jam. You have ₦10. How much money will you have left over?

**Homework activity**
Pupils to correct the revision test.

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**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>
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<tr>
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<tr>
<td>849</td>
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</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>
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<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>
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<tr>
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<td>771</td>
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<tr>
<td>849</td>
<td>64</td>
</tr>
<tr>
<td>188</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>
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<tr>
<td>635</td>
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</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. Adeyu earns ₦106,859 per year. Mrs. Dadu earns ₦317,929 per year. How much less money does Mrs. Adeyu 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 re state 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) $3 \frac{1}{3}$  b) $2 \frac{1}{3}$  c) $3 \frac{1}{2}$
   d) $1 \frac{1}{7}$  e) $1 \frac{1}{2}$  f) $1 \frac{1}{4}$
   g) $7 \frac{1}{2}$  h) $6 \frac{2}{9}$  i) $41 \frac{2}{9}$
   j) $30 \frac{5}{9}$
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 tractions 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.
15. \( \frac{1}{9} + \frac{5}{12} = \frac{16}{36} + \frac{15}{36} = \frac{21}{36} \)
16. \( \frac{1}{2} + 3 \frac{1}{3} = \frac{5}{6} + 3 \frac{10}{6} = \frac{20}{6} + \frac{35}{6} = \frac{5}{6} \)
17. \( \frac{2}{5} + 3 \frac{3}{7} = \frac{22}{35} + 3 \frac{22}{35} = \frac{154}{35} + \frac{110}{35} = \frac{264}{35} = \frac{79}{35} \)
18. \( \frac{1}{2} + 7 \frac{1}{5} = \frac{9}{10} + 3 \frac{6}{10} = \frac{45}{10} + \frac{72}{10} = \frac{117}{10} = 11 \frac{7}{10} \) or
   \( 4 + 7 \) and \( \frac{1}{2} + \frac{1}{3} = 11 \) and \( \frac{5}{10} + \frac{2}{10} = \frac{7}{10} \) so \( 11 \frac{7}{10} \)

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Exercise 3
1. \( \frac{2}{3} - \frac{1}{2} = \frac{4}{6} - \frac{3}{6} = \frac{1}{6} \)
2. \( \frac{5}{8} - \frac{1}{8} = \frac{5}{8} - \frac{1}{8} = \frac{3}{8} \)
3. \( \frac{5}{6} - \frac{5}{8} = \frac{40}{48} - \frac{30}{48} = \frac{10}{24} \)
4. \( \frac{9}{12} - \frac{1}{2} = \frac{16}{24} - \frac{12}{24} = \frac{4}{24} \)
5. \( \frac{2}{3} - \frac{1}{2} = \frac{1}{3} \)
6. \( \frac{3}{5} - \frac{3}{8} = \frac{12}{40} - \frac{15}{40} = \frac{3}{40} \)
7. \( \frac{11}{12} - \frac{3}{8} = \frac{44}{48} - \frac{18}{48} = \frac{13}{24} \)
8. \( \frac{7}{9} - \frac{1}{6} = \frac{14}{36} - \frac{6}{36} = \frac{8}{36} \)
9. \( \frac{5}{12} - \frac{1}{5} = \frac{30}{60} - \frac{12}{60} = \frac{18}{60} = \frac{3}{10} \)
10. \( \frac{7}{8} - \frac{1}{2} = \frac{7}{8} - \frac{4}{8} = \frac{3}{8} \)
11. \( 3 \frac{1}{2} - 2 \frac{1}{4} = \frac{7}{2} - \frac{9}{8} = \frac{14}{8} - \frac{9}{8} = \frac{5}{4} = \frac{10}{4} \) or
    \( 3 \frac{1}{2} - 2 \frac{1}{4} = \frac{7}{4} - \frac{3}{4} = \frac{4}{4} = \frac{1}{4} \)
12. \( 7 \frac{1}{5} - 2 \frac{3}{8} = \frac{36}{5} - \frac{19}{8} = \frac{299}{40} - \frac{95}{40} = \frac{193}{40} = \frac{433}{40} \)
13. \( 5 \frac{2}{3} - 3 \frac{1}{2} = \frac{24}{6} - \frac{3}{2} = \frac{21}{6} \)
14. \( 6 \frac{2}{3} - 4 \frac{1}{2} = \frac{20}{6} - \frac{5}{2} = \frac{21}{6} \)
15. \( 5 \frac{1}{6} - 3 \frac{5}{6} = \frac{31}{12} - \frac{46}{12} = \frac{17}{12} = \frac{15}{12} \)
16. \( 4 \frac{7}{13} - 1 \frac{3}{12} = \frac{3 \frac{21}{30}}{30} - \frac{10}{30} = \frac{3}{10} \)
17. \( 8 \frac{1}{8} - 3 \frac{1}{5} = \frac{65}{8} - \frac{24}{40} = \frac{325}{40} - \frac{152}{40} = \frac{173}{40} = \frac{413}{40} \)
18. \( 6 - \frac{2}{3} = 6 - \frac{2}{3} = \frac{18}{6} - \frac{4}{6} = \frac{14}{6} \)
19. \( 3 \frac{2}{3} - 1 \frac{5}{14} = \frac{23}{7} - \frac{19}{14} = \frac{16}{14} - \frac{19}{14} = \frac{27}{14} = \frac{13}{14} \)
20. \( 3 \frac{1}{5} - 1 \frac{3}{4} = \frac{16}{5} - \frac{3}{4} = \frac{25}{20} - \frac{15}{20} = \frac{43}{20} = \frac{29}{20} \)

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Homework activity
Worksheet 7 page 17 Question 3.

Lesson 3 Pupil’s Book page 45

Prepare
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.

**Worksheet 7 page 17 questions 4 & 5.**

**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**
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: \( \frac{1}{3} \) + \( \frac{1}{6} \) = \( \frac{2}{6} \) + \( \frac{1}{2} \) = \( \frac{3}{6} \) = \( \frac{1}{2} \). 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. \( \frac{5}{2} + \frac{3}{4} = \frac{5}{2} + \frac{1}{4} = \frac{5}{2} \)
2. \( \frac{5}{4} - \frac{1}{2} = \frac{5}{8} - \frac{1}{8} = \frac{5}{8} \)
3. \( \frac{3}{6} + \frac{7}{8} = \frac{10}{8} + \frac{7}{8} = \frac{10}{8} \)
4. \( \frac{6}{2} - \frac{4}{2} = \frac{2}{4} = \frac{2}{4} = \frac{2}{2} \)
5. \( \frac{2}{8} + \frac{1}{4} = \frac{3}{8} + \frac{6}{8} = \frac{3}{8} = \frac{4}{8} \)
6. \( \frac{8}{6} - \frac{4}{3} = \frac{4}{6} - \frac{2}{6} = \frac{4}{6} = \frac{2}{3} \)
7. \( \frac{1}{2} - \frac{1}{8} = \frac{1}{2} - \frac{1}{8} = \frac{5}{24} \)
8. \( \frac{3}{7} - \frac{1}{8} = \frac{25}{35} - \frac{9}{35} = \frac{16}{35} = \frac{16}{35} \)
9. \( \frac{1}{2} + \frac{3}{6} = \frac{2}{3} = \frac{1}{3} + \frac{2}{3} = \frac{3}{8} \)
10. \( \frac{4}{3} + \frac{3}{4} = \frac{4}{3} + \frac{3}{4} = \frac{8}{8} = \frac{1}{2} \)

**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 use the correct steps for each question.
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. \[\frac{32}{5} - 7 \frac{7}{10} = \frac{17}{10} - \frac{17}{10} = \frac{34}{10} - \frac{17}{10} = \frac{17}{10} = 1 \frac{7}{10}\]
2. \[\frac{41}{4} - 2 \frac{3}{4} = \frac{17}{4} - \frac{11}{4} = \frac{6}{4} = \frac{2}{4} = \frac{1}{2}\]
3. \[5.123 - 1.239 = 3.884\]
4. \[3 \frac{1}{4} - 1 \frac{5}{6} = \frac{13}{4} - \frac{31}{12} = \frac{39}{12} - \frac{162}{12} = \frac{103}{12} = -8 \frac{7}{12}\]
5. \[7 \frac{1}{2} - 21 \frac{1}{8} = \frac{15}{2} - \frac{169}{8} = \frac{60}{8} - \frac{169}{8} = \frac{109}{8} = -13 \frac{5}{8}\]
6. \[14.32 - 7.123 = 7.2\]

Revision exercise
1. a) \[\frac{3}{8} + \frac{1}{2} = \frac{43}{8} + \frac{4}{8} = \frac{47}{8}\]
   b) \[15 \frac{1}{2} + 16 \frac{3}{4} = 31 \frac{2}{4} + \frac{3}{4} = 32 \frac{1}{4}\]
   c) \[\frac{42}{7} + \frac{23}{6} = \frac{6}{28} + \frac{33}{28} = \frac{69}{28} = 2 \frac{11}{28}\]
2. a) \[\frac{5}{3} + \frac{2}{3} = \frac{7}{3} + \frac{4}{9} = \frac{7}{9}\]
   b) \[10 - 2 \frac{4}{25} = 9 \frac{25}{25} - \frac{4}{25} = 5 \frac{21}{25}\]
   c) \[\frac{1}{3} + \frac{1}{4} = \frac{2}{12} + \frac{3}{12} = 1 \frac{11}{12}\]
3. a) \[\frac{3}{7} - \frac{4}{5} = \frac{13}{35} - \frac{28}{35} = \frac{9}{35} = \frac{3}{15}\]
   b) \[\frac{8}{7} - 2 \frac{3}{14} + \frac{1}{5} = \frac{56}{28} - \frac{60}{28} = \frac{31}{28} = \frac{14}{15}\]
4. a) 7.546, b) 4.343
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) \[\frac{524}{30} + \frac{5}{30} = \frac{529}{30}\]
   d) \[\frac{51}{9} + \frac{1}{7} = \frac{5}{63} + \frac{9}{63} = \frac{516}{63}\]
   e) \[11 \frac{7}{8} + \frac{1}{4} = 11 \frac{2}{8} + \frac{2}{8} = 12 \frac{1}{8}\]
2. a) \[\frac{75}{12} - \frac{44}{12} = 3 \frac{1}{12}\]
   b) \[\frac{141}{15} - \frac{32}{15} = 9 \frac{1}{15}\]
   c) \[\frac{19}{8} - \frac{10}{8} = \frac{9}{8} = 1 \frac{1}{8}\]
   d) \[\frac{68}{9} - \frac{11}{9} = \frac{272}{36} - \frac{99}{36} = 173 \frac{17}{36} = 4 \frac{29}{36}\]
   e) \[\frac{51}{5} - \frac{19}{2} = 10 \frac{2}{10} - \frac{95}{10} = 7 \frac{7}{10}\]
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{₦}9405.48
   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
   d) 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.

Start 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 2000 × 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?’ and ‘If I multiply my number by 7, the answer is 35; what is my number?’ 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) \( \frac{22}{4} = 22 \frac{1}{2} \)  
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. \( \frac{2}{5} \)

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.

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. N90
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 N 795. 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 N 0.75, how much money would Mrs. Hara earn?
7. Mr. Yakini learned that N 1,348 worth of tickets were sold at the carnival. If tickets cost 4 for N 1, how many tickets were sold?
8. Mrs. Hara sold 120 pencils for N 0.35 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  
   f) 194 103
3. a) 44600  
   b) 116 200  
   c) 77244  
   d) 144 555  
   e) 461 216
4. | 3 460 | 4 570 | 6 230 |
   | 6 920 | 91 400 | 124 600 |
   | 103 800 | 137 100 | 186 900 |
   | 138 400 | 182 800 | 249 200 |
   | 173 000 | 228 500 | 311 500 |
5. 259 361
6. 20 000
7. a) 30  
   b) 60  
   c) 140  
   d) N 400  
   e) 40

Unit 8: Multiplying 3-digit numbers 35
Unit 9
Multiplying by zero and 1

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 × 11 = 0    b) 4 × 0 = 0    c) 5 × 0 = 0
d) 59 × 0 = 0    e) 110 × 0 = 0    f) 0 × 99 = 0
2. Any number multiplied by 0 equals 0.
3. a) 1 × 98 = 98    b) 194 × 1 = 194
c) 40 × 1 = 40    d) 53 × 1 = 53
e) 1 432 × 1 = 1 432
4. Any number multiplied by 1 equals the same number.
5. a) 0 × 5 = 5 groups of 0 = 0    b) 0 × 6 = 6 groups of 0 = 0
c) 9 × 0 = 9 groups of 0 = 0    d) 3 × 1 = 3 groups of 1 = 3
e) 1 × 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.
Homework activity
Worksheet 9 page 19 Question 6.

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) ? ? ? ?  b) 19.49
   + 61.02  + ? ? ? ?
   162.48  28.25
   c) ? ? ?  d) 37.663
   + 12.5  + ? ? ? ?
   60.3  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 $2 \frac{3}{4}$ litre of orange juice. After you pour $\frac{5}{8}$ of a litre into a glass, how much is left in the jug?
2. Jackie has $\frac{1}{3}$ of a chocolate bar. Steven has $\frac{4}{12}$ 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
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 $10 \times 10$.

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 $34 \times 10$; $45 \times 10$; $560 \div 10$ and $2300 \div 10$. 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 $56 \div 10$ (the tens become units, the units become tenths and so on, and so $56 \div 10 = 5.6$). Give the pupils a few of these to work out, for example $26 \div 10$; $456 \div 10$; $28 \div 10$ and $289 \div 10$. 

Unit 10: Multiplying decimals and fractions 39
**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 1000. 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, 1000, etc. Complete Exercise 1 page 59 and Exercise 2 page 60 PB.

**Answers**

**Exercise 1**

1. 4.56 × 10 = 45.6
2. 1.234 × 1 000 = 1 234
3. 5.238 × 100 = 523.8
4. 4.825 × 10 = 48.25
5. 1.08 × 100 = 108
6. 7.567 × 100 = 756.7
7. 38.76 × 1 000 = 38 760
8. 456.1 × 100 = 45 610
9. 18.54 × 100 = 1 854
10. 4.468 × 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 = 4 002 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 1000. 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 × 50 becomes 2,956 × 10 × 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. \(54.65 \times 400 = 21,860\)
6. \(6.48 \times 200 = 1,296\)
7. \(8.6591 \times 5,000 = 43,295.5\)
8. \(91.685 \times 2,000 = 183,370\)
9. \(100.456 \times 800 = 80,364.8\)
10. \(56.7 \times 300 = 17,010\)
11. \(6.7 \times 7,000 = 46,900\)
12. \(2.46 \times 8,000 = 19,680\)
13. \(8.289 \times 400 = 3,315.6\)
14. \(9.245 \times 3,000 = 27,735\)
15. \(6.835 \times 4,000 = 27,340\)
16. \(5.148 \times 500 = 2,574\)
17. \(58.49 \times 40 = 2,339.6\)
18. \(38.56 \times 50 = 1,928\)
19. \(45.67 \times 600 = 27,402\)
20. \(165.781 \times 900 = 149,202.9\)

**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 ₦0.75 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 ₦200 be worth now.
4. Kwame and Ndu have a lawn mowing service. Kwame charges ₦8.25 per hour and Ndu charges ₦5.85 per hour.
   a) How many hours did Kwame work if he earned ₦20?
   b) How many hours did Ndu work if he earned ₦20?
   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 × 2.4; 4 × 5.6; 5 × 12.2; 3.2 ÷ 4 and 12.4 ÷ 5. Also practise multiplying and dividing decimals that are less than 1, for example 0.5 × 6 and 2.4 ÷ 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 × 32 = 155.52
2. 51.65 × 28 = 1446.2
3. 0.89 × 46 = 40.94
4. 1.587 × 19 = 30.153
5. 23.7 × 24 = 568.8
6. 5.13 × 67 = 343.71
7. 6.42 × 53 = 340.26
8. 2.876 × 71 = 204.196
9. 2.945 × 95 = 279.775
10. 67.923 × 42 = 2852.766
11. 23.94 × 87 = 2082.78
12. 123.41 × 56 = 6910.296
13. 3.215 × 35 = 112.525
14. 78.64 × 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.

<table>
<thead>
<tr>
<th>Across:</th>
<th>Down:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. 4 × 0.06</td>
<td>a. 8 × 0.009</td>
</tr>
<tr>
<td>b. 3 × 0.3</td>
<td>b. 9 × 0.03</td>
</tr>
<tr>
<td>c. 10 × 0.07</td>
<td>c. 7 × 0.07</td>
</tr>
<tr>
<td>d. 90 × 0.011</td>
<td>d. 5 × 0.16</td>
</tr>
<tr>
<td>e. 100 × 0.05</td>
<td>e. 10 × 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 N0.25, 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 = \(N\text{809.40}\) tax per year
3. Alhaji paid \(110.050.67 \times 16\) = \(N\text{1760.810.72}\) customs duty
4. \(€27 \times 246.58 = N\text{657.66}\)
5. The area of the rectangle is \(85.76 \times 57\) m
   = \(4888.32\) m
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 \(2\text{846.65} - 2\text{486.56} = N\text{360.09}\)
   The total value of the mistake is \(50 \times N\text{360.09}\)
   = \(N\text{18\,004.50}\)
10. \(6000 \times N\text{144.50} = N\text{867\,000.00}\)
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. \(43.52\)
   \(10\)
   \(435.2\)
2. \(8.664\)
   \(866.4\)
   \(86.69\)
3. \(649.3\)
   \(649.3\)
   \(649.3\)
4. \(0.8769\)
   \(8.769\)
5. \(4.91\)
   \(147.30\)
   \(1473\)

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.
Lesson 6  Pupil’s Book page 64

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

 Starter activity
Let pupils chose 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) \(3.45 \times 10 = 34.5\)
   b) \(2.8 \times 10 = 28\)
   c) \(3.912 \times 100 = 391.2\)
   d) \(9.867 \times 1000 = 9867\)
   e) \(8.45 \times 1000 = 8450\)
   f) \(6.82 \times 10 = 68.2\)
   g) \(7.612 \times 100 = 761.2\)
   h) \(4.111 \times 10 = 41.11\)
   i) \(5.78 \times 100 = 578\)
   j) \(28.1 \times 10 = 281\)
2. a) \(17.51 \times 40 = 700.4\)
   b) \(1.856 \times 50 = 92.8\)
   c) \(7.982 \times 70 = 555.74\)
   d) \(12.049 \times 90 = 1084.16\)
   e) \(6.785 \times 800 = 5428\)
   f) \(5.621 \times 5000 = 28105\)
   g) \(3.42 \times 3000 = 10260\)
   h) \(4.567 \times 30 = 137.01\)
3. a) \(45.8 \times 30 = 1374\)
   b) \(60.08 \times 38 = 2283.04\)
4. a) \(90 \times 46.58 = 4192.20\)
   b) \(56 \times 46.58 = 2608.48\)
   c) \(182 \times 46.58 = 8477.56\)

 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) \(7.656 \times 10 \times 3 = 229.68\)
   c) \(6.517 \times 10 \times 7 = 456.19\)
   d) \(7.931 \times 100 \times 6 = 4758.6\)
   e) \(79.13 \times 1000 \times 5 = 395650\)
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
**Objective**
- 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 $10 \times 25 = 250$. In Question 3, the pupils have to spot that the difference in successive calculations is always the first number $\times 10$. You may like to check their understanding and ask what the difference between, for example, $26 \times 35$ and $26 \times 45$ 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 $2 \times 2$; $22 \times 22$; $3 \times 3$; $33 \times 33$ 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) 48
   b) 48

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) $17\frac{830}{1000}$

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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.