Teaching and learning materials

Students: 4-figure tables (provided on pages 237 and 248 of the Student’s Book), calculator.
Teacher: Newspaper articles and reports that contain numerical data, population and other official data.

Areas of difficulty

Students may find it difficult to find the percentage error when they have to find the range of values of certain measurements. It would help if you could explain it as follows:

The biggest possible error when measuring is considered to be \( \pm \frac{1}{2} \) of that unit.

Examples

1. **400 m to the nearest 0.1 of a m** means that the error would be \( \pm \frac{1}{2} \) of \( \pm 0.1 = \pm 0.05 \) and
   
   \( 400 - 0.05 \leq \text{length} < 400 + 0.05 \),
   
   which gives \( 399.95 \leq \text{length} < 400.05 \).
   
   \[ \text{% error} = \frac{\text{error}}{\text{measured length}} \times \frac{100}{1} = \pm \frac{0.05}{400} \times \frac{100}{1} = \pm 0.0125\% \]

2. **400 m to the nearest m** means that the error would be \( \pm \frac{1}{2} \) of \( \pm 1 = \pm 0.5 \) and
   
   \( 400 - 0.5 \leq \text{length} < 400 + 0.5 \),
   
   which gives \( 399.5 \leq \text{length} < 400.5 \).
   
   \[ \text{% error} = \frac{\text{error}}{\text{measured length}} \times \frac{100}{1} = \pm \frac{0.5}{400} \times \frac{100}{1} = \pm 0.125\% \]

3. **400 m to the nearest 10 m** means that the error would be \( \frac{1}{2} \) of \( \pm 1 = \pm 5 \) and
   
   \( 400 - 5 \leq \text{length} < 400 + 5 \),
   
   which gives \( 395 \leq \text{length} < 405 \).
   
   \[ \text{% error} = \frac{\text{error}}{\text{measured length}} \times \frac{100}{1} = \pm \frac{5}{400} \times \frac{100}{1} = \pm 1.25\% \]

4. **400 m correct to 1 s.f.** means that the error would be \( \frac{1}{2} \) of \( \pm 100 = \pm 50 \) and
   
   \( 400 - 50 \leq \text{length} < 400 + 50 \),
   
   which gives \( 350 \leq \text{length} < 450 \).
   
   \[ \text{% error} = \frac{\text{error}}{\text{measured length}} \times \frac{100}{1} = \pm \frac{50}{400} \times \frac{100}{1} = \pm 12.5\% \]

5. **400 m to the nearest 2 m** means that the error would be \( \frac{1}{2} \) of \( \pm 2 = \pm 1 \) and
   
   \( 400 - 1 \leq \text{length} < 400 + 1 \),
   
   which gives \( 399 \leq \text{length} < 401 \).
   
   \[ \text{% error} = \frac{\text{error}}{\text{measured length}} \times \frac{100}{1} = \pm \frac{1}{400} \times \frac{100}{1} = \pm 0.25\% \]

6. **4 000 m correct to 1 s.f.** means that the error would be \( \frac{1}{2} \) of \( \pm 1 000 = \pm 500 \) and
   
   \( 4 000 - 500 \leq \text{length} < 4 000 + 500 \),
   
   which gives \( 3 500 \leq \text{length} < 4 500 \).
   
   \[ \text{% error} = \frac{\text{error}}{\text{measured length}} \times \frac{100}{1} = \pm \frac{500}{4 000} \times \frac{100}{1} = \pm 12.5\% \]