

Exercise walk-through

E1.9

Estimation

IGCSE Mathematics

You must be able to

- round a number to a given number of significant figures or decimal places
- estimate the value of a calculation by rounding each number to 1 significant figure
- decide whether a calculated answer is reasonable

1

The method

Method — Round each number to 1 significant figure, then calculate

- **Significant figures start at the first non-zero digit:** 0.0472 to 2 s.f. is 0.047; the leading zeros do not count.
- **Estimate:** $4.7 \times 19.6 \approx 5 \times 20 = 100$ (the exact value is 92.12, so the estimate is close).
- **Division:** round the bottom too. $\frac{9.87 \times 4.13}{0.48} \approx \frac{10 \times 4}{0.5} = 80$.
- **Roots:** round to a number whose root you know — $\sqrt{38.2} \approx \sqrt{36} = 6$.

Answer shapes (marked by **method marks** — M1 for a correct method, A1 for the correct answer): writing the rounded numbers down is the method mark; an estimate with no rounding shown earns nothing even if the number is right.

Method — Round each number to 1 significant figure, then calculate

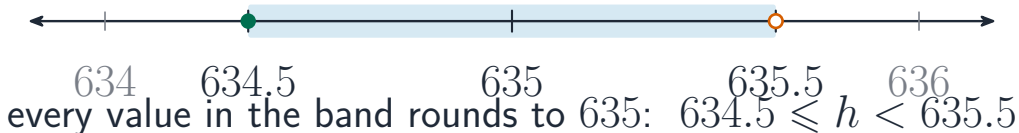
Answer shapes (marked by method marks — M1 for a correct method, A1 for the correct answer): writing the...

lower bound 634.5

included: it rounds up to 635

upper bound 635.5

not included: it rounds to 636



A number line showing the interval a rounded value can have come from

2

Practice

Practice 2.1 ■ 1 mark

Write 0.004 869 correct to 2 significant figures.

Solution 2.1

Method: Round each number to 1 significant figure, then calculate — p.4

Worked steps

- the first significant figure is the 4, so keep two digits from there

0.0049

B1

Practice 2.2 ■ 2 marks

By writing each number correct to 1 significant figure, estimate the value of 61.4×3.82 .

Solution 2.2

Method: Round each number to 1 significant figure, then calculate — p.4

Worked steps

- round each to 1 s.f.: $61.4 \rightarrow 60$ and $3.82 \rightarrow 4$ **M1**

$$60 \times 4 = \mathbf{240}$$

A1

Practice 2.3 ■ 2 marks

By writing each number correct to 1 significant figure, estimate the value of $\frac{9.87 \times 4.13}{0.48}$.

Solution 2.3

Method: Round each number to 1 significant figure, then calculate — p.4

Worked steps

■ round each to 1 s.f.: $\frac{10 \times 4}{0.5}$ **M1**

$$= \frac{40}{0.5} = 80$$
 A1

3

Exam-style

Exam-style 3.1 (a) ■ 2 marks

By writing each number correct to 1 significant figure, estimate the value of $\frac{18.6 \times 4.32}{0.51}$.

Solution 3.1 (a)

Method: Round each number to 1 significant figure, then calculate — p.4

Worked steps

■ round each to 1 s.f.: $\frac{20 \times 4}{0.5}$ **M1**

$$= \frac{80}{0.5} = \mathbf{160} \quad \mathbf{A1}$$

Exam-style 3.1 (b) ■ 2 marks

Use a calculator to find the exact value, correct to 2 decimal places, and say whether your estimate was reasonable.

Solution 3.1 (b)

Worked steps

$$\blacksquare \frac{18.6 \times 4.32}{0.51} = \frac{80.352}{0.51} \quad \text{M1}$$
$$= 157.55 \quad \text{A1}$$

- the estimate of 160 is within about 2% of this, so it was reasonable

Exam-style 3.2 ■ 3 marks

A rectangle measures 8.3 cm by 5.7 cm, each correct to 1 decimal place.

Exam-style 3.2 (a) ■ 1 mark

Estimate the area by rounding each length to 1 significant figure.

Solution 3.2 (a)

Method: Round each number to 1 significant figure, then calculate — p.4

Worked steps

■ $8.3 \rightarrow 8$ and $5.7 \rightarrow 6$

$$8 \times 6 = 48 \text{ cm}^2$$

B1

Exam-style 3.2 (b) ■ 2 marks

Calculate the upper bound of the area.

Solution 3.2 (b)

Worked steps

- each length is correct to 0.05 cm, so the upper bounds are 8.35 cm and 5.75 cm **M1**

$$8.35 \times 5.75 = 48.0125 \text{ cm}^2$$

A1