Measurement error

6 questions | 14 marks

Equivalent correct methods earn the corresponding marks.

1. A length is 8 cm to the nearest centimetre. Give bounds. [2 marks]

The half-unit is 0.5 cm.

Answer: $7.5 \le L < 8.5$ cm

2. A mass is 2.30 kg to the nearest 0.01 kg. Give maximum absolute rounding error. [2 marks]

Half of 0.01 is 0.005.

Answer: 0.005 kg

3. A 40 m reported distance has absolute error 0.2 m. Use 40 m as reference to find percentage error. [2 marks]

$\frac{0.2}{40} \times 100 = 0.5.$

Answer: 0.5%

4. A rectangle is 6 by 4 cm, each to the nearest centimetre. Find lower and upper area limits. [3 marks]

$5.5 \times 3.5 = 19.25.$

$6.5 \times 4.5 = 29.25$; upper endpoint excluded.

Answer: 19.25 and 29.25 cm²

5. Compare 100 g with error 2 g and 500 g with error 5 g. Which has smaller relative error using the readings as reference? [3 marks]

$\frac{2}{100} = 2\%$; $\frac{5}{500} = 1\%.$

Answer: The 500 g reading.

6. A 12.0 s reading is to the nearest 0.1 s. Can its true value be 12.06 s? Explain. [2 marks]

$11.95 \le t < 12.05.$

12.06 lies outside this interval.

Answer: No.