

Exercise walk-through

C1.10

Limits of accuracy

IGCSE Mathematics

You must be able to

- Identify the rounding step and half-step
- State lower-inclusive and upper-exclusive measurement bounds
- Test whether a proposed true reading fits the reported measurement

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The method

Method — Key knowledge: Limits of accuracy

Rounded measurements represent intervals. The rounding step is 1 for nearest unit, 0.1 for one decimal place and 10 for nearest ten. Subtract half the step for the lower bound; add half for the upper bound. Include the lower endpoint and exclude the upper: $L \leq x < U$. Core requires bounds of measurements, not bounds of calculations with them.

Exercises 2.1-2.3

2.1 A mass is 24 kg to the nearest kg. Give its lower and upper bounds. [2]

2.2 A distance is 370 m to the nearest 10 m. Write its bounds as an inequality. [2]

2.3 A time is 6.42 s to two decimal places. Give both bounds. [2]

Exercises 2.1·2.3

2.1 A mass is 24 kg to the nearest kg. Give its lower and upper bounds. [2]

2.1

- Half-step is 0.5 kg: $L = 24 - 0.5 = \mathbf{23.5}$ kg; $U = 24 + 0.5 = \mathbf{24.5}$ kg.
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2.2 A distance is 370 m to the nearest 10 m. Write its bounds as an inequality. [2]

2.2

- Half-step is 5 m, so $365 \leq d < 375$ in metres.
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2.3 A time is 6.42 s to two decimal places. Give both bounds. [2]

2.3

- Half-step is 0.005 s: $\mathbf{6.415}$ s and $\mathbf{6.425}$ s.

Exercise 2.4

2.4 A height is 1.8 m to one decimal place. Could the true height be 1.84 m? Explain.[2]

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2.4

- The interval is $1.75 \leq h < 1.85$. Since 1.84 lies inside it, **yes**.

Exercise 3.1 (a)

3.1 Apply the limits of accuracy methods below. Show working and include units where appropriate.

(a) A length is 125 cm to the nearest cm. State the rounding step. [2]

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(a)

- The step is **1 cm**.

Exercise 3.1 (b)

3.1 Apply the limits of accuracy methods below. Show working and include units where appropriate.

(b) Give its lower and upper bounds.

[2]

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3.1 Apply the limits of accuracy methods below. Show working and include units where appropriate.

(b) Give its lower and upper bounds.

[2]

(b)

- Half-step is 0.5 cm: $124.5 \leq l < 125.5$ in cm.

Exercise 3.1 (c)

3.1 Apply the limits of accuracy methods below. Show working and include units where appropriate.

(c) Decide whether 125.5 cm is a possible true length. Explain.

[2]

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3.1 Apply the limits of accuracy methods below. Show working and include units where appropriate.

(c) Decide whether 125.5 cm is a possible true length. Explain. [2]

(c)

- **No.** 125.5 cm is excluded and rounds up to 126 cm.

Exercise 3.2 (a)

3.2 A parcel is labelled 2.4 kg, rounded to the nearest 0.1 kg. A service accepts only parcels strictly below 2.45 kg.

(a) Write the full interval for the true mass and state whether every possible mass meets the service rule. [3]

Exercise 3.2 (a)

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(a) Write the full interval for the true mass and state whether every possible mass meets the service rule. [3]

(a)

- Half-step is $h = 0.1/2 = 0.05$ kg.
- Interval **$2.35 \leq m < 2.45$** kg.
- **Every possible mass meets the rule**, since all are strictly less than 2.45 kg.

Exercise 3.2 (b)

3.2 A parcel is labelled 2.4 kg, rounded to the nearest 0.1 kg. A service accepts only parcels strictly below 2.45 kg.

(b) Consider true masses 2.35 kg, 2.44 kg and 2.45 kg. State which could give the label 2.4 kg, with an explanation of the boundary case. [3]

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(b)

- **2.35 and 2.44 kg are possible.**
- **2.45 kg is not possible:** at that upper boundary it rounds to 2.5 kg, so the interval excludes it.