IGCSE MATHEMATICS • EXERCISE SHEET

E1.10 Limits of accuracy

Name: _____ Class: _____ Date: _____ **Total: 11 marks**

KEY WORDS lower bound 下界 • upper bound 上界 • lower and upper bounds 下界和上界 • area 面积 • limits of accuracy 精确度的界限

Objective

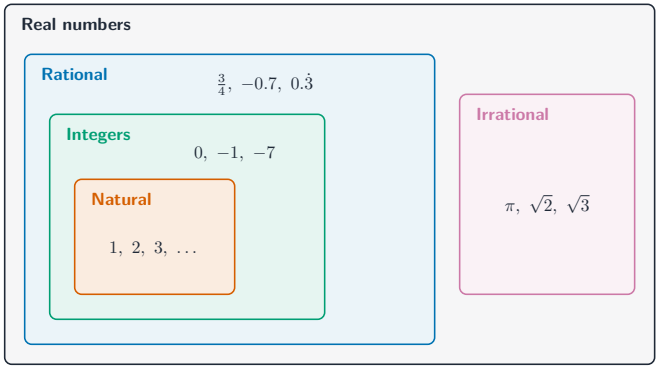
Build the skills to answer Extended exam questions on **limits of accuracy** 精确度的界限 — the **lower and upper bounds** 下界和上界 of a rounded value, and using bounds in calculations.

You must be able to:

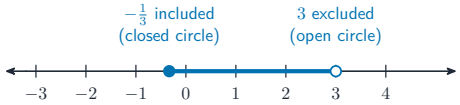
- give the upper and lower bounds of a rounded measurement
- find the largest and smallest result of a calculation
- choose the right bounds for a sum, product or quotient

1 Worked examples

■ Upper and lower bounds



A rounded value could be anything that rounds to it



Upper and lower bounds place a value within an interval

- **Bounds:** 635 m to the nearest metre → $634.5 \leqslant h < 635.5$.
- **Largest product:** use both **upper** bounds. **Smallest:** both **lower** bounds.
- **Quotient:** the **largest** $\frac{a}{b}$ uses the **largest** a and the **smallest** b.

Answer shapes: M1 a correct method, **A1** the correct answer.

2 Practice

2.1 A length is 24 cm, to the nearest cm. Write down the lower bound. [1]

2.2 A mass is 3.5 kg, correct to 1 decimal place. Write down the upper bound. [1]

2.3 A time is 40 s, to the nearest 10 s. Write down the lower and upper bounds. [2]

3 Exam-style questions

3.1 A rectangle measures 12 cm by 7 cm, each side to the nearest cm.

(a) Calculate the upper bound of the area. [2]

(b) Calculate the lower bound of the perimeter. [2]

3.2 A car travels 90 m (to the nearest 10 m) in 8.0 s (to the nearest 0.1 s). Calculate the upper bound of its average speed. [3]

Solutions

Marking: **M1** a correct method, **A1** the correct answer.

2.1 23.5 cm.

2.2 3.55 kg.

2.3 lower bound 35 s, upper bound 45 s.

3.1 (a) upper bounds 12.5 and 7.5 $\rightarrow$ area $= 12.5 \times 7.5 = 93.75$ cm^2. (b) lower bounds 11.5 and 6.5 $\rightarrow$ perimeter $= 2(11.5 + 6.5) = 36$ cm.

3.2 largest speed = largest distance $\div$ smallest time. Distance upper bound = 95 m; time lower bound = 7.95 s $\rightarrow \frac{95}{7.95} = 11.9$ m/s (to 3 s.f.).