



3.1H Error Intervals: Higher Tier Practice

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 75 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** A length is recorded as 3.6 m, correct to 1 decimal place. Write down the lower and upper bounds of the length.

(Total for Question 1 is 2 marks)

- 2** A booklet has width recorded as 9.8 cm to 1 decimal place and height recorded as 14 cm to the nearest centimetre.
Calculate the minimum possible area of the rectangle formed by these measurements. Give your answer to 3 significant figures.

(Total for Question 2 is 3 marks)

- 3** A cylindrical tin has recorded radius 2.4 cm correct to 1 decimal place and recorded height 8.0 cm correct to 1 decimal place. Using bounds, show that the maximum possible volume is less than 155 cm^3 .
Take π as π and leave your reasoning in terms of π where helpful.

(Total for Question 3 is 4 marks)

4 The mass of a small package is given as 250 g correct to the nearest 10 g. The number of packages in a box is recorded as 24 correct to the nearest whole number.

(a) Find the possible range for the total mass of the packages in the box. (2 marks)

(b) Giving your answer to the nearest 10 g, find the possible value(s) of the mean mass per package to 3 significant figures. (1 mark)

(a) (a) Find the possible range for the total mass of the packages in the box. (2)

(b) (b) Giving your answer to the nearest 10 g, find the possible value(s) of the mean mass per package to 3 significant figures. (1)

(Total for Question 4 is 3 marks)

5 A quantity x is given as $x = 4.0$ correct to 2 significant figures. A quantity y is given as $y = 0.036$ correct to 2 significant figures.

Using bounds, find the maximum possible value of $x * y$. Give your answer in standard form to 2 significant figures.

(Total for Question 5 is 4 marks)

6 Given that a and b are measured values with a in $[1.98, 2.02]$ and b in $[0.495, 0.505]$, find a range for the value of (a / b) . Give answers to 3 significant figures.

You must show how you obtain the minimum and maximum values.

(Total for Question 6 is 5 marks)

Mark scheme · 3.1H Error Intervals: Higher Tier Practice

Question 1

- **B1** lower bound 3.55 m cao
- **B1** upper bound 3.65 m cao (upper bound exclusive)
- **Answer: Lower bound 3.55 m, upper bound 3.65 m (upper bound is exclusive).**

Question 2

- **M1** use lower bounds: width = 9.75 cm and height = 13.5 cm and multiply
- **A1** 131.625 (intermediate product) oe
- **A1** 132 to 3 significant figures cao
- **Answer: 132 to 3 significant figures (from $9.75 \times 13.5 = 131.625$).**

Question 3

- **M1** use upper bounds: radius $r_{\text{upper}} = 2.45$ cm, height $h_{\text{upper}} = 8.05$ cm and write $V_{\text{max}} \leq \pi \times (2.45)^2 \times 8.05$
- **M1** calculate numeric product $(2.45)^2 \times 8.05 = 48.320125$ or show equivalent numeric work
- **A1** show $V_{\text{max}} = 48.320125 \pi \text{ cm}^3$ (in exact numeric times π form) oe
- **A1** compare with 155 by evaluating numerically or noting 48.320125×3.1416 is approximately 151.8 and conclude $V_{\text{max}} < 155$ cao
- **Answer: Upper bound volume $V_{\text{max}} = \pi \times (2.45)^2 \times 8.05 = 48.320125 \pi$; numerically this is approximately 151.8 cm^3 , so $V < 155 \text{ cm}^3$.**

Question 4

- (a) **M1** use bounds: mass per package lower 245 g, upper 254.999... g; number lower 23.5, upper 24.5
- (a) **A1** total mass between $245 \times 23.5 = 5757.5$ g and $254.999... \times 24.5 = 6247.5$ g cao
- (a) **Answer: Total mass between 5757.5 g and 6247.5 g.**
- (b) **B1** compute means: lower mean = $5757.5/24 = 239.8958...$ then give 240 to 3 s.f. and round to nearest 10 g = 240 g; upper mean = $6247.5/24 = 260.3125$, to 3 s.f. 260 g and nearest 10 g = 260 g
- (b) **Answer: Possible mean masses to nearest 10 g: 240 g and 260 g.**

Question 5

- **M1** identify upper bounds: $x_{\text{upper}} = 4.05$ and $y_{\text{upper}} = 0.0365$
- **M1** multiply upper bounds: $4.05 \times 0.0365 = 0.147825$
- **A1** convert to standard form 1.47825×10^{-1} oe
- **A1** round to 2 significant figures 1.5×10^{-1} cao
- **Answer: 1.5×10^{-1}**

Question 6

- **M1** identify that a/b is minimised by smallest a and largest b , and maximised by largest a and smallest b
- **M1** substitute bounds: min = $1.98 / 0.505$ and max = $2.02 / 0.495$
- **A1** calculate min = $1.98 / 0.505 = 3.920792079...$ and give 3.92 to 3 s.f. cao
- **A1** calculate max = $2.02 / 0.495 = 4.080808081...$ and give 4.08 to 3 s.f. cao
- **B1** state range a/b is between 3.92 and 4.08 inclusive to 3 s.f. oe
- **Answer: Minimum $a/b = 1.98 / 0.505 = 3.920792...$ so 3.92 (3 s.f.); Maximum $a/b = 2.02 / 0.495 = 4.080808...$ so 4.08 (3 s.f.). Range: 3.92 to 4.08.**