

Upper and Lower Bounds

Please write clearly in block capitals

Forename:

Surname:

Materials

For this paper you must have:

- mathematical instruments



You **can** use a calculator.

Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer all questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- You may ask for graph paper, tracing paper and more answer paper. These must be tagged securely to this answer book.

Advice

- In all calculations, show clearly how you work out your answer.

- 1(a)** A wooden toy is 6 cm tall to the nearest cm. (Level 5)
Find the upper and lower bounds for the height of the toy.

[2 marks]

Answer _____

- 1(b)** The mass of the toy is 2.2 kg to the nearest 0.1 kg.
Find the error interval, in which the true mass of the toy, m , lies

[2 marks]

_____ $\leq m <$ _____

- 1(c)** The length of a log is measured exactly to be 55.6m
Calculate the length of the log truncated to the nearest meter.

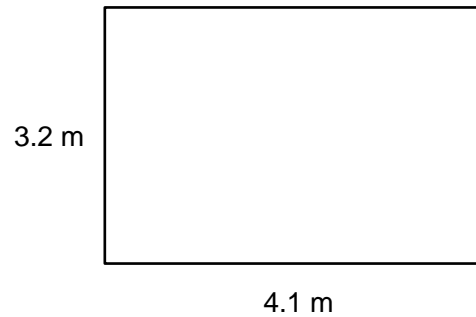
[1 mark]

Answer _____

Turn over for next question

- 2 A diagram of a rectangular garden is shown below.
Each length is measured to the nearest 0.1 m

(Level 5)



Calculate minimum and maximum possible values for area of the garden.
Give your answers to 1 decimal place.

[3 marks]

Maximum area: _____ m^2

Minimum area: _____ m^2



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Turn over ►

- 3 The distance from Sarah's house to Peter's house is 230 miles measured to the nearest 10 miles. (Level 6)

Sarah took exactly 4 hours to complete this journey.

Sarah says:

"My average speed was 60 mph for the journey to Peter's house"

Is Sarah correct?

You **must** explain your answer

[3 marks]

Answer _____



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4 x and y are measured as 3.42 m and 0.92 m , both correct to the nearest 0.01 m . (Level 6)

4(a) Find the upper and lower bounds of x and y .

[2 marks]

4(b) $z = \frac{1}{x} + y$

Find the maximum and minimum possible values of z .

Give your answer to 3 decimal places.

[2 marks]

Answer _____



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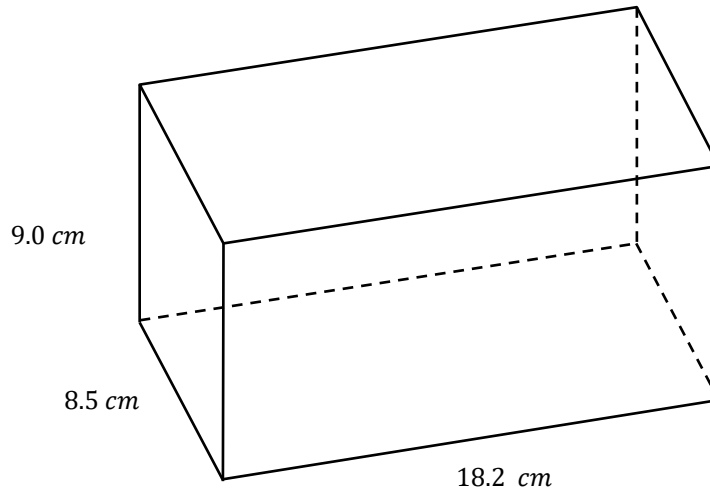
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- 5 The dimensions of a cuboid container are shown below.
Each length has been measured to 1 decimal place.

(Level 7)



- 5(a) Calculate the upper bound for the volume of the cuboid.
Give your answer to 2 decimal places.

[2 marks]

Answer _____ cm^3

Question continues on next page

6 A ball is dropped from a height of d meters. (Level 7)

The time, t seconds, taken for the ball to reach the ground is given by

$$t = \sqrt{\frac{2d}{g}}$$

where g is the acceleration due to gravity.

$d = 12.4$ m correct to 3 significant figures

$g = 9.8$ m/s² correct to 2 significant figures.

6(a) Find the lower bound of d .

[1 mark]

Answer _____

6(b) Find the minimum value of t .

Give your answer to 2 decimal places.

[3 marks]

Answer _____

End of question