Chhetri Academy

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GCSE MATHS

Number

Edexcel 1MA1 | Subtopic collection Topic 08

Rounding, estimation and error intervals

Higher tier

Past paper question booklet

81	2004-2025	Higher
question groups	available papers	tier

Before you begin

1. Show working and use units where appropriate.
2. Use extra paper if you need more space.
3. Print at actual size (100%) for measurement questions.

Name _____ **Date** _____

Whole questions are retained for context; some parts cover other points. Legacy sources are labelled.

8. Each side of a regular pentagon has a length of 101 mm, correct to the nearest millimetre.

(i) Write down the **least** possible length of each side.

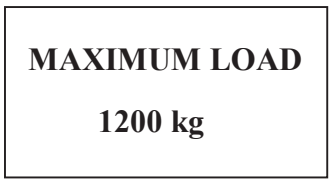
..... mm

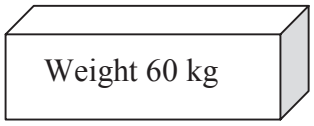
(ii) Write down the **greatest** possible length of each side.

..... mm

(2)

17.





Peter transports metal bars in his van.

The van has a safety notice "Maximum Load 1200 kg".
Each metal bar has a label "Weight 60 kg".

For safety reasons Peter assumes that

1200 is rounded correct to 2 significant figures
and 60 is rounded correct to 1 significant figure.

Calculate the greatest number of bars that Peter can **safely** put into the van if his assumptions are correct.

Q17

.....

(Total 4 marks)

blank

4. Estimate the value of $\dfrac{21 \times 3.86}{0.207}$

.....

Q4

(Total 3 marks)

Blank

11. The length of a line is 63 centimetres, correct to the nearest centimetre.

(a) Write down the **least** possible length of the line.

..... centimetres
(1)

(b) Write down the **greatest** possible length of the line.

..... centimetres
(1)

Q11

(Total 2 marks)

14. Work out an estimate for the value of

$$\frac{6.8\times191}{0.051}$$

.....

(Total 3 marks)

Blank

Q14

2. Work out an estimate for the value of $\dfrac{31 \times 4.92}{0.21}$

.....

(Total 3 marks)

Q2

9. (a) A solid cube has sides of length 5 cm.

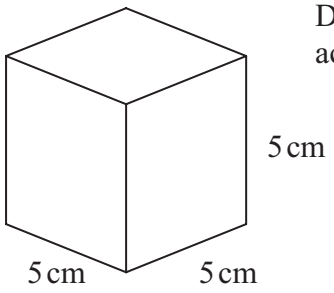


Diagram **NOT** accurately drawn

Work out the total surface area of the cube.
State the units of your answer.

.....
(4)

The volume of the cube is 125 cm^3.

(b) Change 125 cm^3 into mm^3.

..... mm^3
(2)

The weight of the cube is 87 grams, correct to the nearest gram.

(c) (i) What is the minimum the weight could be?

..... grams

(ii) What is the maximum the weight could be?

..... grams
(2)

(Total 8 marks)

Q9

6. Work out an estimate for $\dfrac{3870}{236\times4.85}$

.....

(Total 2 marks)

Q6

4. Work out an estimate for $\frac{7.19 \times 19.7}{0.46}$

.....

(Total 3 marks)

Q4

8. Work out an estimate for the value of

$$(0.49 \times 0.61)^2$$

.....

Q8

(Total 2 marks)

25. Steve measured the length and the width of a rectangle.
He measured the length to be 645 mm correct to the nearest 5 mm.
He measured the width to be 400 mm correct to the nearest 5 mm.

Calculate the lower bound for the area of this rectangle.
Give your answer correct to 3 significant figures.

..... mm^2 **Q25**

(Total 3 marks)

Question 12

5 Work out an estimate for $\dfrac{31 \times 9.87}{0.509}$

.....

(Total for Question 5 is 3 marks)

3 Susan has a round cake.
The cake has a diameter of 20 cm.

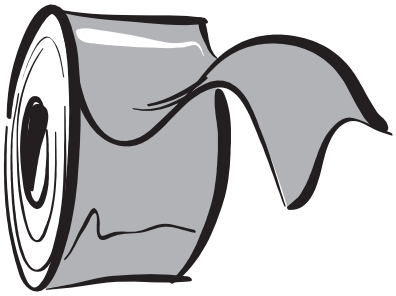
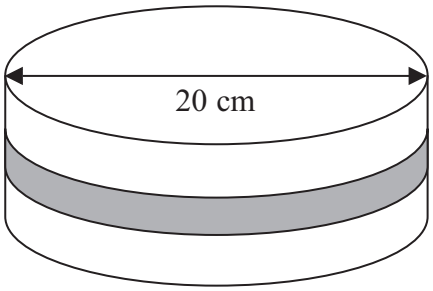


Diagram **NOT** accurately drawn



Susan wants to put a ribbon round the cake.
What is the least length of ribbon she can use?

.....

(Total for Question 3 is 3 marks)

7 A piece of wood has a length of 65 centimetres to the nearest centimetre.

(a) What is the least possible length of the piece of wood?

.....cm

(1)

(b) What is the greatest possible length of the piece of wood?

.....cm

(1)

(Total for Question 7 is 2 marks)

Question 15

9 (a) Work out the value of $\dfrac{\sqrt{30}}{2.5^2}$

Give your answer correct to 3 decimal places.

.....

(2)

(b) Change 4.5 km^2 to m^2.

..... m^2

(2)

(Total for Question 9 is 4 marks)

25 Solve the simultaneous equations $x^2 + y^2 = 9$
$x + y = 2$

Give your answers correct to 2 decimal places.

$x =$ ..... $y =$ .....

or $x =$ ..... $y =$ .....

(Total for Question 25 is 6 marks)

18 Solve $5x^2 + 6x - 2 = 0$
Give your solutions correct to 2 decimal places.

.....

(Total for Question 18 is 3 marks)

Question 18

7 Chelsea's height is 168 cm to the nearest cm.

(a) What is Chelsea's minimum possible height?

..... cm

(1)

(b) What is Chelsea's maximum possible height?

..... cm

(1)

(Total for Question 7 is 2 marks)

Question 19

8 Work out an estimate for the value of $\dfrac{89.3 \times 0.51}{4.8}$

.....

(Total for Question 8 is 2 marks)

15 (a) (i) Use your calculator to work out $\dfrac{\sqrt{46.2 - 17.5}}{2.39 \times 0.7}$

Write down all the figures on your calculator display.

.....

(ii) Give your answer to (i) correct to 3 significant figures.

.....

(3)

(b) Work out $(2.34 \times 10^5) \times (5 \times 10^4)$
Give your answer in standard form.

.....

(2)

(Total for Question 15 is 5 marks)

15 (a) (i) Use your calculator to work out $\dfrac{\sqrt{46.2 - 17.5}}{2.39 \times 0.7}$

Write down all the figures on your calculator display.

.....

(ii) Give your answer to (i) correct to 3 significant figures.

.....

(3)

(b) Work out $(2.34 \times 10^5) \times (5 \times 10^4)$
Give your answer in standard form.

.....

(2)

(Total for Question 15 is 5 marks)

15 The diagram shows the positions of three turbines *A*, *B* and *C*.

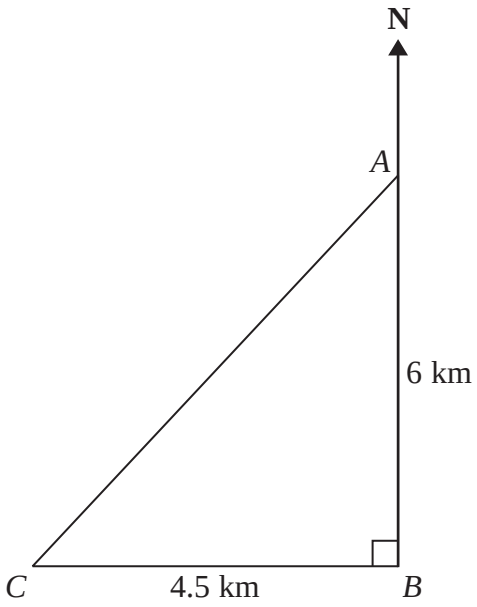


Diagram **NOT** accurately drawn

A is 6 km due north of turbine *B*.
C is 4.5 km due west of turbine *B*.

(a) Calculate the distance *AC*.

..... km
(3)

(b) Calculate the bearing of *C* from *A*.
Give your answer correct to the nearest degree.

..... °
(4)

(Total for Question 15 is 7 marks)

13 The diagram shows the positions of a tower and a tree.

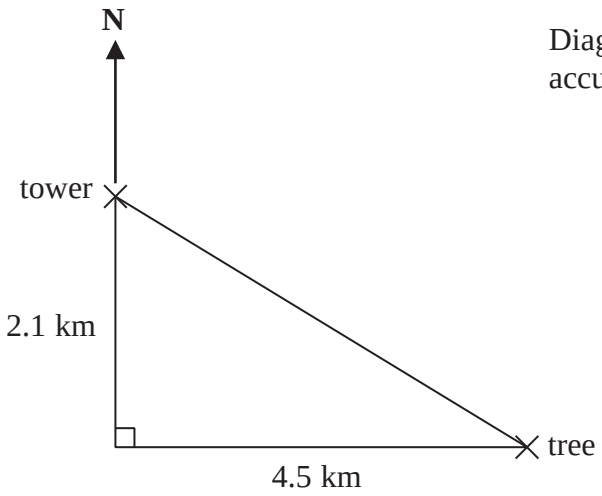


Diagram **NOT** accurately drawn

The tree is 2.1 km South of the tower and 4.5 km East of the tower.

(a) Work out the distance between the tower and the tree.
Give your answer correct to one decimal place.

..... km
(3)

(b) Work out the bearing of the tree from the tower.
Give your answer correct to the nearest degree.

°
.....
(4)

(Total for Question 13 is 7 marks)

13 A nail weighs 4 g correct to the nearest gram.
Alice buys exactly 1 kg of nails.

Work out the least number of nails Alice could get.

.....

(Total for Question 13 is 3 marks)

1 (a) Work out the reciprocal of 1.25

.....

(1)

(b) Work out the value of $\frac{9.6}{\sqrt{5} - 1.7}$

Give your answer correct to 2 decimal places.

.....

(2)

(Total for Question 1 is 3 marks)

10 The diagram shows a trundle wheel.

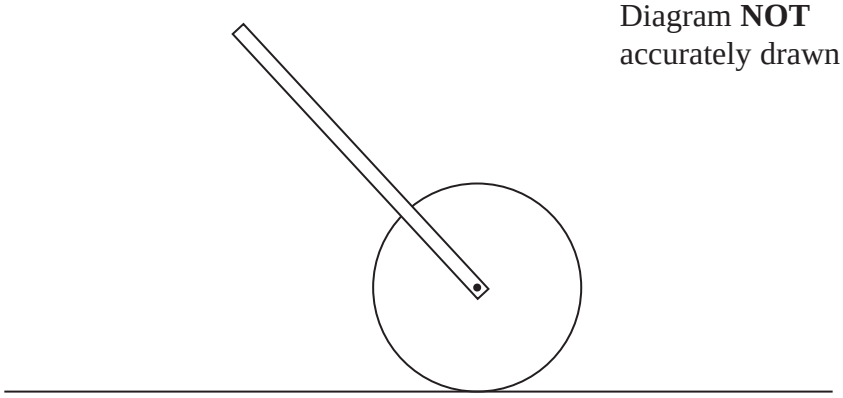


Diagram **NOT** accurately drawn

Trundle wheels are used to measure distances along the ground.

The radius of the trundle wheel is 20 cm.

Jim wants to work out the distance between two junctions on a road.
He rolls the trundle wheel between the two junctions.

The trundle wheel rotates exactly 34 times.

Work out the distance between the two junctions.
Give your answer in metres correct to the nearest metre.

.....m

(Total for Question 10 is 3 marks)

13 The value of an investment increases exponentially each year with a multiplier of 1.15

How long does it take for the investment to double in value?
Give your answer correct to the nearest whole number of years.

.....years

(Total for Question 13 is 2 marks)

18 Solve $2x^2 + 4x - 5 = 0$
Give your solutions correct to 2 decimal places.

.....

(Total for Question 18 is 3 marks)

20 The volume of a sphere is 70 cm^3 correct to the nearest cm^3.

Calculate the upper bound for the surface area of the sphere.
Give your answer correct to 1 decimal place.
You must show all your working.

.....cm^2

(Total for Question 20 is 4 marks)

25 Solve the equation $3x^2 + 4x - 12 = 0$
Give your solutions correct to 2 decimal places.

.....

(Total for Question 25 is 3 marks)

4 The length of a field is 54 metres correct to the nearest metre.

(a) Write down the least possible length of the field.

.....m

(1)

(b) Write down the greatest possible length of the field.

.....m

(1)

(Total for Question 4 is 2 marks)

1 (a) Work out $1\frac{3}{4} + 3\frac{1}{2}$

.....

(1)

(b) Work out $\frac{3}{7} \times £28$

£.....

(2)

(c) Estimate the value of 19.89×201.71

.....

(2)

(Total for Question 1 is 5 marks)

19 The value of p is 4.3
The value of q is 0.4

Both p and q are given correct to the nearest 0.1

(a) Write down the lower bound for p.

.....

(1)

$$r = p + \frac{1}{q}$$

(b) Work out the upper bound for r.
You must show all your working.

.....

(3)

(Total for Question 19 is 4 marks)

1 (a) Work out the value of $\dfrac{4.5 + \sqrt{10}}{3.1}$

Give your answer correct to 2 decimal places.

.....

(2)

(b) Work out the value of

$$\frac{1}{2.5 \times 10^{-3}}$$

.....

(1)

(Total for Question 1 is 3 marks)

20 $I = \dfrac{V}{R}$

V = 250 correct to the nearest 5

R = 3900 correct to the nearest 100

Work out the lower bound for the value of I.
Give your answer correct to 3 decimal places.
You must show your working.

.....

(Total for Question 20 is 3 marks)

20 Solve $3x^2 + 6x - 2 = 0$
Give your solutions correct to 2 decimal places.

.....

(Total for Question 20 is 3 marks)

4 A piece of wood has a width of 37 millimetres, correct to the nearest millimetre.

(a) Write down the least possible width of the piece of wood.

..... mm

(1)

(b) Write down the greatest possible width of the piece of wood.

..... mm

(1)

(Total for Question 4 is 2 marks)

17 Solve $x^2 - 17x - 56 = 0$
Give your solutions correct to 2 decimal places.

.....

(Total for Question 17 is 3 marks)

19 (a) Expand and simplify $(y + 2)(y + 5)$

.....

(2)

(b) Factorise $e^2 + e - 12$

.....

(2)

(c) Solve $3x^2 - x - 1 = 0$
Give your solutions correct to 2 decimal places.

.....

(3)

(Total for Question 19 is 7 marks)

23 A machine puts drinks into cups.
The volume of a cup is 200 m*l*, correct to the nearest 0.5 m*l*.

(a) Write down the lower bound for the volume of a cup.

..... m*l*

(1)

The machine puts tea and milk into each cup.
It puts into each cup

175 m*l* of tea measured correct to the nearest m*l*
24 m*l* of milk measured correct to the nearest m*l*

*(b) Is it possible that the total volume of tea and milk put in a cup is greater than the volume of the cup?
You must show how you get your answer.

(3)

(Total for Question 23 is 4 marks)

12 Sanders has a water tank for storing rainwater.

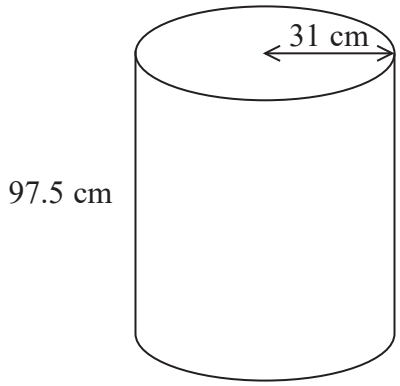


Diagram **NOT** accurately drawn

The tank is in the shape of a cylinder.
The radius of the cylinder is 31 cm.
The height of the cylinder is 97.5 cm.

The tank is full of water.

Work out an estimate for the volume of water in the tank.
Give your answer in litres.
You must show your working.

Use 1000 cm^3 = 1 litre.

.....litres

(Total for Question 12 is 3 marks)

21 Solve $2x^2 + 3x - 7 = 0$
Give your solutions correct to 2 decimal places.

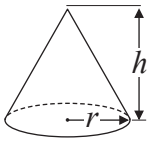
.....

(Total for Question 21 is 3 marks)

15 A cone has a volume of 98 cm^3.
The radius of the cone is 5.13 cm.

(a) Work out an estimate for the height of the cone.

Volume of cone = $\frac{1}{3}\pi r^2 h$



.....cm

(3)

John uses a calculator to work out the height of the cone to 2 decimal places.

(b) Will your estimate be more than John's answer or less than John's answer?
Give reasons for your answer.

.....

.....

.....

(1)

(Total for Question 15 is 4 marks)

7 A number, n, is rounded to 2 decimal places.
The result is 4.76

Using inequalities, write down the error interval for n.

.....

(Total for Question 7 is 2 marks)

13 At the beginning of 2009, Mr Veale bought a company.
The value of the company was £50 000

Each year the value of the company increased by 2%.

(a) Calculate the value of the company at the beginning of 2017
Give your answer correct to the nearest £100

£.....

(2)

At the beginning of 2009 the value of a different company was £250 000
In 6 years the value of this company increased to £325 000

This is equivalent to an increase of x% each year.

(b) Find the value of x.
Give your answer correct to 2 significant figures.

.....

(3)

(Total for Question 13 is 5 marks)

5 (a) Find the value of the reciprocal of 1.6
Give your answer as a decimal.

.....

(1)

Jess rounds a number, x, to one decimal place.
The result is 9.8

(b) Write down the error interval for x.

.....

(2)

(Total for Question 5 is 3 marks)

21 Jackson is trying to find the density, in g/cm^3, of a block of wood.
The block of wood is in the shape of a cuboid.

He measures
the length as 13.2 cm, correct to the nearest mm
the width as 16.0 cm, correct to the nearest mm
the height as 21.7 cm, correct to the nearest mm

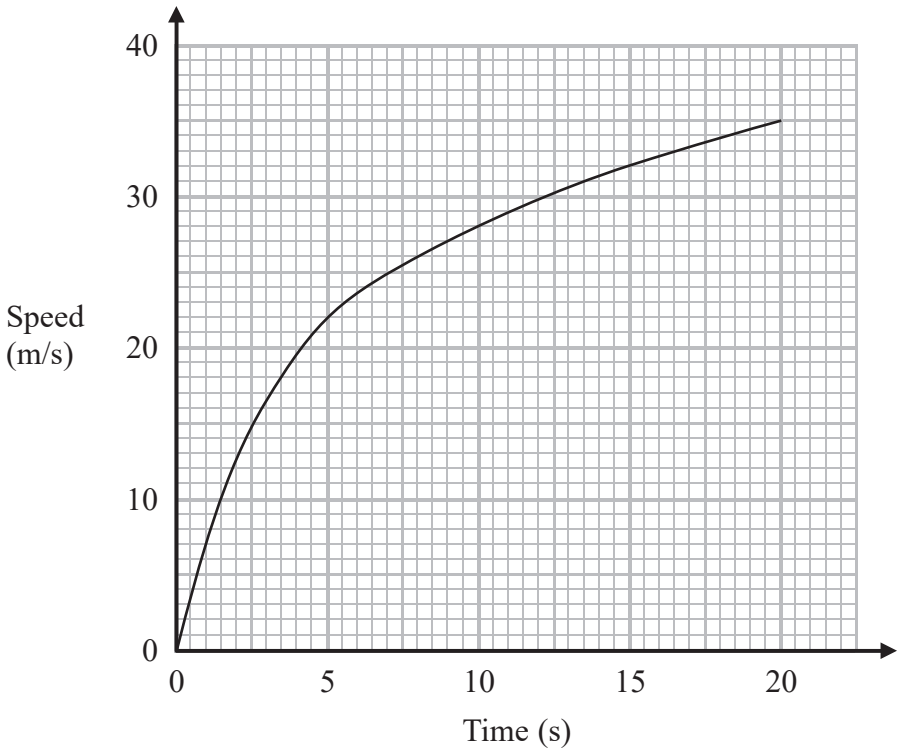
He measures the mass as 1970 g, correct to the nearest 5 g.

By considering bounds, work out the density of the wood.
Give your answer to a suitable degree of accuracy.

You must show all your working and give a reason for your final answer.

(Total for Question 21 is 5 marks)

15 The graph shows the speed of a car, in metres per second, during the first 20 seconds of a journey.



(a) Work out an estimate for the distance the car travelled in the first 20 seconds.
Use 4 strips of equal width.

..... metres
(3)

(b) Is your answer to part (a) an underestimate or an overestimate of the actual distance the car travelled in the first 20 seconds?
Give a reason for your answer.

.....

.....

(1)

(Total for Question 15 is 4 marks)

Question 49

9 Martin truncates the number N to 1 digit.
The result is 7

Write down the error interval for N.

.....

(Total for Question 9 is 2 marks)

8 (a) Work out an estimate for the value of $\sqrt{63.5 \times 101.7}$

.....

(2)

$(2.3)^6 = 148$ correct to 3 significant figures.

(b) Find the value of $(0.23)^6$ correct to 3 significant figures.

.....

(1)

(c) Find the value of 5^{-2}

.....

(1)

(Total for Question 8 is 4 marks)

Question 51

June 2019 | 1MA1/2H | Original Q6

6 Sally used her calculator to work out the value of a number y.

The answer on her calculator display began

8.3

Complete the error interval for y.

..... $\leqslant y <$ .....

(Total for Question 6 is 2 marks)

Question 52

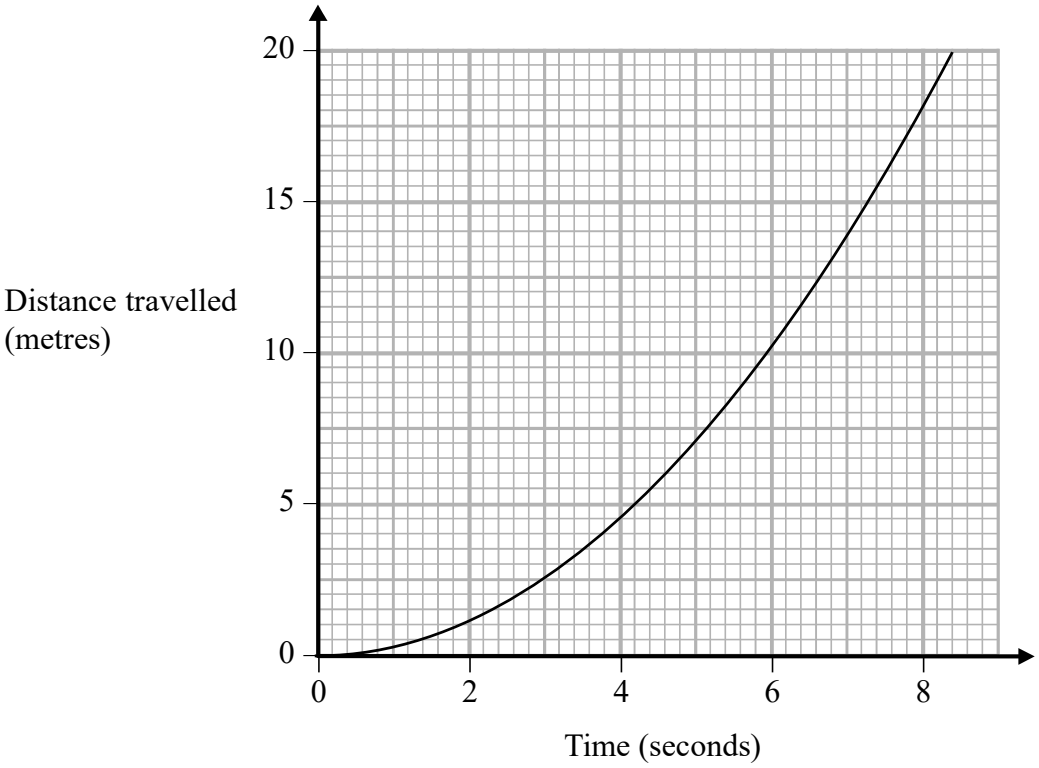
2 The length of a pencil is 128 mm correct to the nearest millimetre.

Complete the error interval for the length of the pencil.

..... mm $\leqslant$ length $<$ ..... mm

(Total for Question 2 is 2 marks)

19 The graph shows information about part of a cyclist's journey.

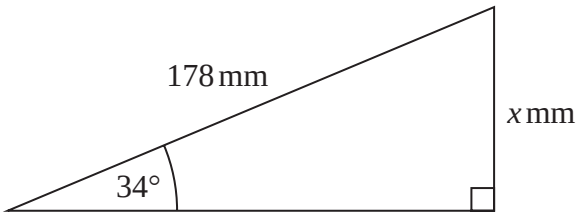


Work out an estimate of the speed, in m/s, of the cyclist at time 6 seconds.

..... m/s

(Total for Question 19 is 3 marks)

5



Work out the value of x.
Give your answer correct to 1 decimal place.

.....

(Total for Question 5 is 2 marks)

Question 55

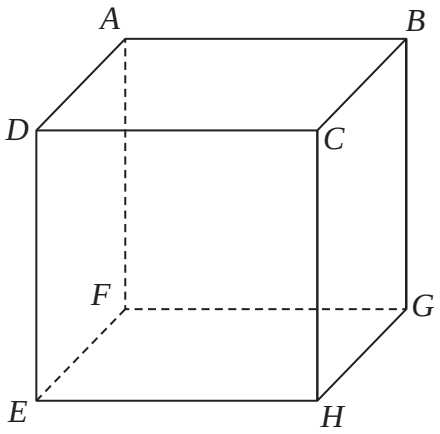
3 A number, m, is rounded to 1 decimal place.
The result is 9.4

Complete the error interval for m.

..... $\leqslant m <$ .....

(Total for Question 3 is 2 marks)

18 The diagram shows a cube.



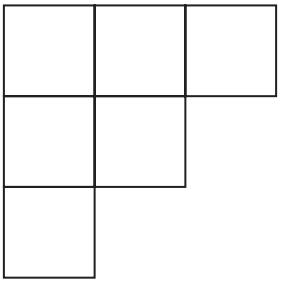
AH = 11.3 cm correct to the nearest mm.

Calculate the lower bound for the length of an edge of the cube.
You must show all your working.

..... cm

(Total for Question 18 is 4 marks)

10 The diagram shows a shape made from 6 identical squares.



The total area of the shape is 5406 cm^2

(a) Find an estimate for the length of one side of each square.
Give your answer correct to the nearest whole number.

..... cm

(3)

(b) Is your answer to part (a) an underestimate or an overestimate?
You must give a reason for your answer.

.....

.....

.....

(1)

(Total for Question 10 is 4 marks)

21 The time period, T seconds, of a simple pendulum of length l cm is given by the formula

$$T = 2\pi\sqrt{\frac{l}{g}}$$

Katie uses a simple pendulum in an experiment to find an estimate for the value of g.

Here are her results.

l = 52.0 correct to 3 significant figures.
T = 1.45 correct to 3 significant figures.

Work out the upper bound and the lower bound for the value of g.
Use π = 3.142
You must show all your working.

upper bound = ...

lower bound = ...

(Total for Question 21 is 4 marks)

4 A water tank is empty.
Anil needs to fill the tank with 2400 litres of water.

Company **A** supplies water at a rate of 8 litres in 1 minute 40 seconds.
Company **B** supplies water at a rate of 2.2 gallons per minute.

1 gallon = 4.54 litres

Company **A** would take more time to fill the tank than Company **B** would take to fill the tank.

How much more time?
Give your answer in minutes correct to the nearest minute.

..... minutes

(Total for Question 4 is 4 marks)

Question 60

11 Freya writes down the value of x, correct to 1 decimal place.

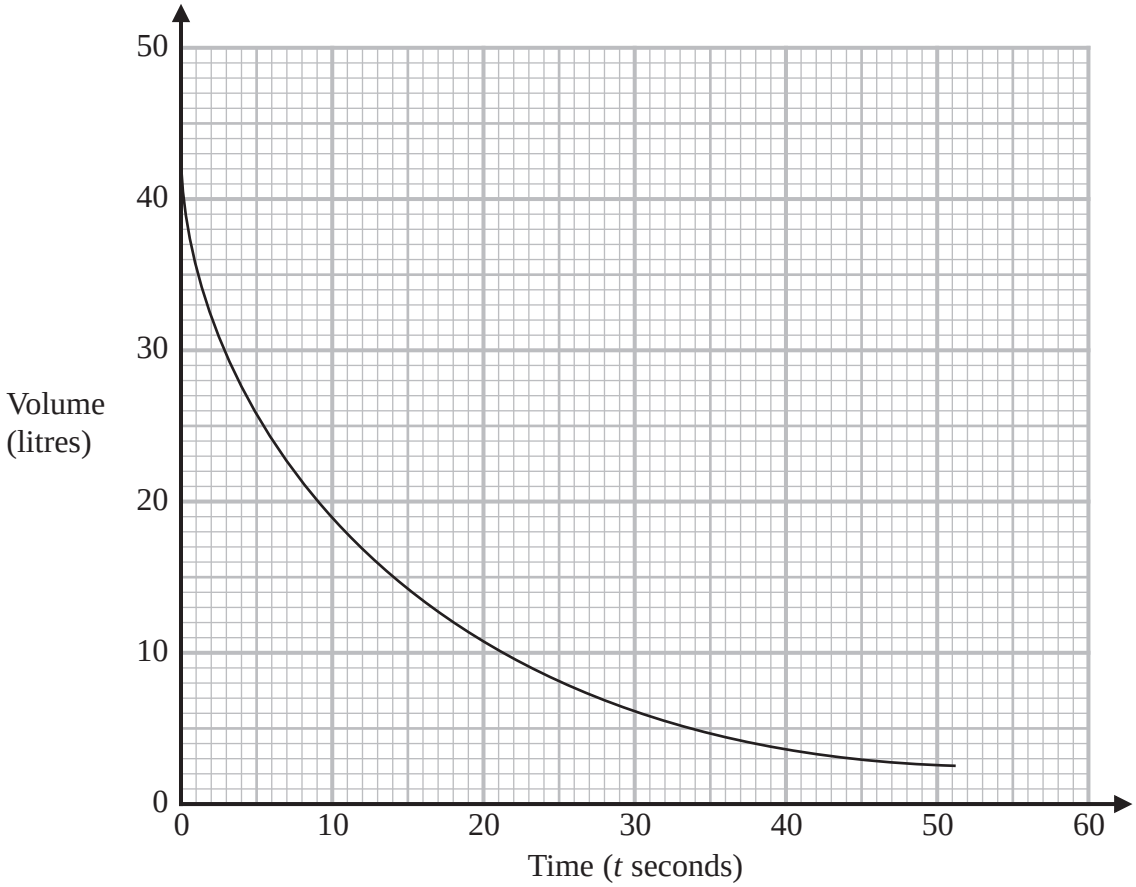
She writes $x = 6.4$

Complete the error interval for x.

..... $\leqslant x <$ .....

(Total for Question 11 is 2 marks)

15 The graph gives the volume of water, in litres, in a container at time t seconds after the water started to flow out of the container.



Using the graph, work out an estimate for the rate at which the water is flowing out of the container when $t = 12$
You must show your working.

..... litres per second

(Total for Question 15 is 3 marks)

Question 62

3 The length of a football pitch is 90 metres, correct to the nearest metre.

Complete the error interval for the length of the football pitch.

..... m $\leqslant$ length $<$ ..... m

(Total for Question 3 is 2 marks)

4 Festival A will be in a rectangular field with an area of 80 000 m^2
The greatest number of people allowed to attend Festival A is 425

Festival B will be in a rectangular field 700 m by 2000 m.
The greatest number of people allowed to attend Festival B is 6750

The area per person allowed for Festival B is greater than the area per person allowed for Festival A.

(a) How much greater?
Give your answer correct to the nearest whole number.

..... m^2
(4)

Callum says,

"300 cm^2 is the same as 3 m^2 because there are 100 cm in 1 m so you divide by 100"

Callum's method is wrong.

(b) Explain why.

.....

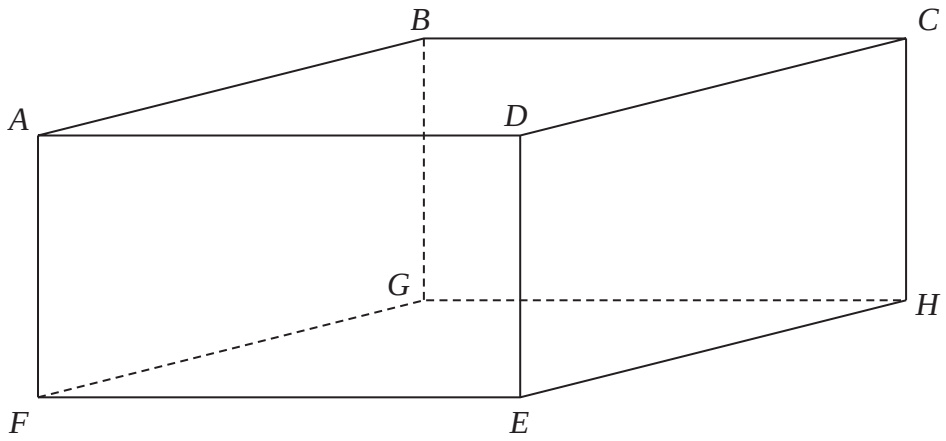
.....

.....

(1)

(Total for Question 4 is 5 marks)

20 *ABCDEFGH* is a cuboid.



$AD = 9\,\text{cm}$
$FD = 13\,\text{cm}$
Angle $GHF = 49°$

Work out the size of angle FAH.
Give your answer correct to the nearest degree.

.....°

(Total for Question 20 is 4 marks)

Question 65

12 Martin used his calculator to work out the value of a number P.
He wrote down the first two digits of the answer on his calculator.

He wrote down 1.2

Complete the error interval for P.

..... $\leqslant P <$ .....

(Total for Question 12 is 2 marks)

Question 66

7 A number, d, is rounded to 1 decimal place.
The result is 12.7

Complete the error interval for d.

..... $\leqslant d <$ .....

(Total for Question 7 is 2 marks)

2 Jonny wants to know how much coffee he will need for 800 people at a meeting.

Each person who drinks coffee will drink 2 cups of coffee.
10.6 g of coffee is needed for each cup of coffee.

Jonny assumes 68% of the people will drink coffee.

(a) Using this assumption, work out the amount of coffee Jonny needs.
Give your answer correct to the nearest gram.

..... g
(4)

Jonny's assumption is wrong.
72% of the people will drink coffee.

(b) How does this affect your answer to part (a)?

.....

.....

.....

(1)

(Total for Question 2 is 5 marks)

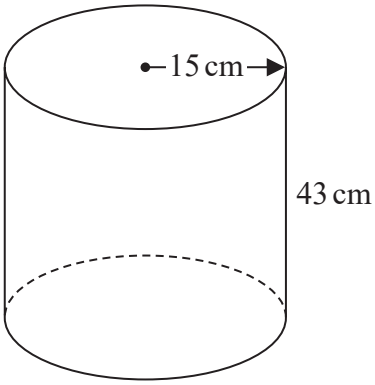
6 Lava flows from a volcano at a constant rate of $11.9\,m^3/s$

How many days does it take for $67\,205\,600\,m^3$ of lava to flow from the volcano?
Give your answer correct to the nearest day.

..... days

(Total for Question 6 is 3 marks)

7 The diagram shows an empty tank in the shape of a cylinder.



The cylinder has radius 15 cm and height 43 cm.

Water flows into the tank at a rate of 0.47 litres per minute.

Calculate the number of minutes it will take to completely fill the tank.
Give your answer correct to the nearest minute.

..... minutes

(Total for Question 7 is 4 marks)

8 A number x is written correct to 2 significant figures.

The result is 1.9

Complete the error interval for x.

..... $\leqslant x <$ .....

(Total for Question 8 is 2 marks)

22 Ebony makes some bracelets to sell.

The materials to make all the bracelets cost £190, correct to the nearest £5
Ebony sells all the bracelets for a total of £875, correct to the nearest £5

The total time taken to make and sell all these bracelets was 72 hours, correct to the nearest hour.

Ebony uses this method to calculate her hourly rate of pay

$$\text{Hourly rate of pay} = \frac{\text{total selling price} - \text{total cost of materials}}{\text{total time taken}}$$

The minimum hourly rate of pay for someone of Ebony's age is £8.20

By considering bounds, determine if Ebony's hourly rate of pay was definitely more than £8.20
You must show all your working.

(Total for Question 22 is 4 marks)

5 Sophie drives a distance of 513 kilometres on a motorway in France.
She pays 0.81 euros for every 10 kilometres she drives.

(a) Work out an estimate for the total amount that Sophie pays.

..... euros

(3)

(b) Is your answer to part (a) an underestimate or an overestimate?
Give a reason for your answer.

.....

.....

.....

(1)

(Total for Question 5 is 4 marks)

9 A number N is rounded to 2 significant figures.
The result is 7.3

(a) Write down the least possible value of N.

.....

(1)

Leila says,

"The value of N cannot be greater than 7.349 because 7.350 would round up to 7.4"

(b) Is Leila correct?
You must give a reason for your answer.

.....

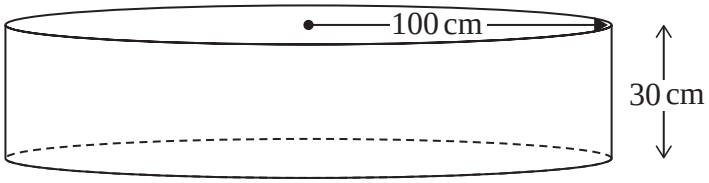
.....

.....

(1)

(Total for Question 9 is 2 marks)

7 A paddling pool is in the shape of a cylinder.



The pool has radius 100 cm.
The pool has depth 30 cm.

The pool is empty.
It is then filled with water at a rate of 250 cm^3 per second.

Work out the number of minutes it takes to fill the pool completely.
Give your answer correct to the nearest minute.
You must show all your working.

..... minutes

(Total for Question 7 is 4 marks)

19 $R = \dfrac{P}{Q}$

$P = 5.88 \times 10^8$ correct to 3 significant figures.
$Q = 3.6 \times 10^5$ correct to 2 significant figures.

Work out the lower bound for R.
Give your answer as an ordinary number correct to the nearest integer.
You must show all your working.

.....

(Total for Question 19 is 3 marks)

Question 76

19 $T = \dfrac{w}{a - c}$

w = 435 correct to the nearest 5
a = 9.8 correct to 2 significant figures.
c = 2.5 correct to 2 significant figures.

By considering bounds, calculate the value of T to a suitable degree of accuracy.
You must show all your working and give a reason for your final answer.

.....

(Total for Question 19 is 5 marks)

Question 77

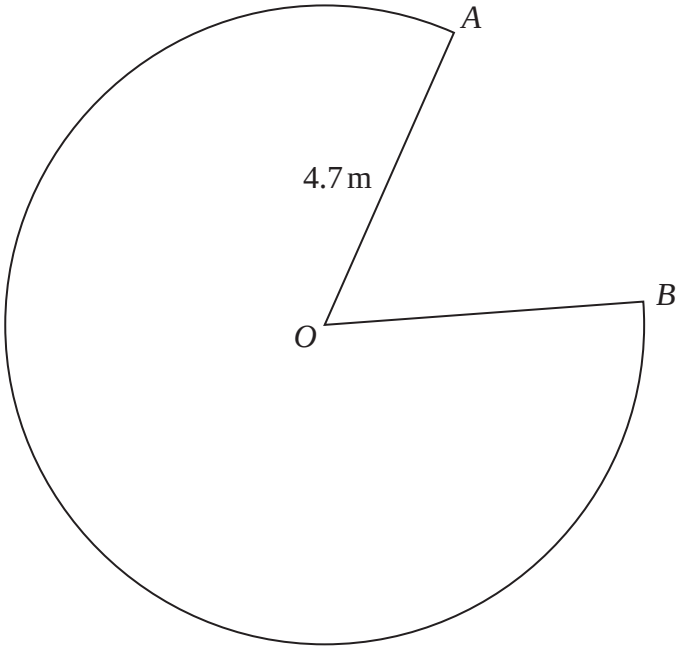
7 Jana used her calculator to find the value of a number t.
The answer on her calculator began 10.2

Complete the error interval for t.

..... $\leqslant t <$ .....

(Total for Question 7 is 2 marks)

11 *OAB* is a sector of a circle with centre *O* and radius 4.7 m.



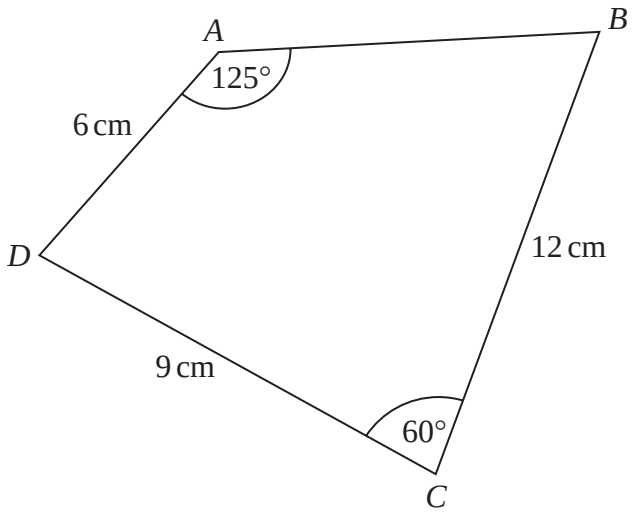
The sector has a perimeter of 34.3 m.

Find the size of the reflex angle *AOB*.
Give your answer correct to the nearest degree.

.....°

(Total for Question 11 is 3 marks)

23 *ABCD* is a quadrilateral.



Find the size of angle *ABC*.
Give your answer correct to the nearest degree.

.....°

(Total for Question 23 is 5 marks)

Question 80

5 Karim rounds a number, n, to 1 decimal place.
The result is 23.8

Complete the error interval for n.

..... $\leqslant n <$ .....

(Total for Question 5 is 2 marks)

19 There are some sheets of paper in a pile.

The height of the pile is 10.4 cm, correct to the nearest mm.
The thickness of each sheet of paper is 0.17 mm, correct to 2 significant figures.

Calculate the upper bound for the number of sheets of paper in the pile.
You must show all your working.

.....

(Total for Question 19 is 3 marks)