Name: SOLUTIONS

GCSE (1 - 9)

Bounds

These questions represent all of the times that this topic has appeared in unlocked Pearson Edexcel GCSE maths papers.

Question	Where the question appeared
1	Edexcel, GCSE, Summer 2017, Paper 3H, Q17
2	Edexcel, GCSE, Autumn 2017, Paper 1H, Q13
3	Edexcel, GCSE, Autumn 2017, Paper 3H, Q16
4	Edexcel, GCSE, Summer 2018, Paper 2H, Q21
5	Edexcel, GCSE, Autumn 2018, Paper 3H, Q18
6	Edexcel, GCSE, Summer 2019, Paper 3H, Q19
7	Edexcel, GCSE, Autumn 2019, Paper 2H, Q20
8	Edexcel, GCSE, Autumn 2020, Paper 3H, Q18

1

A train travelled along a track in 110 minutes, correct to the nearest 5 minutes.

Jake finds out that the track is 270 km long.
He assumes that the track has been measured correct to the nearest 10 km.

(a) Could the average speed of the train have been greater than 160 km/h?
You must show how you get your answer.

LB | | UB
107.5 | 110 | 112.5
265 | 270 | 275

$\text{Speed} = \frac{\text{distance}}{\text{time}}$

$\text{Greatest Speed} = \frac{275}{107.5} \times 60$

$= 153.488$

No. 153.488 < 160.

(4)

Jake's assumption was wrong.
The track was measured correct to the nearest 5 km.

(b) Explain how this could affect your decision in part (a).

No change. Maximum possible distance is now lower.
So highest average speed would be lower.

(1)

(Total for Question 17 is 5 marks)

[Edexcel, GCSE, Summer 2017, Paper 3H, Q17]

2

A factory makes 450 pies every day.
The pies are chicken pies or steak pies.

Each day Milo takes a sample of 15 pies to check.

The proportion of the pies in his sample that are chicken is the same as the proportion of the pies made that day that are chicken.

On Monday Milo calculated that he needed exactly 4 chicken pies in his sample.

(a) Work out the total number of chicken pies that were made on Monday.

$\frac{4}{15} \times 450 = 120$

120

(2)

On Tuesday, the number of steak pies Milo needs in his sample is 6 correct to the nearest whole number.

Milo takes at random a pie from the 450 pies made on Tuesday.

(b) Work out the lower bound of the probability that the pie is a steak pie.

LB 5.5 6 UB 6.5

$\frac{5.5}{15} = \frac{165}{450}$ (×30 / ×30)

$\frac{165}{450}$

(2)

(Total for Question 13 is 4 marks)

[Edexcel, GCSE, Autumn 2017, Paper 1H, Q13]

3

The petrol consumption of a car, in litres per 100 kilometres, is given by the formula

$$\text{Petrol consumption} = \frac{100 \times \text{Number of litres of petrol used}}{\text{Number of kilometres travelled}}$$

Nathan's car travelled 148 kilometres, correct to 3 significant figures.
The car used 11.8 litres of petrol, correct to 3 significant figures.

Nathan says,

"My car used less than 8 litres of petrol per 100 kilometres."

Could Nathan be wrong?
You must show how you get your answer.

LB
147.5
11.75

UB
148.5
11.85

$$\frac{100 \times 11.85}{147.5}$$

$= 8.03389$

Yes. $8.03389 > 8$

(Total for Question 16 is 3 marks)

[Edexcel, GCSE, Autumn 2017, Paper 3H, Q16]

4

Jackson is trying to find the density, in g/cm³, of a block of wood.
The block of wood is in the shape of a cuboid.

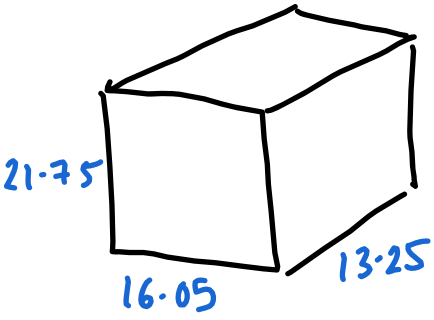
He measures
the length as 13.2 cm, correct to the nearest mm
the width as 16.0 cm, correct to the nearest mm
the height as 21.7 cm, correct to the nearest mm

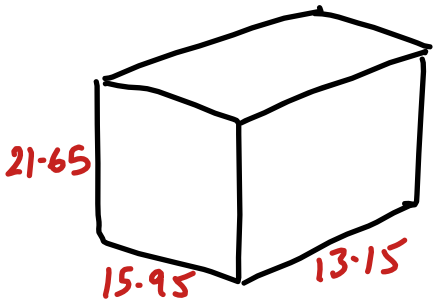
He measures the mass as 1970 g, correct to the nearest 5 g.

LB: 1967.5 UB: 1972.5

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.





Max Volume
$= 21.75 \times 16.05 \times 13.25$
$= 4625.41\ cm^3$

Min Volume
$= 21.65 \times 15.95 \times 13.15$
$= 4540.93\ cm^3$

LB density $= \frac{1967.5}{4625.41}$

$= 0.425367$

UB density $= \frac{1972.5}{4540.93}$

$= 0.434382$

UB and LB both round to 0.43 to 2dp.

(Total for Question 21 is 5 marks)

[Edexcel, GCSE, Summer 2018, Paper 2H, Q21]

5

A high speed train travels a distance of 487 km in 3 hours.

3 hours = 180 minutes

The distance is measured correct to the nearest kilometre.
The time is measured correct to the nearest minute.

By considering bounds, work out the average speed, in km/minute, of the train to a suitable degree of accuracy.
You must show all your working and give a reason for your answer.

Speed = distance / time

LB	UB
486.5	487.5
179.5	180.5

$$\text{Speed LB} = \frac{486.5}{180.5} = 2.695290$$

$$\text{Speed UB} = \frac{487.5}{179.5} = 2.715877$$

LB and UB both round to 2.7

.....km/minute

(Total for Question 18 is 5 marks)

[Edexcel, GCSE, Autumn 2018, Paper 3H, Q18]

6

$$D = \frac{u^2}{2a}$$

$u = 26.2$ correct to 3 significant figures

$a = 4.3$ correct to 2 significant figures

(a) Calculate the upper bound for the value of D.
Give your answer correct to 6 significant figures.
You must show all your working.

LB

26·15

4·25

UB

26·25

4·35

Upper bound of D = $\frac{26.25^2}{2 \times 4.25}$ = 81·0662

(3)

The lower bound for the value of D is 78.6003 correct to 6 significant figures.

(b) By considering bounds, write down the value of D to a suitable degree of accuracy.
You must give a reason for your answer.

80.

Bounds agree when rounded to 80.

(2)

(Total for Question 19 is 5 marks)

[Edexcel, GCSE, Summer 2019, Paper 3H, Q19]

7

$d = \frac{1}{8}c^3$

$c = 10.9$ correct to 3 significant figures.

By considering bounds, work out the value of d to a suitable degree of accuracy.
Give a reason for your answer.

LB

10·85

UB

10·95

Lower bound of $d = \frac{1}{8} \times 10.85^3 = 159.6611406$

Upper bound of $d = \frac{1}{8} \times 10.95^3 = 164.1165469$

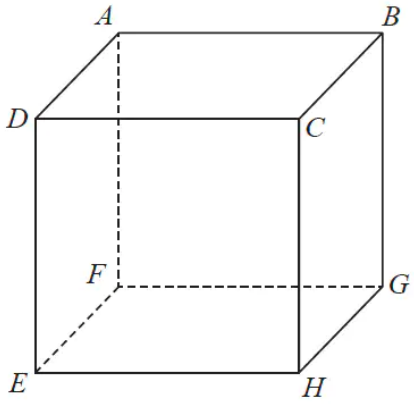
160, Both LB and UB round to 160.

(Total for Question 20 is 4 marks)

[Edexcel, GCSE, Autumn 2019, Paper 2H, Q20]

8

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.

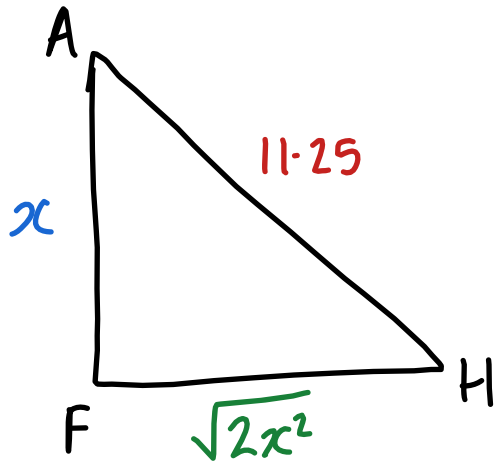
$x^2 + 2x^2 = 3x^2$

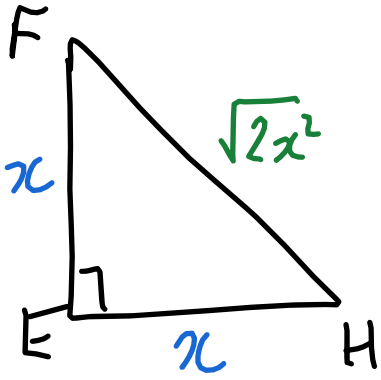
$3x^2 = 11.25^2$

$x^2 = \frac{126.5625}{3}$

$x^2 = 42.1875$

$x = 6.49519$





$x^2 + x^2 = 2x^2$

6·49519 cm

(Total for Question 18 is 4 marks)

[Edexcel, GCSE, Autumn 2020, Paper 3H, Q18]