AQA

.CG Maths.
Worked Solutions

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

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Forename(s) _____

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I declare this is my own work.

GCSE
MATHEMATICS

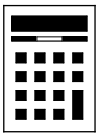
F

Foundation Tier Paper 3 Calculator

Monday 7 November 2022 Morning Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:
- a calculator
- mathematical instruments
- the Formulae Sheet (enclosed).



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.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- 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.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

Advice

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

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
24–25	
TOTAL	

Please note that these worked solutions have neither been provided nor approved by AQA and may not necessarily constitute the only possible solutions. Please refer to the original mark schemes for full guidance.

Any writing in blue indicates what must be written in order to answer the questions and get the marks. The worked solutions have been designed to show the smallest amount of work which needs to be done to answer the question.

Anything written in green in a cloud doesn't have to be written in the exam.

Anything written in orange in a rectangle doesn't have to be written in the exam and is there to show what should be put into a calculator or measured using a ruler or protractor.

If you find any mistakes or have any requests or suggestions, please send an email to curtis@cgmaths.co.uk

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Answer **all** questions in the spaces provided.

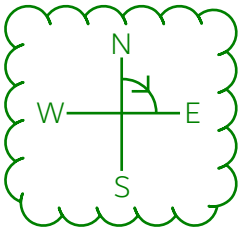
Do not write outside the box

1 What is the **clockwise** turn from North to East?

Circle your answer.

[1 mark]

45° 90° 270° 315°



2 d is 6 more than c.

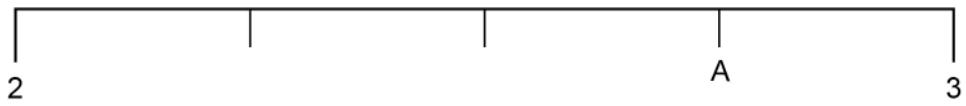
Circle the correct equation.

[1 mark]

$d = 6c$ $c = 6d$ $d = c + 6$ $c = d + 6$

'is' means =. Adding 6 to c expresses 6 more than c

3 Here is a number line.



Which number is at A?

Circle your answer.

[1 mark]

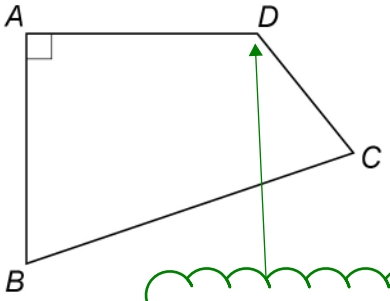
2.3 2.55 2.6 2.75

1 ÷ 4 = 0.25
0.25 x 3 = 0.75
2 + 0.75 = 2.75

There is a difference of 1 between 2 and 3. Dividing this difference by the 4 divisions between them on the number line works out that each division is worth 0.25. A is 3 divisions after 2 so multiplying the 0.25 by 3 works out that it is 0.75 after 2. Adding this 0.75 to the 2 works out A

Do not write outside the box

4 In the quadrilateral, which angle is **obtuse**?



Circle your answer.

[1 mark]

ADC *BAD* *CBA* *DCB*

It is more than 90° but less than 180°

5 (a) Write down the **two** prime numbers between 25 and 35

[2 marks]

Prime numbers can only be divided by themselves and 1

Answer 29 and 31

Using the calculator to express all the odd numbers between 25 and 35 as a product of prime factors

If a number doesn't change, it is prime. For example $27 = 3^3$ so is not prime but $29 = 29$ so it is prime

5 (b) Write down **one** cube number between 100 and 300

[1 mark]

Answer 125

$\sqrt[3]{100} = 4.6...$
$5^3 = 125$

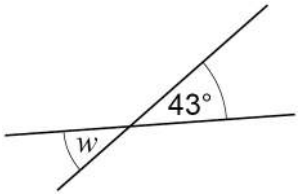
Cube rooting the 100 tells us that the number must be over 4.6... cubed, so could be 5 cubed

7

Do not write outside the box

6 (a) Here are two straight lines.

Not drawn accurately



Write down the size of angle w.

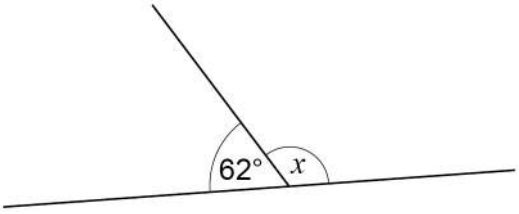
[1 mark]

$w =$ 43 degrees

Vertically opposite angles are equal

6 (b) Here are two different straight lines.

Not drawn accurately



Work out the size of angle x.

[1 mark]

180 - 62 = 118 ← Angles around a point on a straight line add up to 180°

$x =$ 118 degrees

6 (c) In a triangle, two of the angles are 51° and 74°.

Work out the size of the third angle.

[1 mark]

180 - 51 - 74 = 55 ← Angles in a triangle add up to 180°

Answer 55 degrees

Do not write outside the box

7 (a) Solve $12 - e = 0$

[1 mark]

$e =$ 12

12 - 12 = 0

7 (b) Solve $7f = 0$

[1 mark]

$f =$ 0

7 x 0 = 0

8 Put these probabilities in order, starting with the **least** likely.

72% 0.705 $\frac{7}{10}$

70.5% 70%

[2 marks]

0.705 x 100 = 70.5
7/10 x 100 = 70

Multiplying any decimal or fraction by 100 converts it into a percentage. Percentages are easy to compare

Answer $\frac{7}{10}$, 0.705 , 72%

7

Do not write outside the box

9

x	0	2	4	6	8	10
y	3	7	11	15	19	23

The x-values in the table make a linear sequence.

The y-values in the table make a different linear sequence.

9 (a) Complete the table.

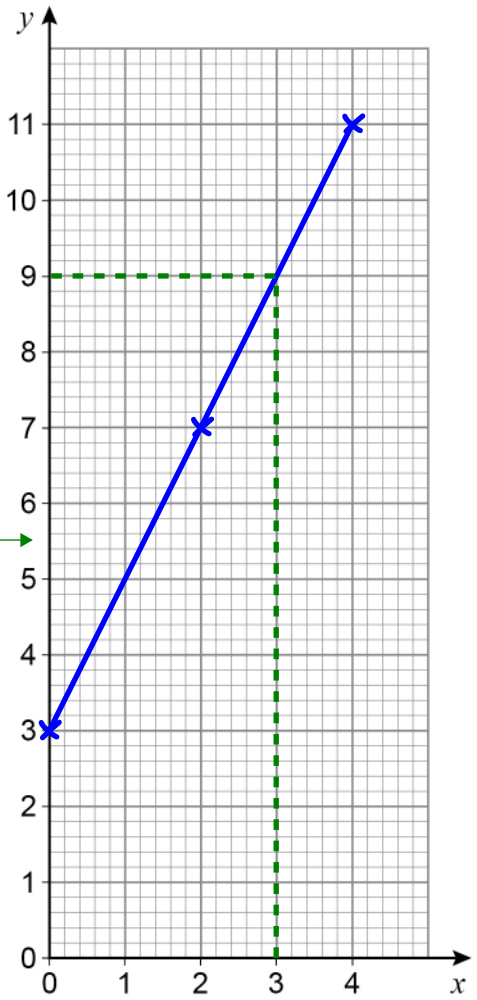
[2 marks]

8 + 2 = 10
11 + 4 = 15

The x values increase by 2 between each term.
The y values increase by 4 between each term

9 (b) Draw a straight line passing through the points (0, 3), (2, 7) and (4, 11)

[2 marks]



Plotting the points then drawing a straight line through them

Do not write outside the box

9 (c) Use the graph to work out the value of y when $x = 3$

[1 mark]

$y =$ 9

Reading up from 3 on the x-axis to the line then across to the y-axis

10 (a) When 5 is added to a negative number, the answer can be **positive**

Give **one** example to show that this is correct.

[1 mark]

-1+5=4 ← -1 is a negative number. Adding 5 to this gives 4, which is a positive number

10 (b) When 5 is added to a negative number, the answer can be **negative**

Give **one** example to show that this is correct.

[1 mark]

-6+5=-1 ← -6 is a negative number. Adding 5 to this gives -1, which is a negative number

10 (c) When a number is doubled, the answer is always greater than the original number

Give **one** example to show that this is **not** correct.

[1 mark]

0x2=0 ← Doubling means to multiply by 2. When 0 is doubled, the answer is 0 and this is not greater than 0

8

Do not write outside the box

11 480 people are asked if they eat sushi.

20% say Yes.

$\frac{2}{3}$ of the people who say Yes eat sushi at least once a month.

Complete the frequency tree.

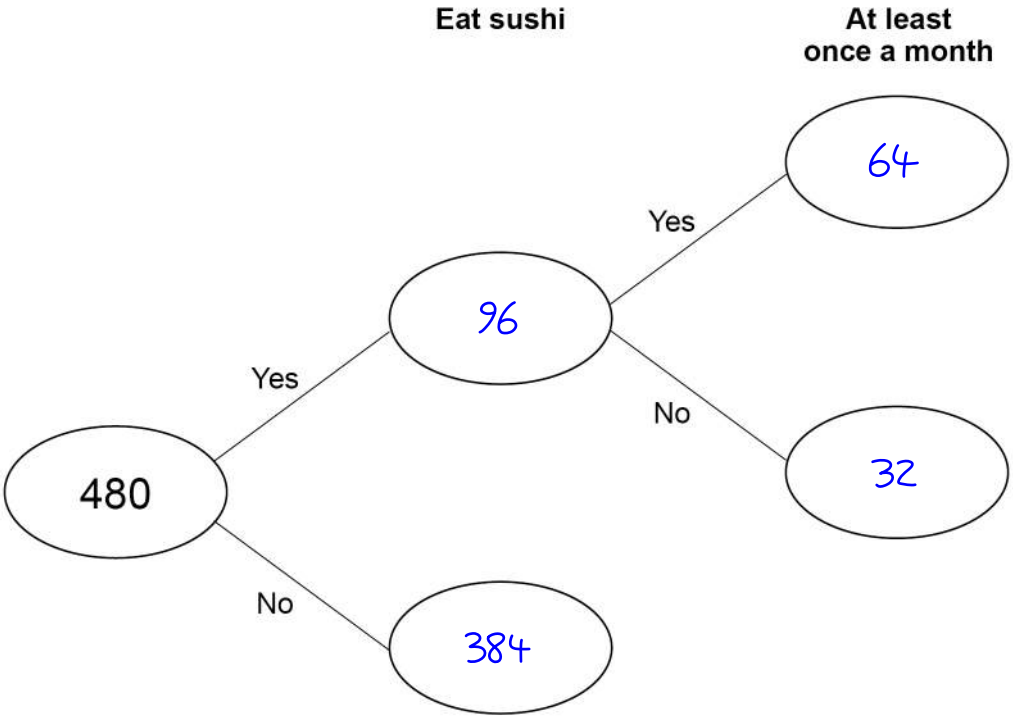
[4 marks]

48×2 ← 10% is 1/10 as a fraction. 480 ÷ 10 = 48 so 10% of 480 is 48. Multiplying this by 2 works out that 20% of 480 is 96, so this many say yes

480−96 ← There are 480 people in total. Subtracting the 96 who say yes leaves 384 who say no

$\frac{2}{3}$×96 ← 'Of' means to multiply so this works out 2/3 of the 96 who say yes, which works out that 64 eat sushi at least once a month

96−64 ← Subtracting the 64 who eat sushi at least once a month from the 96 who say yes leaves 32 who do not eat sushi at least once a month



Do not write outside the box

12 Event A has taken place every 4 years.

Event B has taken place every 3 years.

Both events took place in 2019

Work out the last year, before 2019, when both events took place.

[2 marks]

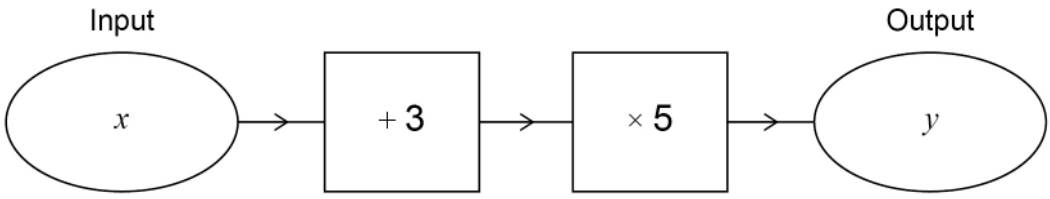
2019
− 12
2007

The lowest common multiple of 3 and 4 is 12 so the events both take place at the same time every 12 years. So they must have both took place 12 years before 2019.
To find the lowest common multiple, count up in 4s until a multiple of 3 is found

Answer 2007

13 Luke wants to make a number machine so that $y = 5x + 3$

Here is his attempt.



What mistake has he made?

[1 mark]

Should multiply by 5 then add 3

Currently the addition is done first to get x + 3.
Then it is all multiplied by 5 to get 5x + 15

7

Do not write outside the box

14 Circle the solid that has six edges.

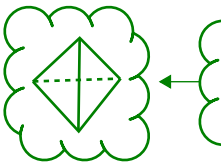
[1 mark]

triangular-based pyramid

sphere

cube

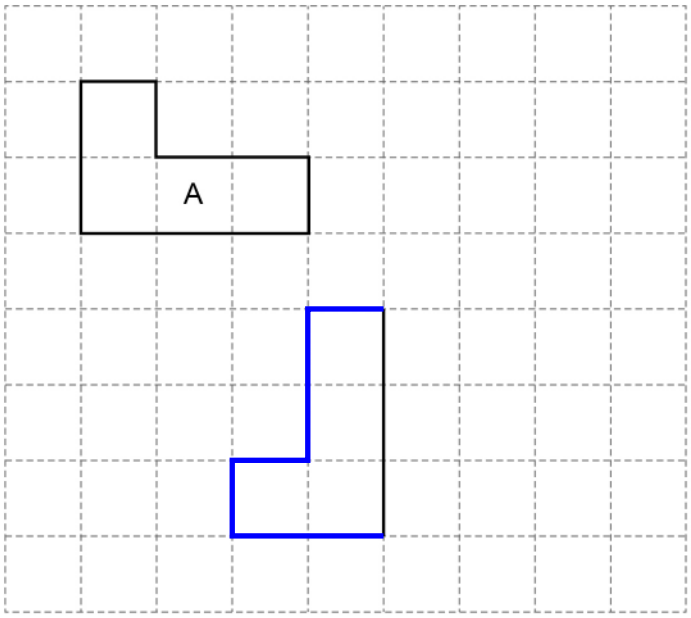
cylinder



A triangular-based pyramid has 3 edges on the triangle on the base then 3 edges joining up to the corner at the top

15 (a) On the grid, shape A is shown.

One side of shape B is also shown.



Complete shape B so that it is congruent to shape A.

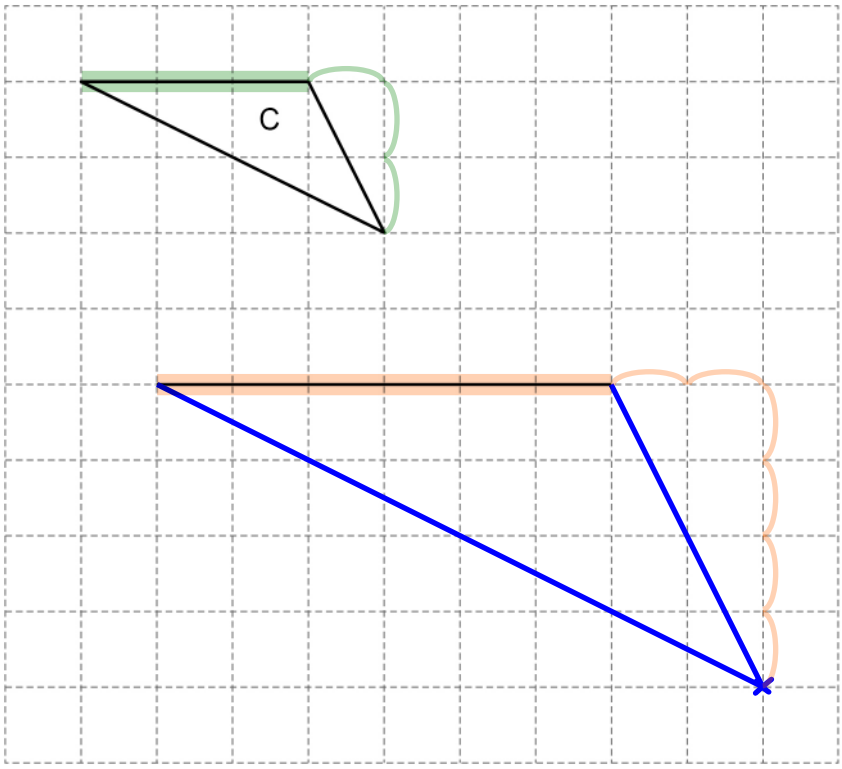
[1 mark]

Congruent means the shape is the same shape and size

Do not write outside the box

15 (b) On this grid, shape C is shown.

One side of shape D is also shown.



Complete shape D so that it is an enlargement of shape C with scale factor 2

[1 mark]

The side highlighted in orange is the bigger version of the side highlighted in green as it is twice the size. There is 1 jump to the right and 2 jumps down to get from the top right corner to the bottom corner on the smaller shape. Multiplying both of these amounts by 2 finds that there now needs to be 2 jumps to the right and 4 jumps down. Plotting where the bottom corner should be then drawing the sides

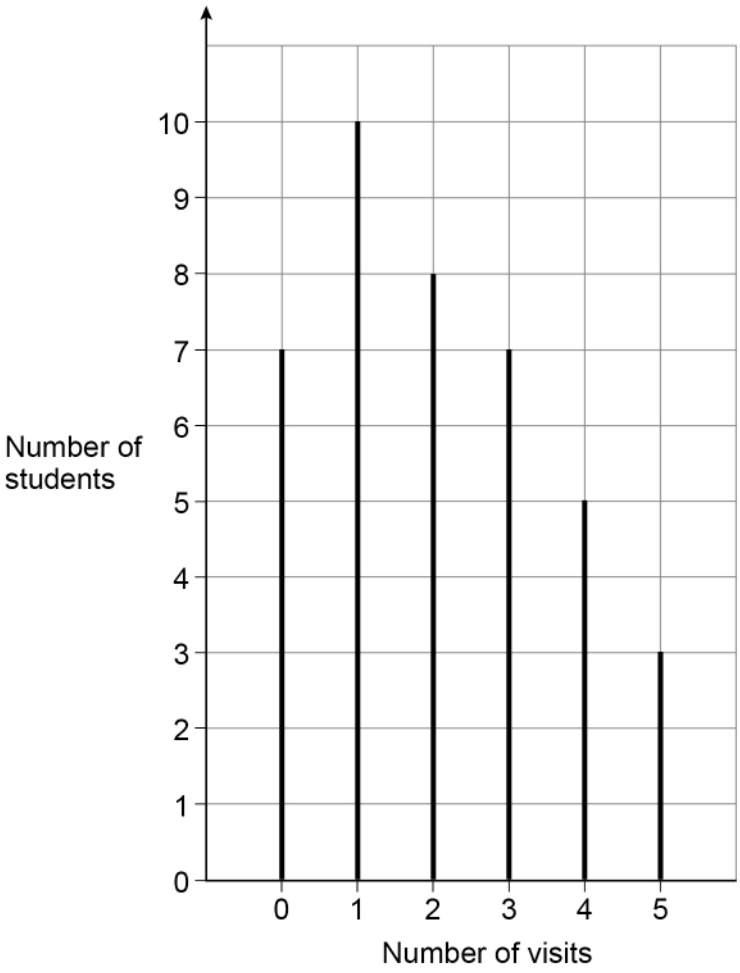
Turn over for the next question

3

Do not write outside the box

16 40 students were asked the number of visits they made to a gym one week.

The chart shows information about the results.



16 (a) Write down the modal number of visits.

[1 mark]

Answer 1

This was the number of visits with the most students so it the mode

Do not write outside the box

16 (b) Work out the mean number of visits.

Give your answer as a decimal.

[3 marks]

Mean = total ÷ number, where total is the total number of visits and number is the number of students

0×7=0
1×10=10
2×8=16
3×7=21
4×5=20
5×3=15

Multiplying the number of visits by the number of students works out the total of each bar

0+10+16+21+20+15

Adding the total of each bar works out that the overall total number of visits was 82

82÷40

Dividing the overall total number of visits by the 40 students works out the mean

Answer 2.05

16 (c) One of the 40 students is chosen at random.

Work out the probability that the student visited the gym **at least** once.

[2 marks]

10+8+7+5+3

Adding the numbers of students who visited 1, 2, 3, 4 and 5 times works out that 33 of the students visited at least once

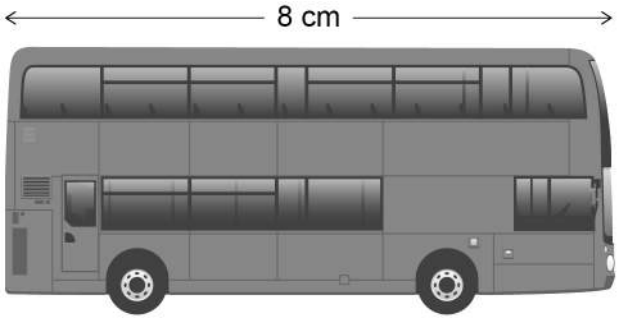
Answer $\frac{23}{40}$

33 out of the 40 students visited at least once

6

Do not write outside the box

17 This scale drawing of a bus has length 8 cm



Scale 1 cm represents 1.65 m

The actual length of the bus is 3.8 times the actual length of a car.

Work out the actual length of the car.

Give your answer in metres, to the nearest centimetre.

[3 marks]

8×1.65 ← Multiplying the 8cm by the 1.65m each centimetre represents works out that the length of the bus is 13.2m

13.2÷3.8 ← Dividing the length of the bus by 3.8 works out the length of the car

Answer 3.47 metres

The answer of 3.473... is rounded to 2 decimal places as a centimetre is 0.01m and it needs to be given to the nearest centimetre

Do not write outside the box

18 11 identical full tins of red paint hold a total of 3630 ml

All the paint from 4 of these tins is poured into an empty bucket.

The bucket can hold 2500 ml

Tins of white paint each hold 140 ml

Can all the white paint from 9 tins be added to the bucket?

You **must** show your working.

[4 marks]

3630 ÷ 11 ← Dividing the total capacity of the 11 tins of red paint by 11 works out that each tin of red paint holds 330ml

330 × 4 ← Multiplying the 330ml held by each tin of red paint by the 4 tins poured into the bucket works out that there is 1320ml of red paint in the bucket

2500 − 1320 ← Subtracting the 1320ml of red paint in the bucket from the 2500ml it can hold works out that 1180ml of white paint can be added to the bucket

1180 ÷ 140 = 8.4 ← Dividing the 1180ml of white paint which can be added to the bucket by the 140ml in each tin of white paint works out that just over 8 tins of white paint can be added to the bucket

No ← White paint from 9 tins cannot be added to the bucket

19 The largest possible value of n is 2

Circle the correct inequality.

[1 mark]

$n \leqslant 2$ $\quad n < 2$ $\quad n \geqslant 2$ $\quad n > 2$

n must be less than or equal to 2

8

Do not write outside the box

20 Jamil is on holiday in France.

20 (a) The cost of a room in a hostel is 27 euros.

Convert the cost to £

Use £1 = 1.2 euros

[2 marks]

27÷1.2 ← Every 1.2 euros is £1. Dividing the 27 euros by 1.2 works out how many lots of 1.2 euros it is and therefore how many pounds it is

Answer £ 22.50

22.5 is £22.50

20 (b) Jamil rides a motorbike.

The motorbike uses one litre of petrol for every 14 miles.

How many litres of petrol does the motorbike use to go 168 kilometres?

Use 8 kilometres = 5 miles

[3 marks]

168÷8 ← This works out that the 168km is 21 lots of 8km

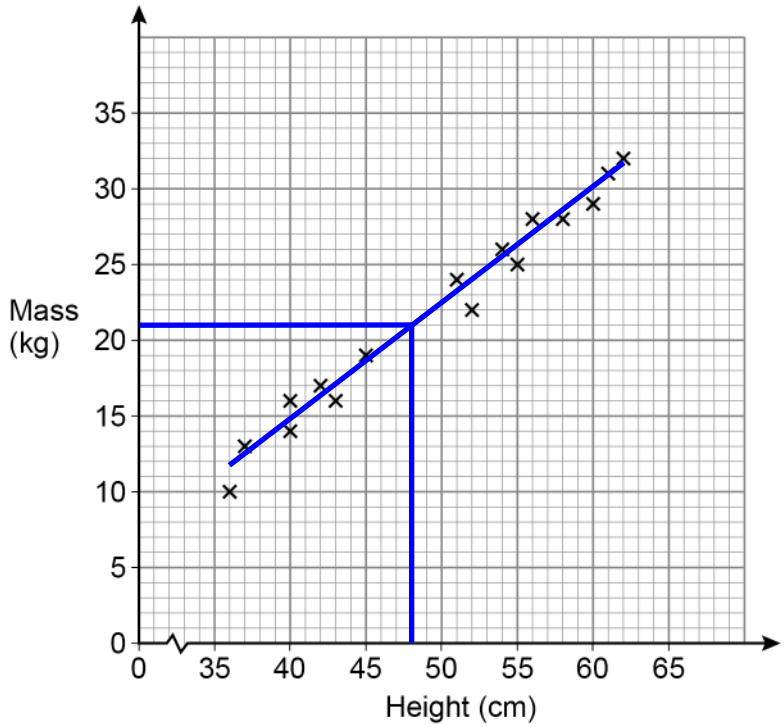
21×5 ← Each lot of 8km is 1 lot of 5 miles so multiplying the 21 lots by 5 to convert it into 105 miles

105÷14 ← This works out how many lots of the 14 miles are done and therefore how many litres of petrol are used

Answer 7.5 litres

Do not write outside the box

21 The scatter graph shows the height and mass of some dogs.



21 (a) The scatter graph shows positive correlation.

Describe the relationship between the height and mass of the dogs.

[1 mark]

The greater the height, the greater the mass

21 (b) Use a line of best fit to estimate the mass of a dog with height 48 cm

[2 marks]

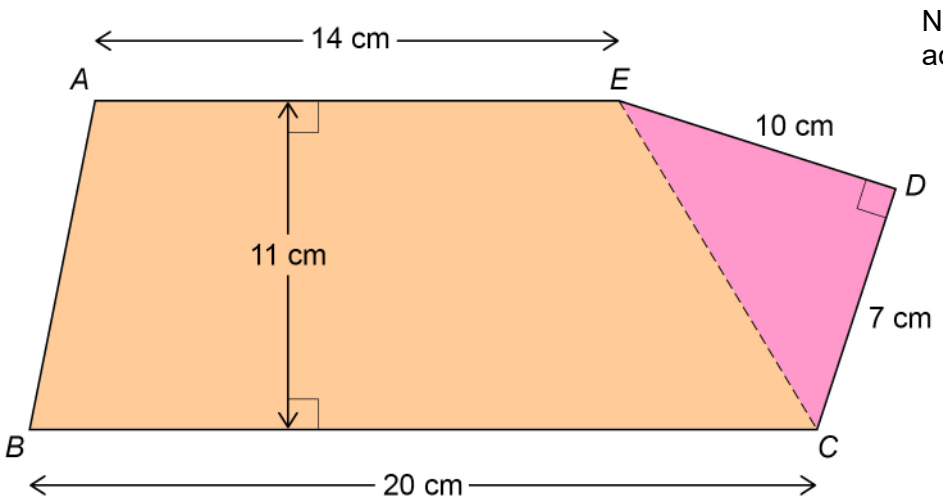
Answer 21 kg

A straight line of bests fit is drawn using a clear ruler. The ruler is lined up in the same direction as the points with a roughly equal spread of point above and below. Then reading up from the height of 48cm to the line then across to the mass

8

Do not write outside the box

22 *ABCDE* is a pentagon.



Not drawn accurately

Work out the area of the pentagon.

[3 marks]

$\frac{1}{2}(14+20)\times 11=187$ ← Area of the orange trapezium. Area of trapezium = 1/2 (a + b)h, where a and b are the parallel sides and h is the distance between them

$\frac{1}{2}\times 7\times 10=35$ ← Area of the pink triangle. Area of triangle = 1/2 x base x height. The base is 7cm and the height is 10cm

$187+35$ ← Adding the area of the orange trapezium and the pink triangle works out the area of the pentagon

Answer 222 cm^2

Do not write outside the box

23 Joe, Kim and Lisa each have an amount of money.

Joe has £72

Joe's amount : Kim's amount = 6 : 5

Lisa's amount is $1\frac{1}{2}$ times Joe's amount.

Show that, in total, they have **less** than £250

[3 marks]

$72 \div 6$ ← 6 parts of the ratio represent Joe's amount. So dividing the £72 Joe has by 6 works out the value of 1 part of the ratio

$12 \times 5 = 60$ ← Multiplying the value of 1 part of the ratio by the 5 parts which represent Kim works out that Kim has £60

$1\frac{1}{2} \times 72 = 108$ ← This works out that Lisa has £108

$72 + 60 + 108 = 240$ ← Adding the £72 Joe has, the £60 Kim has and the £108 Lisa has works out that they have £240 in total, which is less than £250

Turn over for the next question

6

Do not write outside the box

24 A solid statue has volume 512 cm^3

The statue has mass 3.6 kilograms.

density of iron = 7.87 grams per cubic centimetre

Is the statue made of iron?

You **must** show your working.

[3 marks]

The unit of density (grams per cubic centimetre) tells us that the mass in grams needs to be divided by the volume in cm^3

3.6 × 1000 ← Converting the kilograms to grams. There are 1000g in 1kg

3600 ÷ 512 = 7.0 ← Dividing the mass in grams by the volume in cubic centimetres works out that the density is 7.0... g/cm^3

No ← 7.0... is not 7.87 so it is not made of iron

Do not write outside the box

25 (a) Here is the rule for a sequence.

> After the first two terms, each term is the sum of the previous two terms

The 1st term is 33

The 2nd term is x

The 4th term is 73

Work out the value of x.

[3 marks]

$33+x$ ← This is the 3rd term. Adding the 1st and 2nd term gives the 3rd term

$x+33+x$ ← This is the 4th term. Adding the 2nd and 3rd term gives the 4th term

$2x+33=73$ ← Simplifying the expression for the 4th term by collecting like terms. Setting it equal to the actual value of the 4th term which is 73

$2x=40$ ← Subtracting 33 from both sides to get the x term on its own

$x =$ 20

Dividing both sides by 2 finds x

25 (b) An expression for the nth term of a different sequence is $n - n^2$

Ruth says,

"All the terms will be negative because n^2 is always greater than n."

Is she correct?

Tick a box.

☐ Yes ☑ No

Give a reason for your answer.

[1 mark]

The first term is 0

On the first term, n = 1. Substituting this into the expression for the nth term gives $1 - 1^2 = 0$. 0 is not negative

7

Do not write outside the box

26 *P* and *Q* are points.

The x-coordinate of *Q* is 4 **more** than the x-coordinate of *P*.

The y-coordinate of *Q* is 5 **less** than the y-coordinate of *P*.

Work out the gradient of the straight line through *P* and *Q*.

[2 marks]

Answer $\frac{-5}{4}$

Gradient = (change in y)/(change in x). The change in y from P to Q is -5 and the change in x from P to Q is 4

27 $m = pr$

p is halved and r is multiplied by 3

What happens to m ?

Circle your answer.

[1 mark]

× 6 × $\frac{1}{6}$ × $\frac{3}{2}$ × $\frac{2}{3}$

Halving p halves m. Multiplying r by 3 multiplies m by 3

Do not write outside the box

28 Here are the results after 250 spins of a coin.

Heads	128
Tails	122

The coin is spun an extra 50 times.

After all 300 spins, the relative frequency of Heads is 0.49

For the **extra 50 spins**, work out number of Heads : number of Tails

[3 marks]

300×0.49 ← Multiplying the 300 spins by the relative frequency of heads works out that there were 147 heads out of the 300 spins

$147 - 128 = 19$ ← Subtracting the 128 heads in the first 250 spins from the 147 heads in the 300 spins works out that there were 19 heads in the extra 50 spins

$50 - 19 = 31$ ← Subtracting the 19 heads from the 50 spins works out that there were 31 tails in the extra 50 spins

Answer 19 : 31

There were 19 heads and 31 tails in the extra 50 spins. Writing this as a ratio

29 Circle the equation where c is inversely proportional to d.

[1 mark]

$c = \frac{1}{2}d$ $\quad$ $c = \frac{2}{d}$ $\quad$ $c = -2d$ $\quad$ $c = -\frac{2}{d^2}$

Inversely proportional means that whatever d is multiplied or divided by, the opposite happens to c

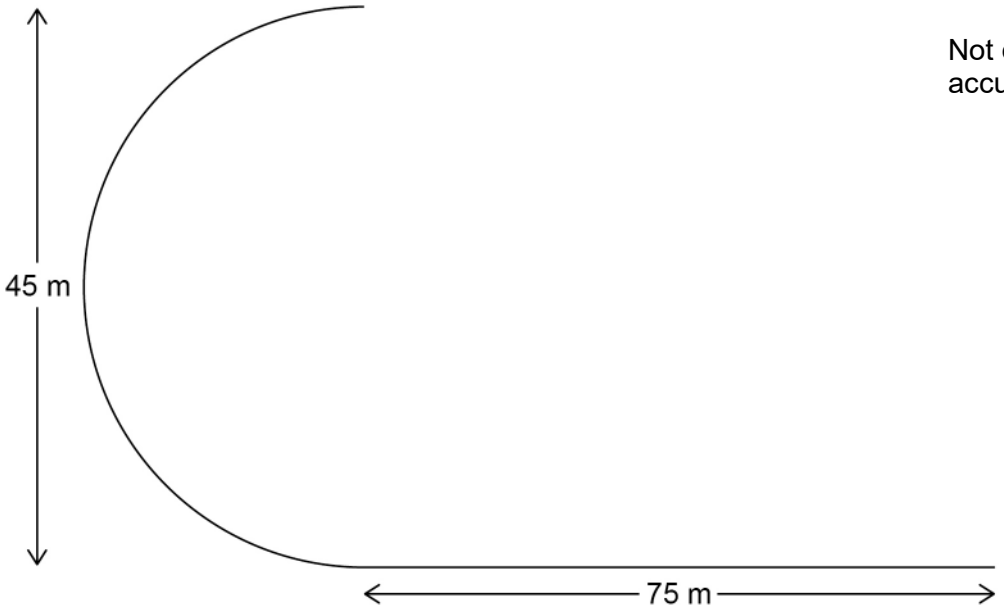
7

Do not write outside the box

30 Part of a running track is the arc of a semicircle joined to a straight line.

The semicircle has diameter 45 metres.

The straight line has length 75 metres.



Not drawn accurately

Abby runs once along this part of the track in 18 seconds.

Work out her average speed.

Give your answer to 2 significant figures.

[4 marks]

$\frac{45\pi \div 2 + 75}{18}$

Circumference is the distance around the outside of a circle and is found by multiplying the diameter by π. So 45π is the circumference of the whole circle. Dividing this by 2 expresses the length of the semi-circle. Adding the 75m to this expresses the distance of the whole track in metres. m/s is metres per second, which means to divide the distance in metres by the time in seconds. So dividing the distance of the whole track in metres by the time taken in seconds

The answer of 8.09... is rounded to 2 significant figures

Answer 8.1 m/s

Do not write outside the box

31 Here is some information about the members of clubs A and B.

	Number of members	Mean height of members
Club A	24	1.8 m
Club B	20	1.92 m

Work out $\dfrac{\text{total height of the members of club A}}{\text{total height of the members of club B}}$

Give your answer as a decimal.

[2 marks]

$m = \frac{t}{n}$ ← Mean = total/number, where total is the total height of all the members and number is the number of members in the club. Writing this as a formula triangle

$24 \times 1.8 = 43.2$
$20 \times 1.92 = 38.4$ ← From the formula triangle, total = mean x number. So multiplying the mean height by the number of members for each club works out that the total height of the members of club A is 43.2m and the total height of the members of club B is 38.4m

$\frac{43.2}{38.4}$ ← Expressing the fraction

Answer 1.125

END OF QUESTIONS

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