AQA

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Worked Solutions

GCSE
MATHEMATICS

F

Foundation Tier   Paper 3 Calculator
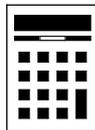
Monday 8 June 2020   Morning   Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:
• a calculator
• mathematical instruments.

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	
26	
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 the exam.

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.

1 What is 6.2819 to 2 decimal places?

Circle your answer.

[1 mark]

6.2   6.28   6.29   6.3

The 8 is in the 2nd decimal place. The 1 after it causes it to round down so the 8 stays the same and everything after it is ignored

2 50% of a number is 40

Circle the number.

[1 mark]

20   80   800   2000

50% is half. The opposite of doing half of a number is multiplying it by 2 and 40 x 2 = 80

3 Circle the correct statement.

[1 mark]

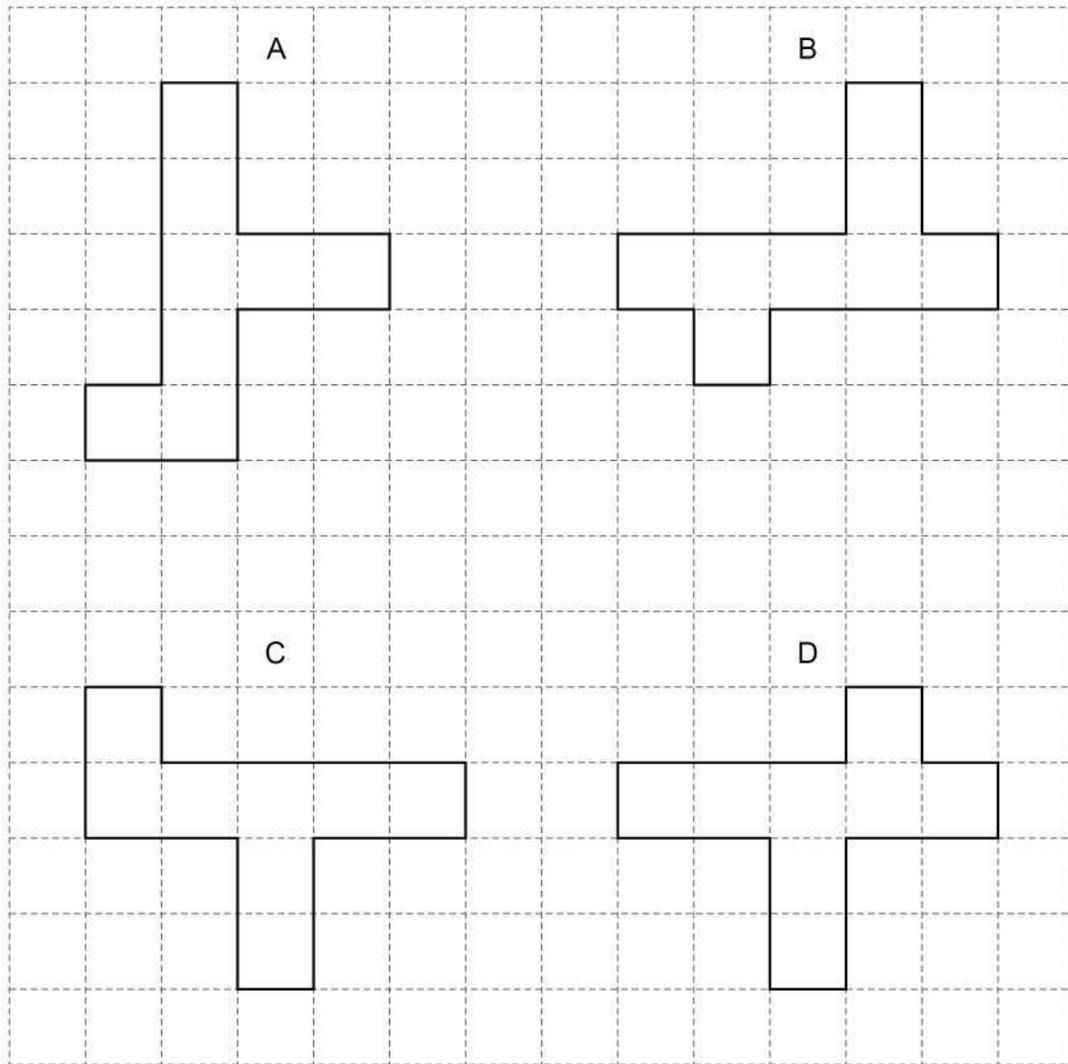$0.07 \geqslant 0.7$ $0.07 = 0.7$ $0.07 < 0.7$ $0.07 > 0.7$

0.07 is less than 0.7

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4   Shapes A, B, C and D are on a square grid.

Which two shapes are congruent?

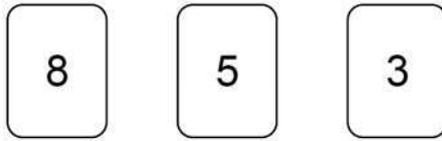Circle your answer.

[1 mark]

A and C   B and A   C and D   D and B

A is the same shape and size as C. It has been rotated

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5 Here are three number cards.

| 8 | 5 | 3 |

5 (a) Use all three cards to make the answer to this calculation a multiple of 10

[1 mark]

$$3\,5 \times 8$$

35 x 8 = 280, which is a multiple of 10 as it is a whole number ending with a 0

5 (b) Use all three cards to make the answer to this calculation a single-digit number.

[1 mark]

$$3 \times 5 - 8$$

3 x 5 - 8 = 7

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5 **(c)** Use all three cards to make this a correct calculation.

[1 mark]

$$\frac{6 + 5}{8 + 3} = 1$$

In order to equal to 1, the numerator must have the same value as the denominator

6 Greg wants to buy a games console that costs £267.50

He already has £125

He will save £7.50 each week.

In how many weeks will he have saved enough?

[3 marks]

267.50−125 ← Subtracting what he already has from the cost works out that he still has to save £142.50

142.50÷7.50 ← Dividing the £142.50 he still needs to save by the £7.50 he will save each week works out that it will take 19 weeks to have enough money
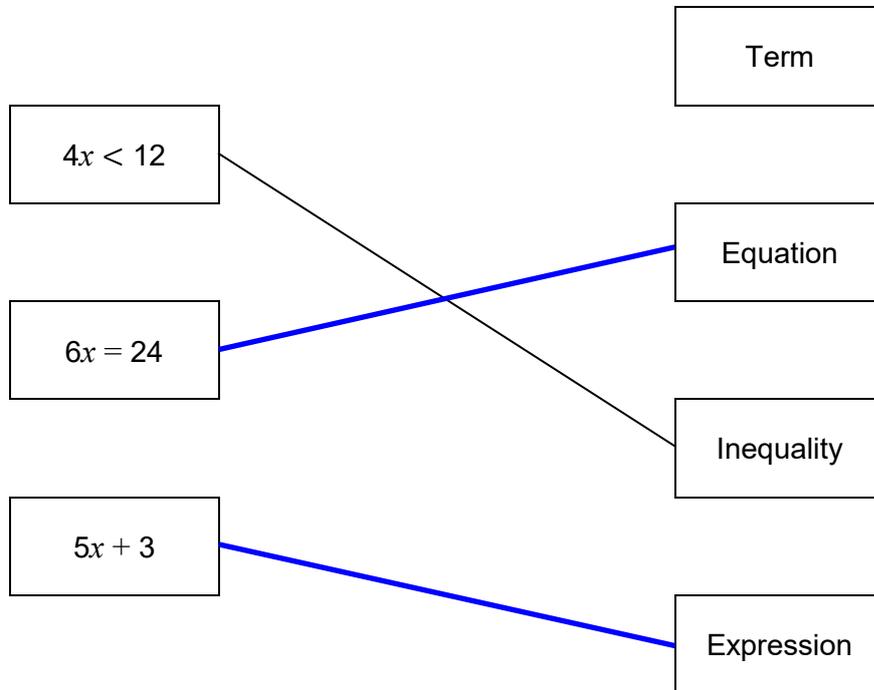
Answer _____19_____

6

Turn over ▶

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7 Match the algebra to the correct description.

One has been done for you.

[2 marks]

Term

$4x < 12$

$6x = 24$

Equation

Inequality

$5x + 3$

Expression

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8   A team of two players is picked from these people.

Female	Amy (A) Laura (L)
Male	Erik (E) Rob (R) Tim (T)

The team **must** have one female player and one male player.

Complete this list to show **all** of the possible teams.

[2 marks]

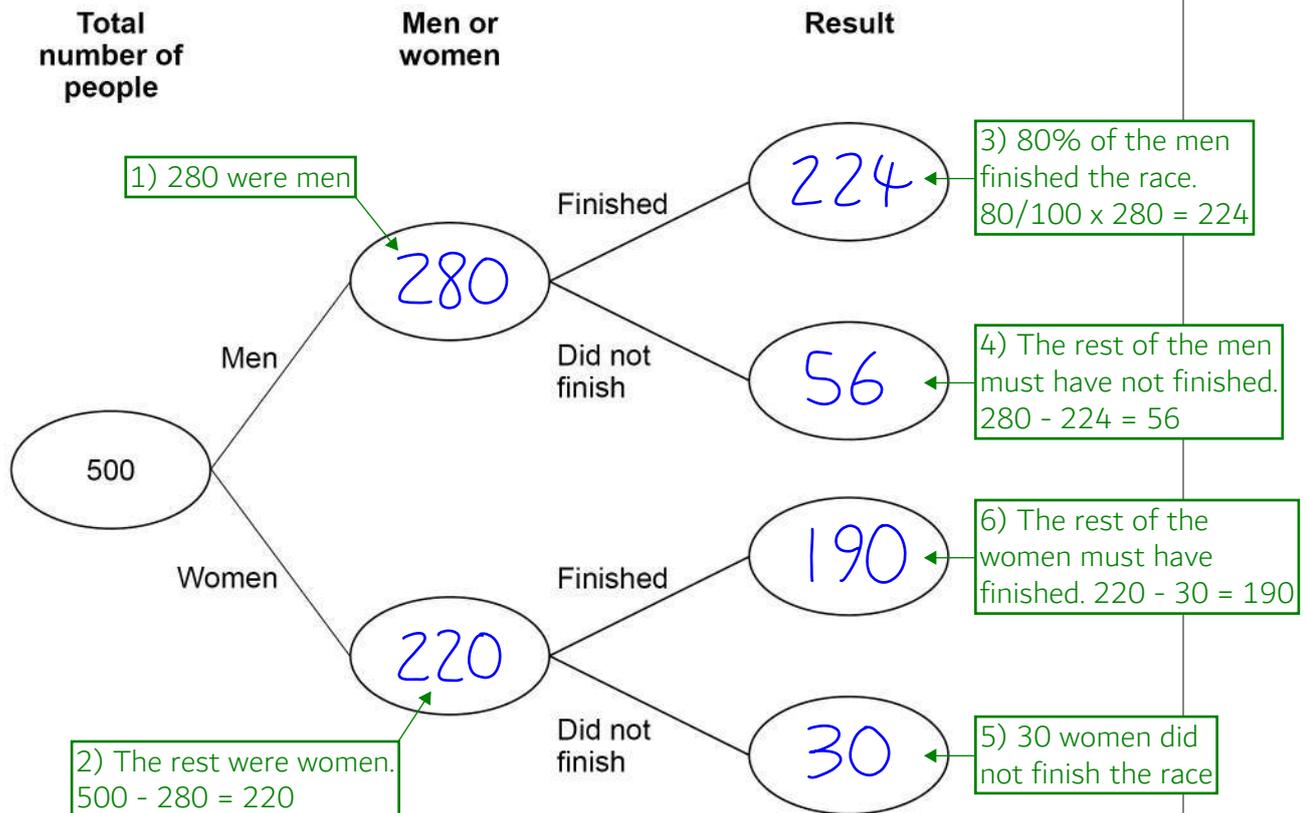| Female player	Male player
A	E
A	R
A	T
L	E
L	R
L	T

Using systematic listing ensures all possibilities are listed

Turn over for the next question

4

Turn over ▶

0 7

9 500 people started a race.

280 were men and the rest were women.

80% of the men finished the race.

30 women did **not** finish the race.

Complete the frequency tree.

[5 marks]

Total number of people	Men or women	Result

1) 280 were men

280

500

Men

Women

Finished

Did not finish

224

3) 80% of the men finished the race. 80/100 x 280 = 224

56

4) The rest of the men must have not finished. 280 - 224 = 56

220

2) The rest were women. 500 - 280 = 220

Finished

Did not finish

190

6) The rest of the women must have finished. 220 - 30 = 190

30

5) 30 women did not finish the race

10 Put these three distances in order of size.

1.8 kilometres   1600 metres $1\frac{3}{4}$ kilometres

1.6   1.75

Start with the shortest.

[2 marks]

There are 1000 metres in a kilometre so dividing the 1600 metres by 1000 converts it to 1.6 kilometres

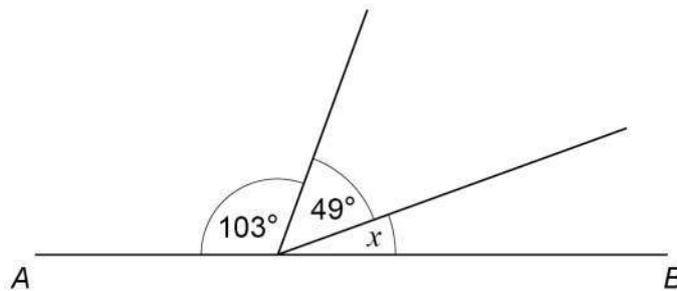Using the calculator to format the mixed fraction as a decimal

Now they are all converted to a decimal number of kilometres they can be compared easier

Shortest distance   1600 metres

$1^3/_4$ kilometres

Longest distance   1.8 kilometres

11 *AB* is a straight line.

Not drawn accurately

Work out the size of angle *x*.

[2 marks]

180 − 103 − 49

There are 180 degrees around a point on a straight line so subtracting the other angles from 180 degrees leaves angle x

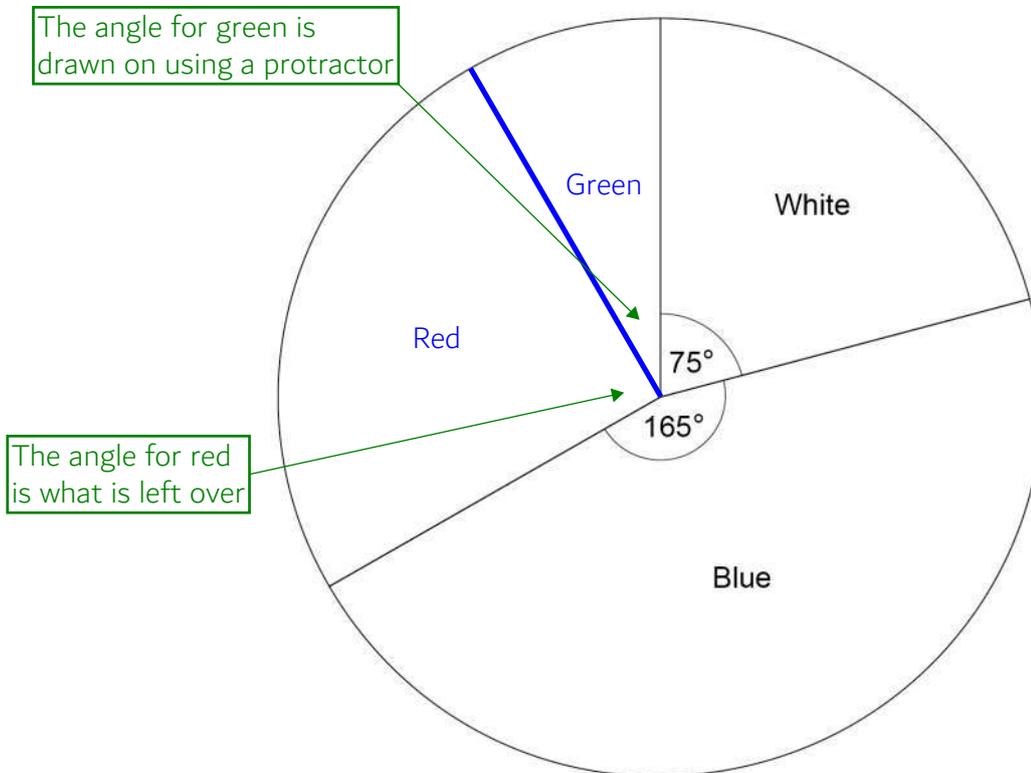Answer   28   degrees

9

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12 Some players were asked the shirt colour of their football team.

Each answer was either White, Blue, Red or Green.

A pie chart is drawn to represent the answers.

Two of the sectors are shown.

The angle for green is drawn on using a protractor

The angle for red is what is left over

Green

White

Red

75°

165°

Blue

12 (a) The number who answered Red is three times the number who answered Green.

Complete the pie chart.

[3 marks]

$360 - 165 - 75$

There are 360 degrees in total in a pie chart. Subtracting the 165 degrees for Blue and the 75 degrees for White from the total 360 degrees works out that there are 120 degrees left over for Red and Green

$120 \div 4 = 30$

The ratio of Red to Green is 3 : 1. There are 4 parts in total in this ratio which represent 120 degrees. So dividing the 120 degrees by the 4 parts works out that 1 part of the ratio is worth 30 degrees. This must be the angle for Green as Green is represented by 1 part of the ratio

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12 (b) There were 600 players altogether.

How many players answered White?

[2 marks]

$$\frac{75}{360} \times 600$$

There are 360 degrees in total in a pie chart. Out of these, 75 degrees are for White. So 75/360 of the 600 must have answered White

Answer _____125_____

13 Milly has an equal number of 20p coins and 50p coins.

The value of her 20p coins is £2.80

Work out the **total** value of her 20p and 50p coins.

[3 marks]

280÷20 — £2.80 is 280p. Dividing this by 20p works out that there are 14 20p coins

14×0.50 — There are also 14 50p coins. 50p is £0.50. Multiplying the 14 coins by the £0.50 works out that the 50p coins are worth £7

2.80+7 — Adding the value of the 20p coins and the value of the 50p coins works out the total value of the coins

Answer £ _____9.80_____

8

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14 Here are ticket prices for a theme park.

Single tickets

Adult £48   Child £26

Special offer tickets

1 adult and 2 children   £82

2 adults and 2 children   £120

14 (a) Freya buys tickets for 3 adults and 4 children.

She pays the cheapest possible total cost.

How much does she save compared to buying all single tickets?

[4 marks]

48×3=144 ← Multiplying the cost of an adult ticket by the 3 adults works out that the cost of 3 adults is £144

26×4 ← Multiplying the cost of a child ticket by the 4 children works out that the cost of 4 children is £104

144+104=248 ← Adding the cost of 3 adults and 4 children using the single tickets works out that it would cost £248 if buying single tickets

82+120 ← Using one of the first special offer tickets and one of the second special offer tickets gives exactly 3 adults and 4 children. Adding the costs of the first special offer ticket and the second special offer ticket works out that the cheapest possible total cost is £202

248-202 ← Subtracting the cheapest cost from the cost of buying all single tickets works out the difference and so how much is saved

Answer £ _____ 46 _____

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14 (b) Leroy buys 5 single adult tickets.

He uses a voucher that reduces the price of tickets by a quarter.

In total, how much does he pay?

[3 marks]

$\frac{1}{4} \times 48$ ← This works out that 1/4 of £48 (the cost of an adult ticket) is £12

$48-12$ ← Subtracting the £12 from the £48 works out that the price of an adult ticket is £36 when reduced by a quarter

36×5 ← Multiplying the reduced price of an adult ticket by 5 works out the cost of buying 5 adult tickets with the voucher

Answer £ _____ 180

15 n is negative.

Circle the expression that is **positive**.

[1 mark]

$n - 1$ n^2 n^3 $\frac{1}{n}$

n^2 means that the negative was multiplied by itself. A negative multiplied by a negative is a double negative so therefore becomes positive

Turn over for the next question

8

**Turn over ▶**

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1 3

16   Here is a formula.

$$y = 3.6x$$

16 (a)   Draw the graph of $y = 3.6x$ for values of x from 0 to 20

[2 marks]

> 3.6 x 0 = 0. So when x is 0, y is also 0. The coordinate of (0, 0) is on the line. 3.6 x 20 = 72. So when x is 20, y is 72. The coordinate of (20, 72) is on the line. Plotting both of these points then joining them up gives the graph for the desired range of values of x. It is a straight line as it is in the form y = mx + c
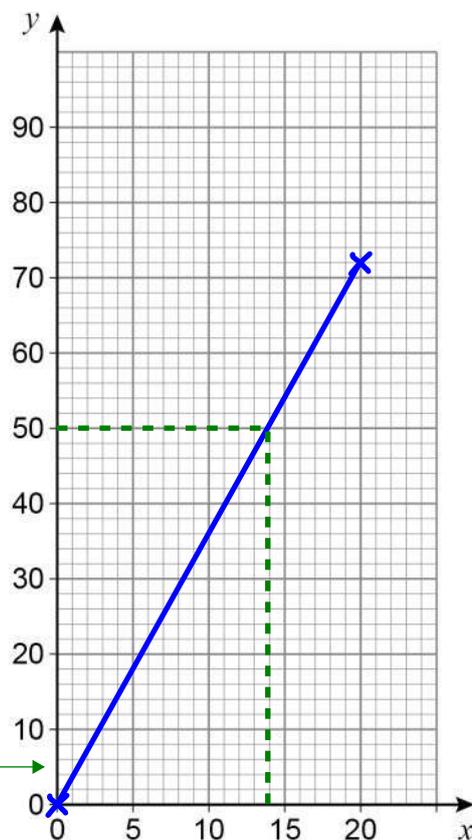
> The scale goes up 10 over 5 small boxes. 10 ÷ 5 = 2. So each small box is worth 2

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In the formula $y = 3.6x$

y is speed in kilometres per hour (km/h)

x is speed in metres per second (m/s)

16 (b) Convert 50 km/h to m/s

Give your answer to the nearest whole number.

[1 mark]

Reading across from 50 on the y-axis to the line then down to the x-axis converts the 50 km/h to roughly 14 m/s

Answer _____ 14 _____ m/s

16 (c) Convert 30 m/s to miles per hour.

Use 1 mile per hour = 1.61 km/h

[3 marks]

3.6×30

30 m/s cannot be read off the graph as it only goes up to 20 m/s. So using the formula. Substituting 30 m/s for x gives y = 3.6 x 30, where y is the km/h. So 30 m/s converts to 108 km/h

$108 \div 1.61$

Every 1.61 km/h is 1 mph so dividing the 108 km/h by 1.61 works out how many lots of 1.61 it is and so how many lots of 1 mph it is
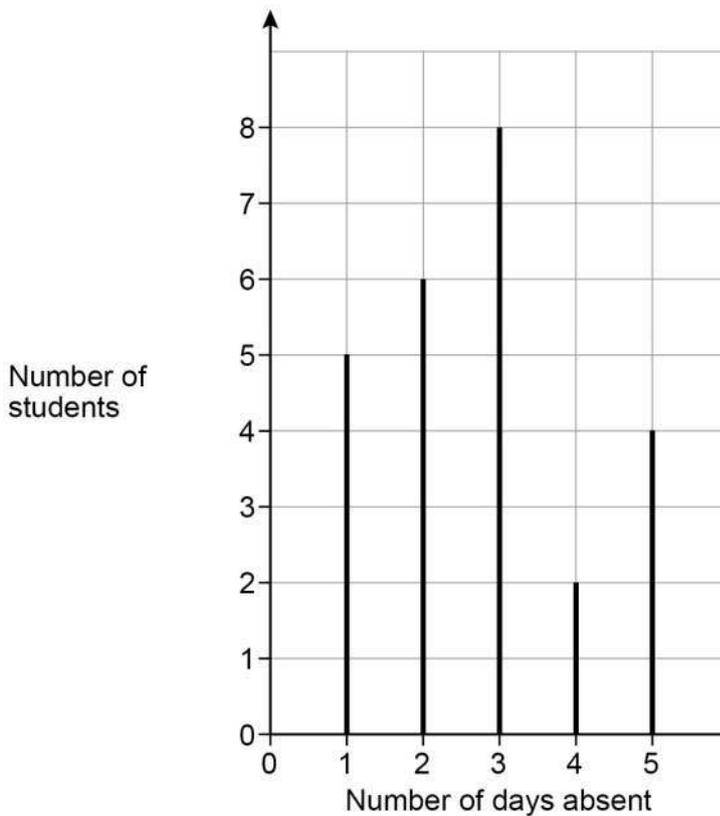
Answer _____ 67.1 _____ miles per hour

67.1 lots of 1 mph is 67.1 mph

Turn over for the next question

6

Turn over ▶

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17 A record was kept of the number of days that 25 students were absent one term.

The chart represents the results.

17 (a) Work out the mean number of days absent.

[3 marks]

1×5=5
2×6=12
3×8=24
4×2=8
5×4=20

Multiplying the number of days absent by the number of students for each bar works out the total number of days absent represented by each bar

5+12+24+8+20

Adding all the totals works out that the overall total number of days absent was 69

69÷25

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

Answer _____2.76_____

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17 (b) One of the students is chosen at random.

Work out the probability that the student was absent for **less than** 4 days.

[2 marks]

$5+6+8$ ← The bars representing 1, 2 and 3 days are less than 4 days. Adding together the number of students these represent works out that 19 students were absent for less than 4 days

Answer $\dfrac{19}{25}$

19 out of the 25 students were absent for less than 4 days

18 Bobbi has these notes.

Note	Number of notes
£5	3
£10	x

The total value of her notes is £T
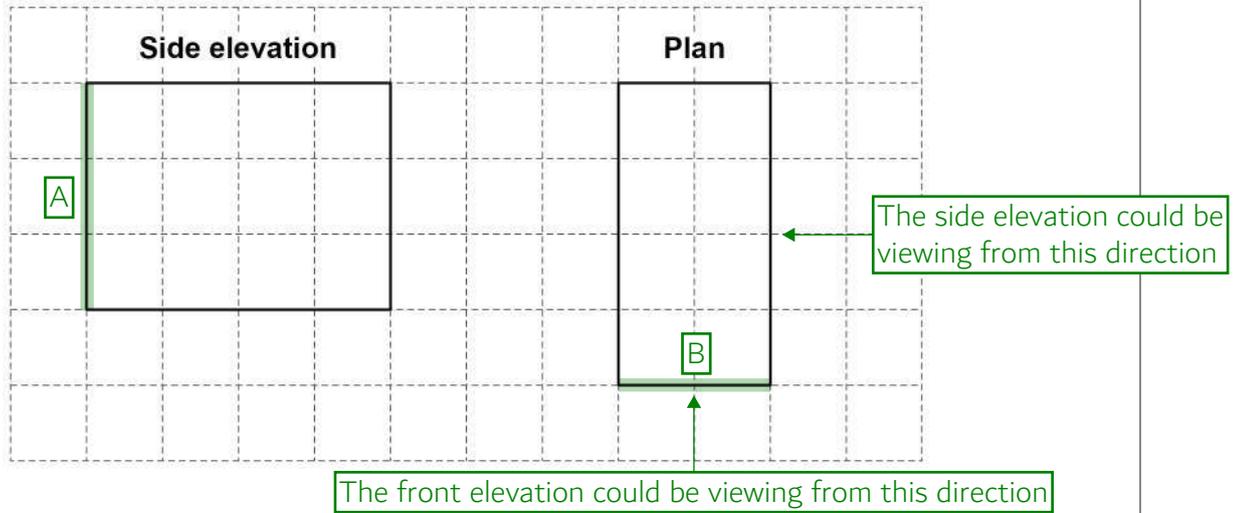
Write a formula for T in terms of x.

[2 marks]

Answer $T = 15 + 10x$

There are 3 £5 notes and 3 x 5 = 15 so these are worth £15. There are x £10 notes and x x 10 = $10x$ so these are worth £$10x$. Adding the value of the £5 notes and the £10 notes gives the total value of the notes, which is T
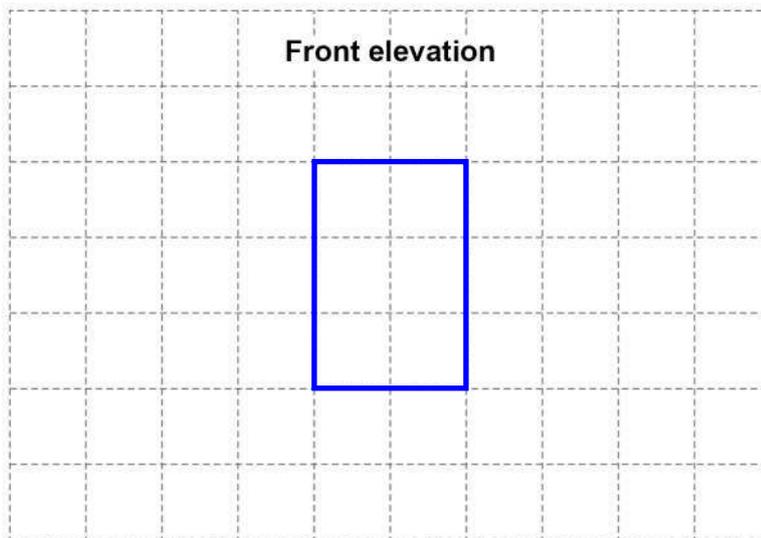
7

Turn over ▶

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19 The side elevation and plan of a cuboid are shown on the centimetre grid.

Side elevation   **Plan**

A

The side elevation could be viewing from this direction

B

The front elevation could be viewing from this direction

Draw the front elevation of the cuboid on this centimetre grid.

[2 marks]

Front elevation

Looking at the side elevation: it is 3 cm tall as indicated by the edge labelled as A. Therefore the cuboid must be 3 cm tall. The other edge is 4 cm long so it must be the longer side on the plan which is also 4 cm. Therefore the front elevation must be looking toward the shorter 2 cm edge of the plan, which is labelled as B. This is 2 cm long so this must be the width of the cuboid

Plan
3cm
Front
Side
4cm
2cm

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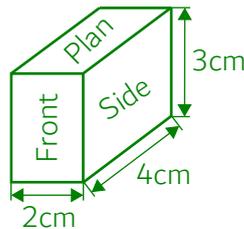
20 To the nearest 1000, there are 18 000 people at a festival.

20 (a) Write down the minimum possible number of people at the festival.

[1 mark]

Answer   17500

The resolution is 1000 as this is what it is to the nearest. Halving this and subtracting it from the 18000 gives the lower bound, which is the minimum possible number of people. 18000 - 1000/2 = 17500

20 (b) Write down the maximum possible number of people at the festival.

[1 mark]

Answer   18499

The resolution is 1000 as this is what it is to the nearest. Halving this and adding it from the 18000 gives the upper bound. 18000 + 1000/2 = 18500. However this rounds up to 19000 so it needs to be 1 fewer than this

21 Circle the equation of the line parallel to $y = 5x + 2$

[1 mark]
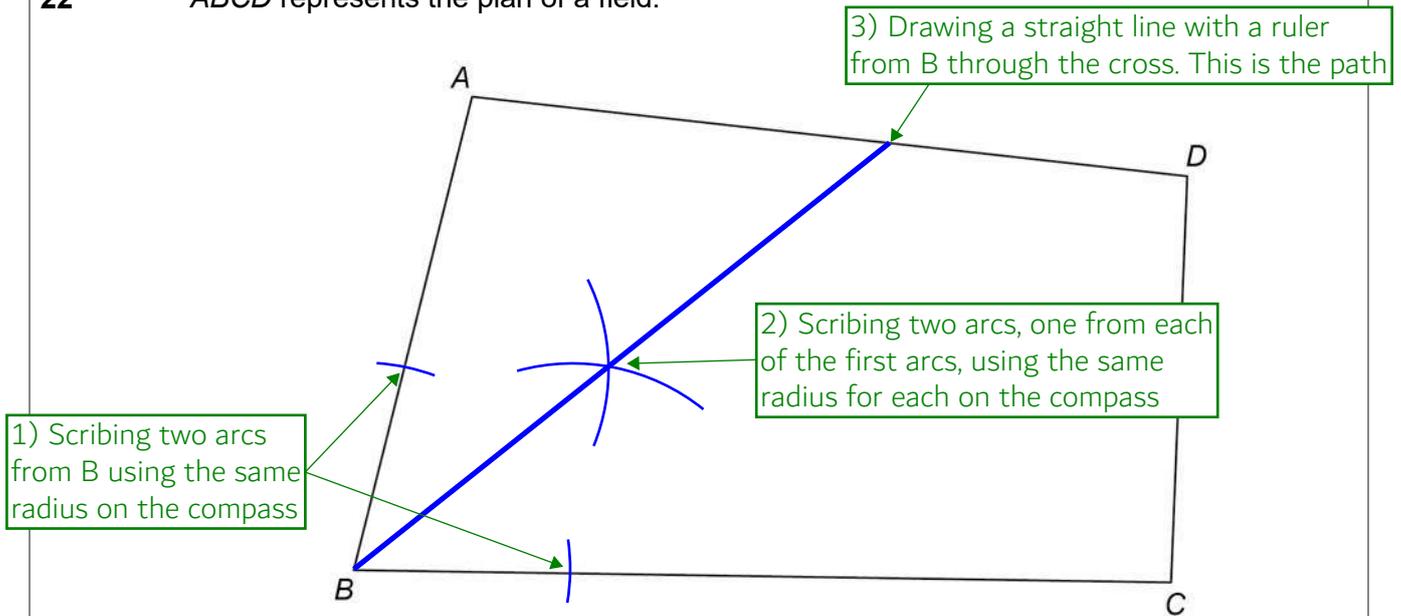
$y = 2x + 5$ $\boxed{y = 5x - 2}$ $y = -5x + 2$ $y = -2x - 5$

Each equation is in the form y = mx + c, where m is the gradient and c is the y-intercept. The equation y = 5x + 2 has a gradient of 5 and to be parallel to this the gradient must be the same

Turn over for the next question

5

Turn over ▶

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22   *ABCD* represents the plan of a field.

3) Drawing a straight line with a ruler from B through the cross. This is the path

2) Scribing two arcs, one from each of the first arcs, using the same radius for each on the compass

1) Scribing two arcs from B using the same radius on the compass

There is a path across the field that

    starts at *B*

    is the same distance from *BA* and *BC*.

Using ruler and compasses, show the position of the path.

[2 marks]

23   *a* is two times *b*.

Circle the ratio   *a* : *b*

[1 mark]
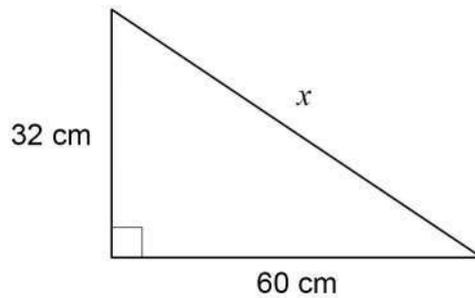
        1 : 3   3 : 1   1 : 2   2 : 1

The number of parts for a needs to be twice as many as for b. 2 is double 1

24   Use Pythagoras' theorem to work out the value of x.

Not drawn
accurately

x

32 cm

60 cm

[3 marks]

$32^2 + 60^2 = x^2$ ← Pythagoras' Theorem is a² + b² = c², where a and b are the shorter sides and c is the longest side. Substituting 32 cm for a, 60 cm for b and x for c

$x = \sqrt{4624}$ ← Square rooting both sides gets rid of the power of 2 and gets x on its own

Answer _____68_____ cm

Turn over for the next question
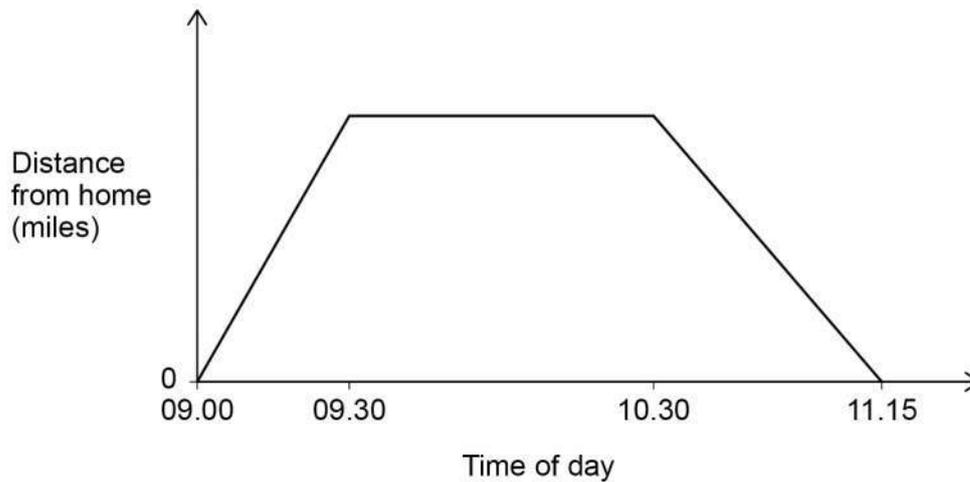
Turn over ▶

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6

25   Chris visits a library.

He cycles to the library in half an hour at a speed of 12 miles per hour.

He stays at the library for one hour.

He then cycles home.

The sketch graph represents his visit.

Work out the speed, in miles per hour, at which Chris cycles home.

[3 marks]

$s\frac{d}{t}$ ← Writing the speed, distance, time formula triangle

$12 \times 0°30° = 6$ ← Covering d in the formula triangle finds that distance = speed x time. The speed is 12 mph and the time from 09.00 to 09.30 is 30 minutes, which is put into the calculator as a sexagesimal. So the distance to the library is 6 miles

$11°15° - 10°30°$ ← Subtracting 10.30 from 11.15 as sexagesimals works out that it took 45 minutes to cycle home

$6 \div 0°45°$ ← Covering s in the formula triangle finds that speed = distance ÷ time. Putting the 45 minutes as a sexagesimal

Answer   _____ 8 _____   mph

26 These two triangles are similar. ← So all the sides on the smaller triangle are multiplied by the same amount to get the sides on the larger triangle

Not drawn accurately

12 cm

20 cm

a
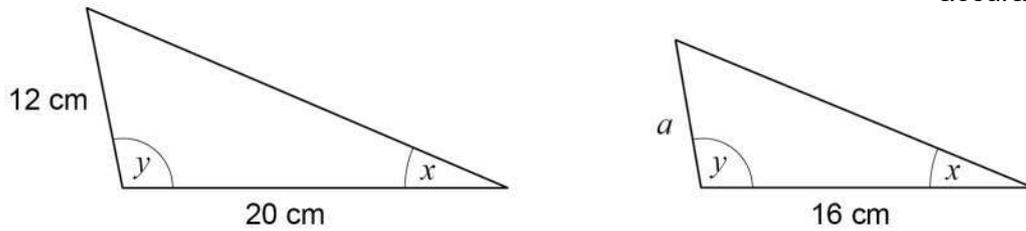
16 cm

Work out the value of a.

[2 marks]

$20 \div 16$ ← The 20 cm in the larger triangle is the larger version of the 16 cm in the smaller triangle. Dividing these works out that the scale factor (what all the sides in the smaller triangle are multiplied by to get the sides in the larger triangle) is 1.25

$12 \div 1.25$ ← Dividing the 12 cm (which is the larger version of a) by the scale factor works out that a is 9.6 cm

Answer _____9.6_____ cm

27 Circle the expression that is equivalent to $(x - 1)^2$

[1 mark]

$x^2 - 1$ $\qquad$ $x^2 + 1$ $\qquad$ $x^2 - 2x - 1$ $\qquad$ $\boxed{x^2 - 2x + 1}$

$(x-1)(x-1)$ ← The power of 2 means that the bracket is multiplied by itself

$x^2 - x - x + 1$ ← Expanding the brackets

Collecting like terms gives $x^2 - 2x + 1$

Turn over for the next question

6

Turn over ▶

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28 Here is some information about 26 houses.

a, b and c are all **different** numbers.

Number of bedrooms	Number of houses
1	7
2	a
3	b
4	c
5	8

13

13

The median number of bedrooms is 3.5

Work out a possible set of values for a, b and c.

[3 marks]

13 houses must have more than 3.5 bedrooms and 13 houses must have less than 3.5 bedrooms as the median is halfway through the data

13−8 → Subtracting the 8 houses with 5 bedrooms from the 13 houses which have more than 3.5 bedrooms works out that c must be 5

13−7 → Subtracting the 7 houses with 1 bedroom from the 13 houses which have less than 3.5 bedrooms works out that a and b must add up to 6

$a =$ _____ 2 _____

$b =$ _____ 4 _____

$c =$ _____ 5 _____

2 and 4 are possible numbers for a and b which add up to 6. All three numbers are different

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29 A rectangle has length 60 cm and width 40 cm

Not drawn accurately

40 cm

60 cm
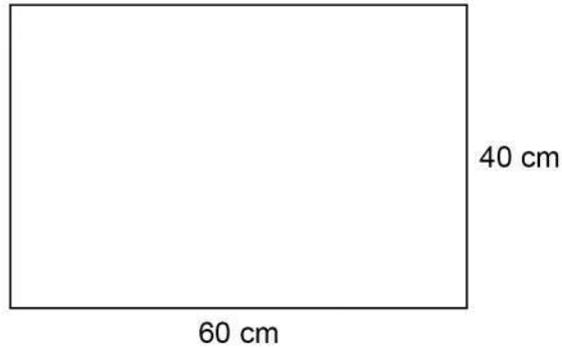
The length decreases by 15%

The width decreases by 10%

Sue says,

"The perimeter decreases by 25% because 15% + 10% is 25%"

Is she correct?

You **must** show calculations to support your answer.

[4 marks]

$$60 \times \frac{100-15}{100} = 51$$

Subtracting the 15% from 100% expresses the percentage the length goes down to. Putting this over 100 converts it to a fraction, which reduces the length by 15% when multiplied. So the new length is 51 cm

$$40 \times \frac{100-10}{100}$$

Subtracting the 10% from 100% expresses the percentage the width goes down to. Putting this over 100 converts it to a fraction, which reduces the width by 10% when multiplied. So the new width is 36 cm

$$51 \times 2 + 36 \times 2 = 174$$

Working out that the new perimeter is 174 cm by adding 2 lots of the new length and 2 lots of the new width

$$60 \times 2 + 40 \times 2$$

Working out that the original perimeter was 200 cm by adding 2 lots of the original length and 2 lots of the original width

$$200 \times \frac{100-25}{100} = 150$$

Subtracting the 25% from 100% expresses the percentage the original perimeter is meant to go down to. Putting this over 100 converts it to a fraction, which reduces the original perimeter by 25% when multiplied. So the original perimeter reduced by 25% is 150 cm

No

Reducing the original perimeter by 25% gives 150 cm, which is not the same as the new perimeter when the length and width is reduced

7

Turn over ▶

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IB/M/Jun20/8300/3F

30 Expand and simplify fully $4(2c + 3) - (5c - 1)$

[2 marks]

$8c + 12 - 5c + 1$

4 x 2c = 8c
4 x 3 = 12
-1 x 5c = -5c
-1 x -1 = 1

Answer $\quad 3c + 13$

Collecting like terms:
8c - 5c = 3c
12 + 1 = 13

31 $\mathbf{c} = \begin{pmatrix} 4 \\ 9 \end{pmatrix}$ $\qquad \mathbf{d} = \begin{pmatrix} 2 \\ -5 \end{pmatrix}$

x-component
y-component

Work out $\quad 4\mathbf{c} + 3\mathbf{d}$

[2 marks]

$4 \times 4 + 3 \times 2$ — 4 times the x-component of c add 3 times the x-component of d gives 22

$4 \times 9 + 3 \times -5$ — 4 times the y-component of c add 3 times the y-component of d gives 21

Answer $\begin{pmatrix} 22 \\ 21 \end{pmatrix}$

END OF QUESTIONS

4