Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
MATHEMATICS

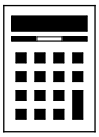
F

Foundation Tier Paper 2 Calculator

Thursday 6 June 2019 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.
- 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	
26–27	
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

.CG Maths.

Answer **all** questions in the spaces provided

Do not write outside the box

1 Circle the number that is one **less** than a cube number.

[1 mark]

20 22 24 26

27 is a cube number as $3^3 = 3 \times 3 \times 3 = 27$ and 26 is one less than it

2 Circle the fraction which is equal to 0.25

[1 mark]

S⇔D Type each fraction into the calculator then convert into a decimal by pressing the button on the left

$\frac{1}{40}$ $\frac{2}{5}$ $\frac{3}{12}$ $\frac{4}{100}$

= 0.025 = 0.4 = 0.25 = 0.04

3 Here is a number line.

Which number is at A?

Circle your answer.

The difference between 3 and 4 is 1. Dividing this by the 5 divisions between them on the number line gives 0.2, which is what it is going up in

[1 mark]

3.3 3.55 3.6 3.8

Do not write outside the box

4 How many millimetres are equal to 3.27 metres?

Circle your answer.

[1 mark]

32.7 327 3270 32 700

There are 1000 millimetres in a metre so 3.27 x 1000 converts the metres to millimetres

5 Which is longer, $\frac{3}{4}$ of a day or 1000 minutes?

You **must** show your working.

[3 marks]

$\frac{3}{4} \times 24 \times 60 = 1080$

There are 24 hours in a day so 3/4 x 24 converts it into hours. There are 60 minutes in an hour so multiplying by 60 converts it into minutes

1080 minutes is more than 1000 minutes

Answer 3/4 of a day

7

Do not write outside the box

6 (a) Use your calculator to work out $\frac{9.75^3}{1.875} + 6.4^2$

Give your answer as a decimal.

Write down your full calculator display.

[2 marks]

Type it all into the calculator exactly as it is above

Answer 535.285

6 (b) Is your answer to part (a) sensible?

Check by rounding each of 9.75, 1.875 and 6.4 to the nearest whole number.

You **must** show your working.

[3 marks]

$\frac{10^3}{2} + 6^2 = 536$

535.285 is close to 536

Tick a box.

☑ Sensible ☐ Not sensible

Do not write outside the box

7 Complete the bank statement. **[3 marks]**

Money received

Money spent

Money in account

Date	Description	Credit (£)	Debit (£)	Balance (£)
01/04/2019	Starting balance			261.43
05/04/2019	Council tax		189.34	72.09
10/04/2019	Refund	14.66		86.75
12/04/2019	Salary	1430.29		1517.04

72.09 + 189.34

This works out the money in the account before the council tax

86.75 - 72.09

The balance increased from £72.09 to £86.75. The difference is the amount of money gained for the refund

86.75 + 1430.29

This works out the balance after the salary

Turn over for the next question

8

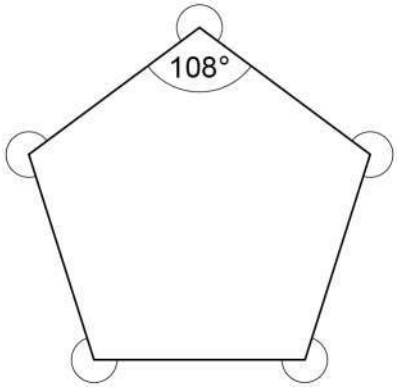
Do not write outside the box

8 (a) The interior angle of a regular pentagon is 108°

Work out the sum of the five **reflex** angles at the vertices of a regular pentagon.

[3 marks]

Not drawn accurately



$5 \times (360 - 108)$

There are 360 degrees in total around a point. So subtracting the 108 degrees from 360 works out the size of one of the reflex angles. Multiplying this by 5 as there are 5 of the reflex angles

Answer 1260 degrees

Do not write outside the box

Omar asks Harry,

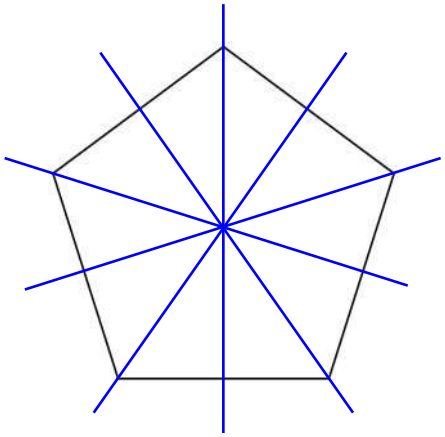
"How many lines of symmetry does a pentagon have?"

Harry assumes it is a regular pentagon.

His answer is 5.

8 (b) Draw the lines of symmetry on this regular pentagon.

[1 mark]



8 (c) Omar then says,

"What if the pentagon is **not** regular?"

For a pentagon that is **not** regular, what is true about the number of lines of symmetry?

Tick **one** box.

[1 mark]

- ☐ There must be 0
- ☑ There could be 0 or 1
- ☐ There could be 0, 1 or 2
- ☐ There could be any number up to 5

This is an example of an irregular pentagon with 1 line of symmetry. It is impossible to draw one with 2 or more lines of symmetry

5

Do not write outside the box

9 56 customers pay for satellite television.

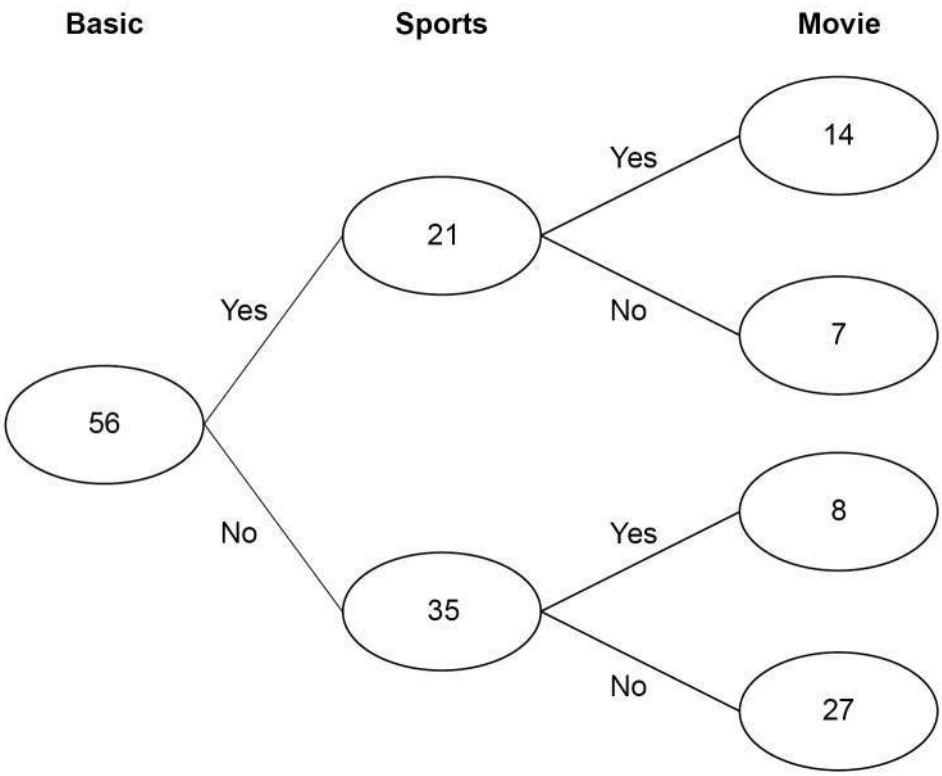
They **all** have the Basic package for £24.50 per month.

Some also have

the Sports package for £27.50 extra per month

the Movie package for £18 extra per month.

The frequency tree shows the number of customers with each package.



Do not write outside the box

In total, how much per month do the 56 customers pay?

[4 marks]

$56 \times 24.50 + 21 \times 27.50 + (14+8) \times 18$

56 customers all have the Basic package for £24.50 per month

21 customers have the Sports package for £27.50 extra per month

14 and another 8 customers have the Movie package for £18 extra per month

Answer £ 2345.50

Turn over for the next question

4

Do not write outside the box

10 Zoe is thinking of a number.

$\frac{3}{10}$ of 90 = $\frac{1}{2}$ of her number

What number is she thinking of?

[3 marks]

$\frac{3}{10} \times 90 \times 2$ ← 3/10 x 90 works out 3/10 of 90. As this is half of her number, multiplying by 2 works out the number.

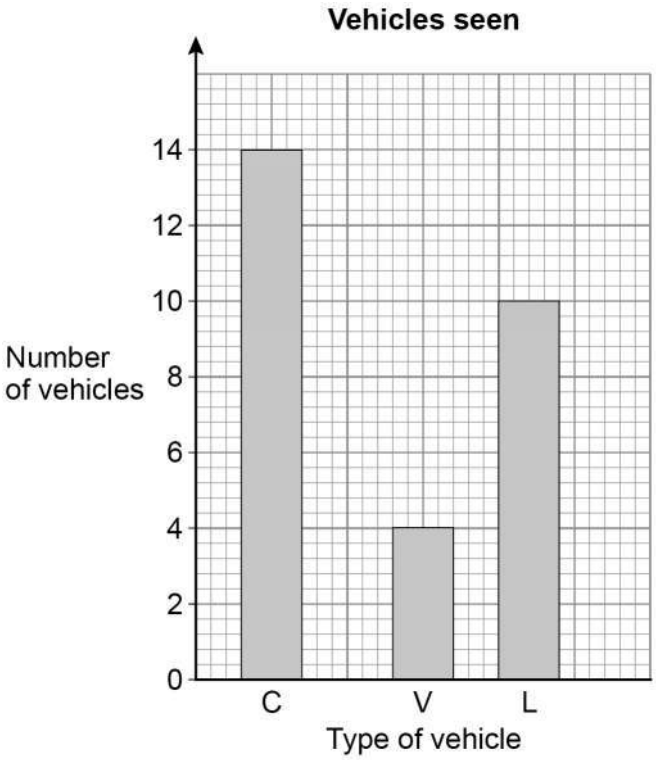
Answer 54

Do not write outside the box

11 On a journey, Laura sees 30 vehicles.

Each vehicle is a car, a van or a lorry.

She draws this bar chart.



Make **two** criticisms of her bar chart.

[2 marks]

Criticism 1 Gaps between the bars are different

Criticism 2 The number of vehicles do not add up to 30

It also isn't clear what C, V and L stand for

5

Do not write outside the box

12 A drawing has a scale of 1 : 40

On the drawing, a bedroom is a rectangle measuring 10 cm by 18 cm

A kitchen has an actual area of 300 000 cm^2

Which has the bigger actual area, the kitchen or the bedroom?

You **must** show your working.

[4 marks]

$(10 \times 40) \times (18 \times 40) = 288000$ ← Area of rectangle = length x width

The scale is 1:40 so the real bedroom is 40 times wider

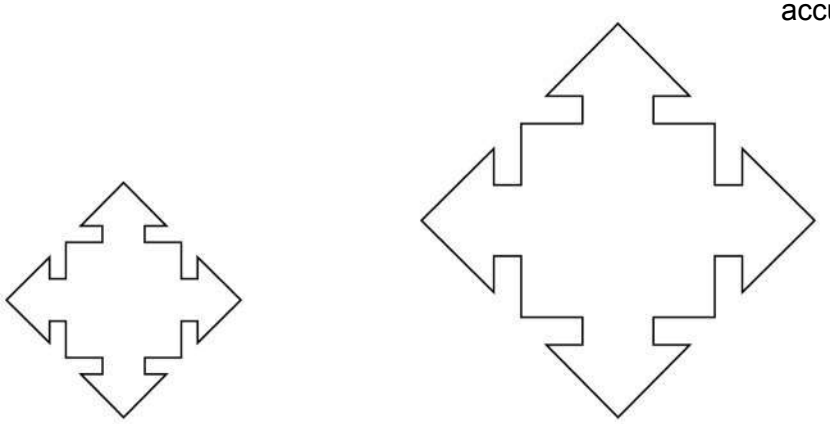
The scale is 1:40 so the real bedroom is 40 times longer

Answer Kitchen

Do not write outside the box

13 Here are two similar shapes, A and B.

Not drawn accurately



A B

length of edges in A : length of edges in B = 2 : 5

The perimeter of A is 210 mm

Work out the perimeter of B.

[2 marks]

$\frac{210}{2} \times 5$

The perimeter is the sum of the edges, so if all of the lengths are scaled up the perimeter will be scaled up by the same factor. 2 parts of the ratio represents the perimeter of A. Dividing by 2 works out 1 part. Multiplying by 5 works out 5 parts, which represents the perimeter of B

Answer 525 mm

6

Do not write outside the box

14 There are 135 passengers on a plane.

3 of the passengers in Business Class are flying for the first time.

In total, there are 15 passengers in Business Class.

$\frac{1}{4}$ of the passengers **not** in Business Class are flying for the first time.

14 (a) In the Venn diagram,

ξ = passengers on the plane

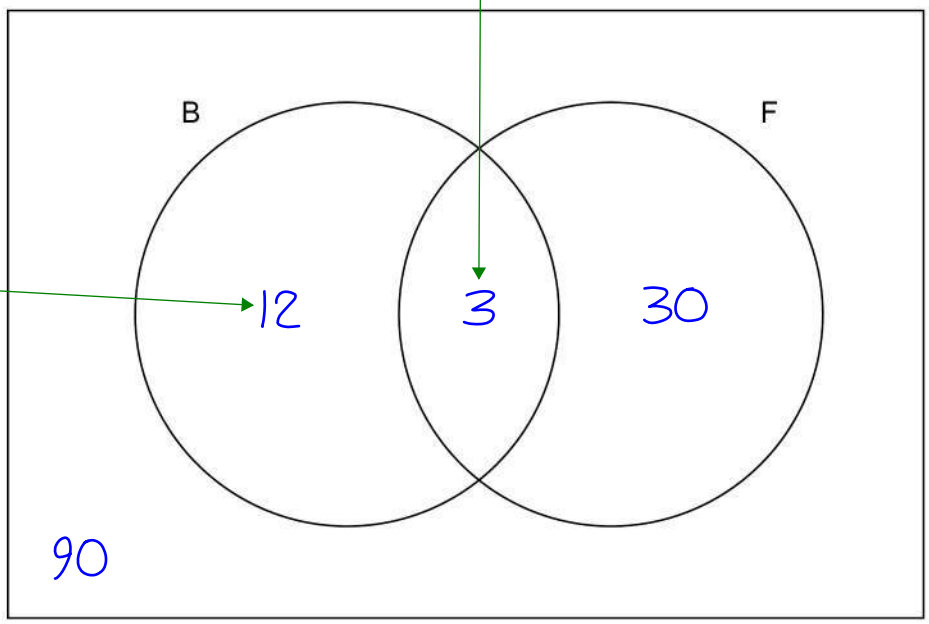
B = passengers in Business Class

F = passengers flying for the first time.

Complete the Venn diagram.

[4 marks]

3 of the passengers in Business Class are flying for the first time



In total, there are 15 passengers in Business Class. This includes the 3 who are flying for the first time so subtracting 3 from 15 leaves the 12 who are not flying for the first time

$135 - 15 = 120$ — 120 passengers are not in Business Class

$\frac{1}{4} \times 120 = 30$ — 30 of the passengers not in Business Class are flying for the first time

$120 - 30 = 90$ — 90 of the passengers not in Business Class are not flying for the first time

Do not write outside the box

14 (b) One of the passengers is chosen at random.

Write down the probability that the passenger is in Business Class.

[1 mark]

15 out of the 135 passengers are in Business Class

Answer $\frac{15}{135}$

15 A line has the equation $y = x + 3$

15 (a) Write down the coordinates of the point where the line intersects the y-axis.

[1 mark]

Answer (0 , 3)

x = 0 when the line intersects the y-axis so y = 0 + 3

15 (b) Write down the coordinates of the point where the line intersects the x-axis.

[1 mark]

Answer (-3 , 0)

y = 0 when the line intersects the x-axis so 0 = x + 3.
Rearranging by subtracting 3 from both sides gives x = -3

7

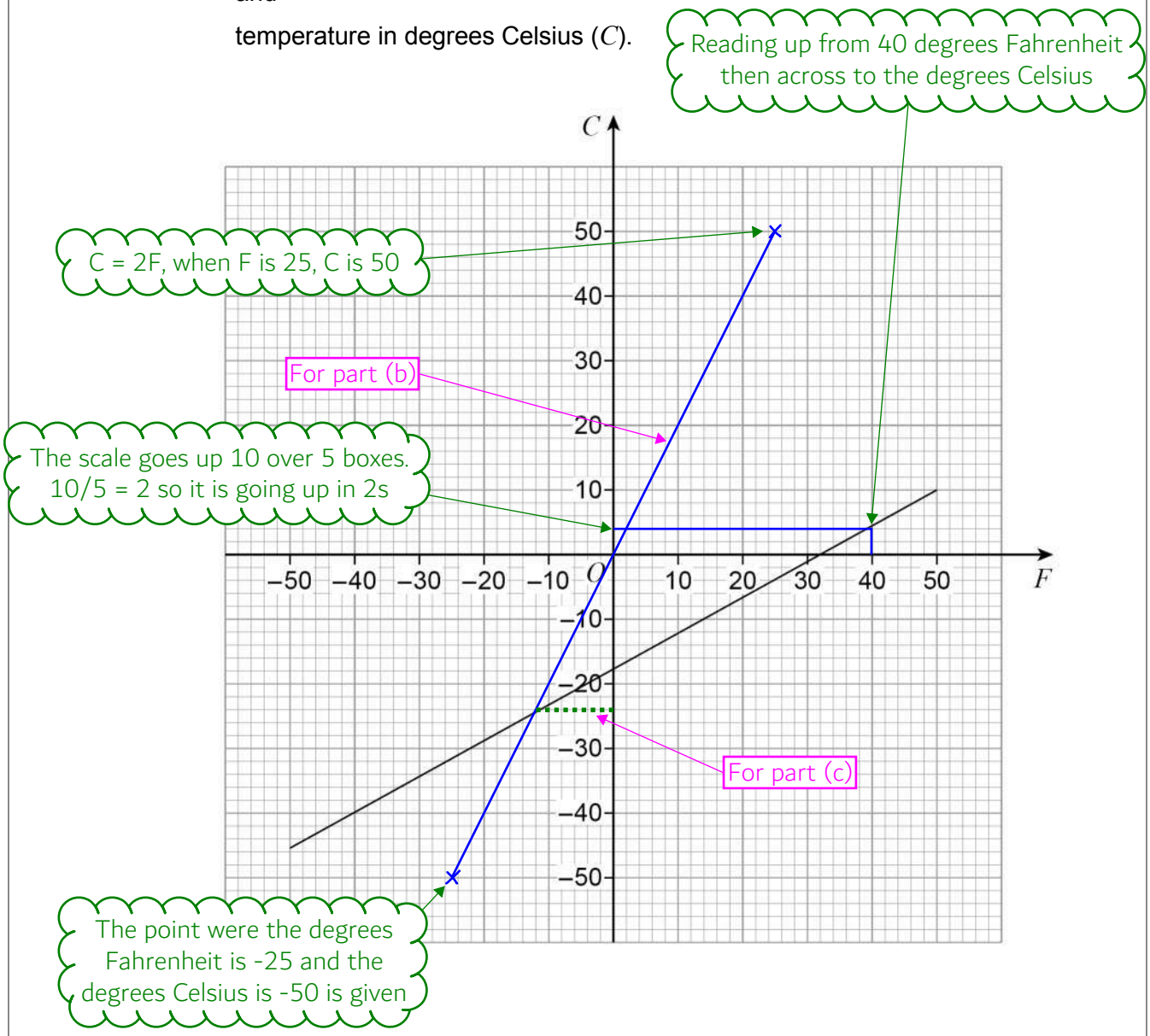
Do not write outside the box

16 The graph below is used to convert between

temperature in degrees Fahrenheit (F)

and

temperature in degrees Celsius (C).



16 (a) Use the graph to convert 40 degrees Fahrenheit into degrees Celsius.

[1 mark]

Answer 4 degrees Celsius

Do not write outside the box

At one temperature, T,

the number of degrees Celsius is **double** the number of degrees Fahrenheit.

The graph of $C = 2F$ can be drawn to help find this temperature.

16 (b) On the grid opposite, draw the graph of $C = 2F$ for values of F from –25 to 25

You may use the table to help you.

[2 marks]

F	–25		
C	–50		

The points (-25 , -50) and (25 , 50) are plotted on the graph. As it is a straight line graph (there are no powers) connecting these two points completes the graph

16 (c) Use your graph to estimate the value of T.

Give your answer in degrees Celsius.

[2 marks]

Answer -24 degrees Celsius

T is the y-coordinate where both the lines meet as this is the only point which lies on both the line which converts the temperatures and the line which indicates the Celsius being double the Fahrenheit

Turn over for the next question

5

Do not write outside the box

17 In a bag there are 10p coins, 20p coins and 50p coins.

There are two **fewer** 20p coins than 10p coins.

There are five **more** 50p coins than 10p coins.

17 (a) Complete the table.

[1 mark]

Coin	Number of coins
10p	n
20p	$n - 2$
50p	$n+5$

There are five more 50p coins than 10p coins

17 (b) Altogether, there are 60 coins.

Work out the total **value** of the 20p coins.

[4 marks]

$n + n - 2 + n + 5 = 60$

Expressing the total number of coins in terms of n by adding the numbers of coins together then setting it equal to 60 as altogether, there are 60 coins.

$3n + 3 = 60$

Collecting the like terms and simplifying the left side. n + n + n = 3n. -2 + 5 = 3

$n = \frac{57}{3}$

$3\overline{)57}$ = 19

Subtracting 3 from both sides then dividing by 3 to find n

17

$\times 20$

340

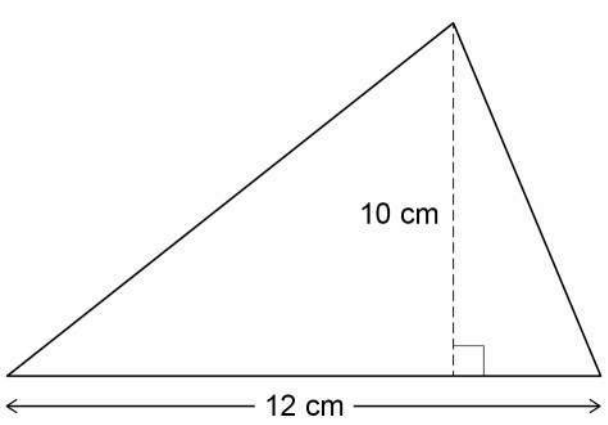
As n = 19, there must be 17 20p coins as the number of 20p coins is n - 2 and 19 - 2 = 17. Multiplying this by 20p works out the value of the 20p coins in pence

Answer £ 3.40

There is 100 pence in a pound so dividing 340 by 100 converts it into pounds

Do not write outside the box

18 A force of 180 newtons (N) is applied to the surface of this triangle.



Not drawn accurately

Work out the pressure.

Use pressure = $\frac{\text{force}}{\text{area}}$

$\frac{180}{\frac{1}{2} \times 12 \times 10}$

Area of triangle = 1/2 x base x height
The base is 12cm and the height is 10cm. Substituting the force and area into the equation gives this

[3 marks]

Answer 3 N/cm^2

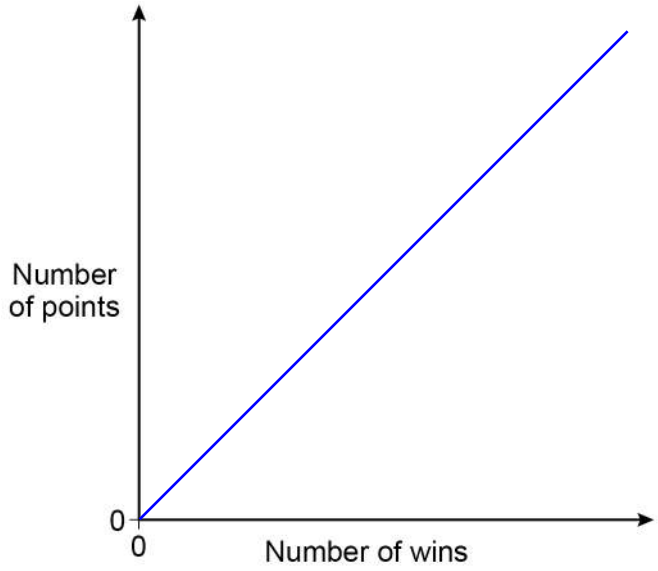
8

Do not write outside the box

19 In a sport, the number of points is directly proportional to the number of wins.

On the axes, sketch a graph to show this relationship.

[1 mark]



Any straight line with a positive gradient which goes through the origin (0 , 0)

Do not write outside the box

20 Using ruler and compasses, show the region inside the grid that is

less than 4 cm from *A*

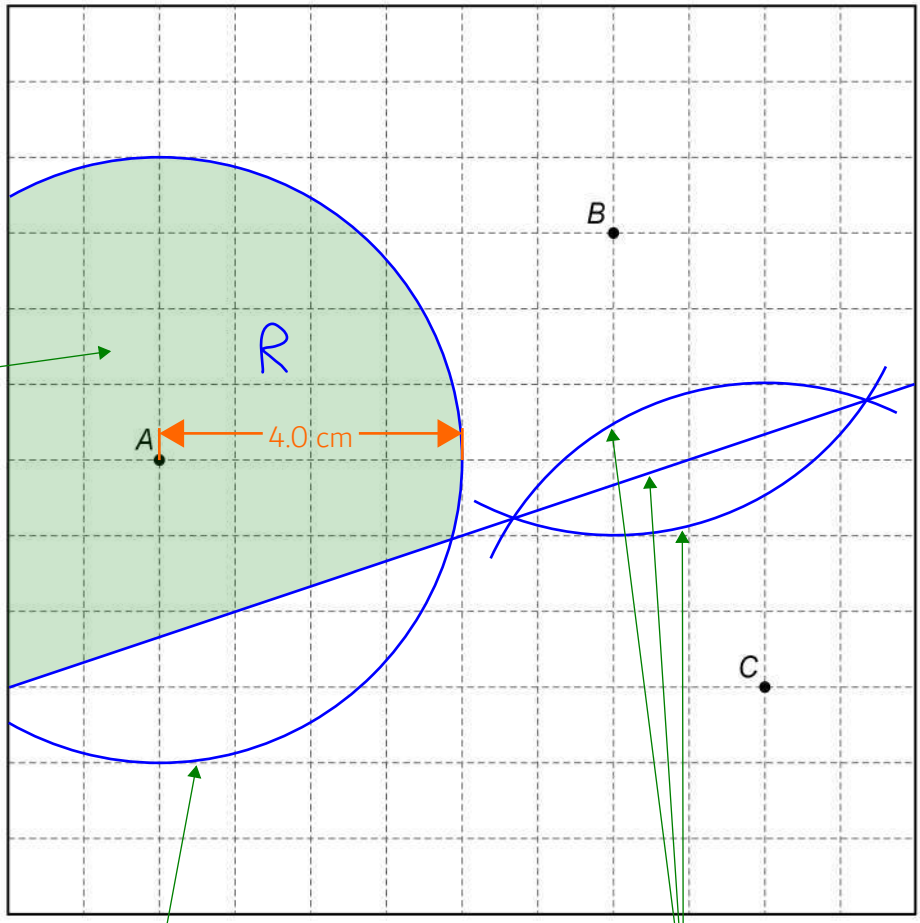
and

nearer to *B* than to *C*.

Label the region R.

Show all your construction lines.

[3 marks]



The region doesn't need to be shaded but is shown in green

Set the compass with a radius of 4cm and scribe an arc around A to indicate all points which are 4cm from A

Construct the perpendicular bisector of line BC to indicate all points which are an equal distance from B and C. Set the compass to a radius which is greater than half of the distance from B to C then scribe arcs from B and C. Draw a straight line through both of the points where the arcs meet

4

Do not write outside the box

21 Beth drives 200 miles in 4 hours.

She drives the first 18 miles at an average speed of 36 mph

Work out her average speed for the rest of the journey.

[3 marks]

s d t

This is the formula triangle for speed, distance and time

$\frac{200-18}{4-\frac{18}{36}}$

From the formula triangle, speed = distance/time. 18 miles has been done in the first part of the journey and there are 200 miles in total so the distance for the rest of the journey is 200 - 18. The whole journey takes 4 hours so subtracting the time for the first part of the journey leaves the time for the rest of the journey. From the formula triangle, time = distance/speed so 18/36 works out the time for the first part of the journey

Answer 52 mph

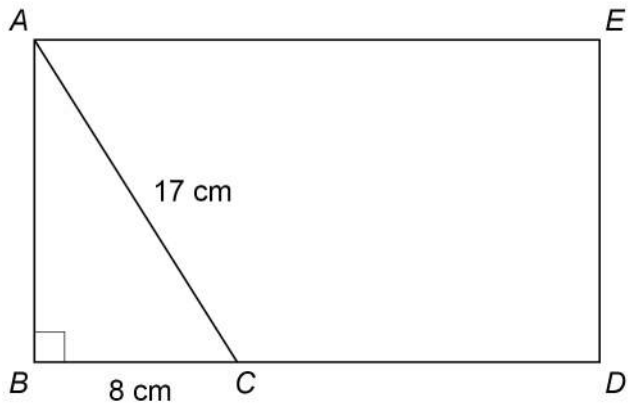
Do not write outside the box

22 The diagram shows rectangle *ABDE* and right-angled triangle *ABC*.

AC = 17 cm

BC = 8 cm

Not drawn accurately



BC : *CD* = 1 : 2

Work out the area of rectangle *ABDE*.

[4 marks]

$a^2+b^2=c^2$ ← Pythagoras' Theorem can be used to work out side AB as there are two sides in the right-angled triangle ABC

$a=\sqrt{c^2-b^2}$ ← Subtracting b^2 then square rooting both sides to make a (which represents side AB) the subject

$\sqrt{17^2-8^2}\times(8\times3)$ ← Substituting 17cm for c (as c is the longest side) and 8cm for b in the equation above to find side AB. This gives the width of the rectangle. BC is represented by 1 part of the ratio and there are 3 parts in total in the ratio so multiplying 8 by 3 works out the length BD. Area of rectangle = length x width so both of these are multiplied together

Answer 360 cm^2

7

Do not write outside the box

23 In a sport, injury time is added time played at the end of a match.

The table shows the injury time, t (minutes) played in 380 matches.

Injury time, t (minutes)	Frequency
$0 < t \leqslant 2$	59
$2 < t \leqslant 4$	158
$4 < t \leqslant 6$	106
$6 < t \leqslant 8$	45
$8 < t \leqslant 10$	12

59

217 ← 59 + 158

23 (a) Circle the **two** words that describe the data.

[1 mark]

continuous discrete grouped ungrouped

Time is continuous as it could be any value. It isn't discrete, which means it can only be certain values. The time is grouped into intervals (0 < t ⩽ 2, for example)

23 (b) Which class interval contains the median?

You **must** show your working.

[2 marks]

$\frac{380+1}{2} = 190.5$

Using the formula (n + 1)/2, where n is the number of data points, works out which value is the median. So the median will be halfway between the 190th and 191st value. The first 59 values are in the first category. The first 217 values are in the first two categories. As 217 is the first cumulative frequency above 190.5, the median must be in the second category

Answer 2 $< t \leqslant$ 4

Do not write outside the box

23 (c) What percentage of the matches had **more than** 6 minutes of injury time?

[2 marks]

$\frac{45+12}{380} \times 100$

Both the 6 < t ⩽ 8 and 8 < t ⩽ 10 are more than 6 minutes. The total frequency for both of these categories is found by 45 + 12. Expressing this as a fraction of the total number of games then multiplying by 100 to convert the fraction into a percentage

Answer 15 %

24 x is an integer.

$$-4 < x \leqslant 2$$

and

$$2 \leqslant x + 3 < 9$$

Work out all the possible values of x.

[3 marks]

$-1 \leq x < 6$ ← Subtracting 3 from all sides of the second inequality gets x on its own in the middle

The smallest integer which satisfies both inequalities is -1 as -1 ⩽ x and -4 is less than this. The largest integer which satisfies both inequalities is 2 as x ⩽ 2 and 6 is greater than this. Listing these and all integers in between

Answer -1, 0, 1, 2

8

Do not write outside the box

25 Joe and Kyle share an amount of money in the ratio $7 : n$

Joe gets 35% of the money.

Work out the value of n.

[2 marks]

$\frac{100-35}{5}$

100 - 35 works out the percentage which Kyle gets. 35 is divided by 5 to get 7 so the percentage for Kyle needs to be divided by 5 too

Answer 13

26 Circle the reciprocal of 4

[1 mark]

–4 2 0.4 0.25

Reciprocal means '1 divided by'.
1/4 = 0.25

Do not write outside the box

27 $x : y = 1 : 3$

Circle the correct equation.

[1 mark]

$y = 3x$ $\quad y = \frac{x}{3}$ $\quad y = x - 2$ $\quad y = x + 2$

x could be 1 and y could be 3. Substituting these values into each equation only works with y = 3x and y = x + 2. However, x could also be 2 and y could be 6 and this only works in the y = 3x

28 A linear sequence starts

11 21 31 41 ...

Work out an expression for the nth term of the sequence.

[2 marks]

The sequence goes up in 10s so much involve 10n. Following the sequence backward to find the 0th term (when n = 0) gives 1 so the constant added must be 1

Answer 10n + 1

END OF QUESTIONS

6