# OCR
## Oxford Cambridge and RSA

**.CG Maths.**
**Worked Solutions**

# Friday 19 May 2023 – Morning

## GCSE (9–1) Mathematics

**J560/01** Paper 1 (Foundation Tier)

**Time allowed: 1 hour 30 minutes**

**F**

**You must have:**
- the Formulae Sheet for Foundation Tier (inside this document)

**You can use:**
- a scientific or graphical calculator
- geometrical instruments
- tracing paper

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number [ ][ ][ ][ ][ ]    Candidate number [ ][ ][ ][ ]

First name(s) _____

Last name _____

## INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.
- Use the $\pi$ button on your calculator or take $\pi$ to be 3.142 unless the question says something different.

## INFORMATION
- The total mark for this paper is **100**.
- The marks for each question are shown in brackets **[ ]**.
- This document has **20** pages.

## ADVICE
- Read each question carefully before you start your answer.

OCR is an exempt Charity

**Turn over**

Please note that these worked solutions have neither been provided nor approved by OCR 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.

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

**.CG Maths.**

**1** Here is a list of numbers.

8    11    19    26    39    49    65    114

From this list, write down

**(a)** an even number,

> Even numbers end in 0, 2, 4, 6, 8

(a) ............................8............................ **[1]**

**(b)** a square number,

> $7^2$ = 7 x 7 = 49, so 49 is a square number as it is the result of squaring a whole number greater than 0

(b) ............................49............................ **[1]**

**(c)** a factor of 57.

> 57 can be divided by 19 to get a whole number. 57 ÷ 19 = 3. So 19 is a factor of 57

(c) ............................19............................ **[1]**

**2** Kai has four differently numbered cards.

- The range of the numbers is 14.
- The median of the numbers is 9.
- All the numbers are prime numbers.
- The lowest number is 5.

Work out the numbers on the cards.
Write the numbers in order of size.

5+14 ← Range = largest - smallest. So largest = smallest + range

> 7 is a prime number 2 below 9 and 11 is a prime number 2 above 9. So they will have 9 halfway between them and make the median of the four numbers be 9

........5........ , ........7........ , ........11........ , ........19........ **[3]**
*lowest*

**.CG Maths.**

**3** Here are the first four terms of a sequence.

$5 \overset{+7}{\phantom{x}} 12 \overset{+7}{\phantom{x}} 19 \overset{+7}{\phantom{x}} 26$

**(a)** Write down the next term in the sequence.

(a) .................................**33**.................................. [1]

**(b)** Explain how you worked out your answer.

**26+7** .................................................................................................. [1]

**4** A fair six-sided dice, numbered 1 to 6, is rolled.

> There are 6 divisions between 0 and 1 so it goes up in sixths

The diagram shows a probability scale.

0    1/6    2/6    3/6    4/6    5/6    1

A    B    C    D    E    F    G
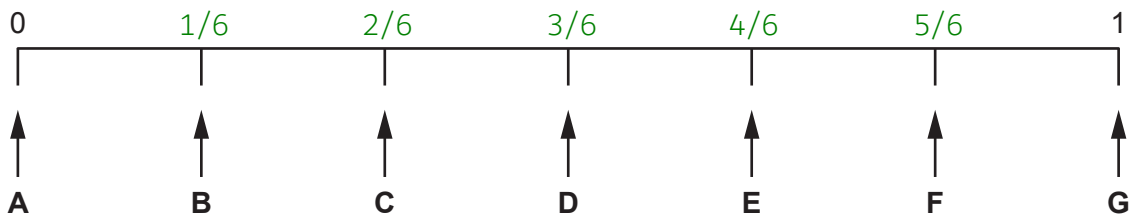
Which arrow shows the probability that the dice

**(a)** lands on 5,

> 1 out of the 6 numbers is a 5. So the probability is 1/6

(a) .................................**B**.................................. [1]

**(b)** lands on 7,

> None of the numbers are a 7. So the probability is 0

(b) .................................**A**.................................. [1]

**(c)** lands on a number greater than 2?

> 3, 4, 5, 6 are greater than 2. This is 4 out of the 6 numbers. So the probability is 4/6

(c) .................................**E**.................................. [1]

**.CG Maths.**

**5** **(a)** Write 0.17 as a fraction.

> Putting the decimal into the calculator should convert it to a fraction

(a) .................... $\frac{17}{100}$ .................... **[1]**

**(b)** Write 0.04 as a percentage.

> Multiplying any decimal by 100 converts it to a percentage. 0.04 x 100 = 4

(b) .................... 4 .................... % **[1]**

**(c)** Write $\frac{7}{8}$ as a decimal.

> The calculator can be used to convert a fraction to a decimal

(c) .................... 0.875 .................... **[1]**

**6** Here is a function.

Input ⟶ ×4 ⟶ +7 ⟶ Output
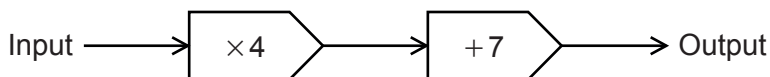
**(a)** Find the input when the output is 87.

87−7
80÷4

> Doing the opposite operations in the opposite order takes it back from the output to the input. The opposite of adding 7 is subtracting 7 then the opposite of multiplying by 4 is dividing by 4

(a) .................... 20 .................... **[2]**

**(b)** The input is *x* and the output is *y*.

Write an equation for *y* in terms of *x*.

> x is multiplied by 4 then has 7 added to the result. This gives y

(b) .................... $y=4x+7$ .................... **[2]**

**.CG Maths.**

**7** **(a)** Work out.

**(i)** $3^5$

This can be put into the calculator

**(a)(i)** ........................ 243 ........................ **[1]**

**(ii)** $\sqrt[3]{2744}$

This can be put into the calculator

**(ii)** ........................ 14 ........................ **[1]**

**(b)** Find the value of $y$.

$$384 = 6 \times 4^y$$

$64 = 4^y$ ← Dividing both sides by 6 eliminates the 6 on the right and gets $4^y$ on its own

$4, 16, 64$ ← Listing out the powers of 4 until 64 is reached. Starting with 4 and keep multiplying by 4 to do this

$4^3 = 64$

**(b)** ........................ 3 ........................ **[2]**

**(c)** Write $3^{-1}$ as a fraction.

The negative power means to do the reciprocal, which means 1 divided by

**(c)** ........................ $\frac{1}{3}$ ........................ **[1]**

**8** 450 g of flour costs £1.44.

Work out the cost of 1 kg of this flour.

$\frac{1.44}{450} \times 1000$ ← Dividing the £1.44 by the 450 g expresses what 1 g costs. Multiplying this by 1000 works out what 1000 g costs. As there are 1000 g in 1 kg, this works out the cost of 1 kg of flour

£........................ 3.20 ........................ **[2]**

**Turn over**

**.CG Maths.**

**9** A farmer keeps sheep in a rectangular field measuring 120 m by 180 m.
The farmer can keep up to 20 sheep per hectare in the field.
1 hectare is 10 000 square metres.

Work out the maximum number of sheep the farmer can keep in the field.

$120 \times 180$ ← Area of rectangle = length x width. So the area of the field is 21600 m²

$21600 \div 10000$ ← Dividing the area of the field by 10000 converts it into hectare

$2.16 \times 20$ ← Multiplying the 2.16 hectares by the 20 sheep per hectare works out how many sheep can be kept

43.2 is rounded down to 43 as there needs to be a whole number of sheep and 44 would be too many

............................. 43 ............................. **[4]**

**.CG Maths.**

**10 (a)** Finley is asked to solve the equation $5x + 4 = 19$.

Finley's working is shown below.

$$5x + 4 = 19$$
$$5x = 19 + 4$$
$$5x = 23$$
$$x = 4.6$$

Write down the error that Finley has made.

Should be 5x = 19 - 4

Doing the opposite operation to both sides of the equation eliminates the 4. The opposite of +4 is -4

**[1]**

**(b)** Charlie is asked to use the formula

$$v = u + at$$

to find the initial velocity, when

- the acceleration is $5 \, \text{m/s}^2$
- the final velocity is $29 \, \text{m/s}$
- the time is 3 seconds.

Charlie's working is shown below.

$$v = 29 + (5 \times 3)$$
$$v = 29 + 15$$
$$v = 44$$

Write down the error that Charlie has made.

v is 29, not u

v is the final velocity. u is the initial velocity

**[1]**

**.CG Maths.**

**11** Cookies are made using these ingredients.

**Ingredients**

**Makes 24 cookies**

240 g butter
360 g sugar
2 eggs
240 g flour
170 g cranberries
100 g white chocolate

**(a)** How many eggs are needed to make 48 cookies?

$48 \div 24$ ← This works out that 48 cookies is 2 lots of 24 cookies

$2 \times 2$ ← Doing 2 lots of the 2 eggs

(a) ............................4............................ **[1]**

**(b)** How much sugar is needed to make 6 cookies?

$\frac{6}{24} \times 360$ ← Expressing the 6 cookies as a fraction of the 24 cookies. Doing this fraction of the 360 g of sugar

(b) ............................90............................ g **[1]**

**(c)** Ashley has 520 g of cranberries and plenty of the other ingredients.
Ashley thinks this is enough to make at least 80 cookies.

Is Ashley correct?
Show working to support your answer.

$\frac{520}{170} \times 24 = 73.4$ ← Dividing the 520 g by the 170 g needed for 24 cookies works out how many lots of the 24 cookies can be made. Doing this many lots of the 24 cookies

............No............ because ......only 73 can be made...... This is not at least 80 cookies

............................................................................................ **[3]**

**.CG Maths.**

**(d)** Darcie makes 100 cookies.
They are put into packets, each holding 6 cookies.
Each packet of 6 cookies is sold for £1.35.
Darcie sells all of these packets.

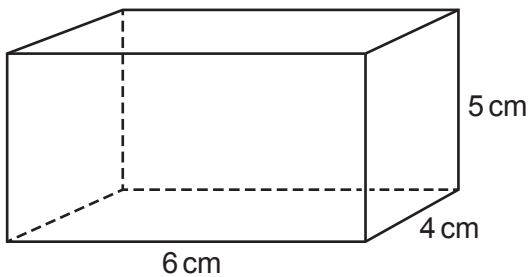Work out how much money Darcie receives.

$100 \div 6$ ← This works out that 100 cookies is 16.6 lots of 6 cookies and so there must have been 16 packets as there needs to be a whole number and 17 is too many

$16 \times 1.35$ ← Multiplying the 16 packets by the £1.35 works out how much Darcie receives

**(d)** £ ................................ 21.60 ................................ **[3]**

**12** Work out the surface area of the cuboid.



5 cm

4 cm

6 cm

$6 \times 5 \times 2 + 6 \times 4 \times 2 + 4 \times 5 \times 2$ ← Adding the areas of all of the faces works out the surface area

The area of the left and right faces. Area of rectangle = length x width. Multiplying by 2 as the left and right are the same

The area of the top and bottom faces. Area of rectangle = length x width. Multiplying by 2 as the top and bottom are the same

The area of the front and back faces. Area of rectangle = length x width. Multiplying by 2 as the front and back are the same

................................ 148 ................................ cm² **[3]**

**Turn over**

**.CG Maths.**

**13** Kareem runs 2460 metres in 8 minutes.

**(a)** Calculate his average speed in metres per minute.

$2460 \div 8$ ← Metres per minute means metres divided by minutes

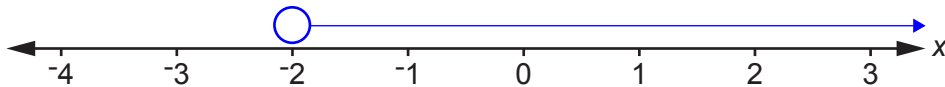**(a)** .................... 307.5 .................... m / min **[2]**

**(b)** Kareem says

This means I can run 6150 metres in 20 minutes.

Write down **one** assumption Kareem has made.

He can run at the same average speed

.................... 6150 ÷ 20 = 307.5 so the average speed is the same. This is .................... **[1]**
an assumption as it might not be true but is taken as a fact

**14** Show the inequality $x > {}^-2$ on this number line.



The open circle means that it cannot be equal to -2

**[2]**

**.CG Maths.**

**15** Finley has 72 sweets.
Finley gives

- 25% of the sweets to Alex

- $\frac{1}{6}$ of the sweets to Umi.

Show that Finley has $\frac{7}{12}$ of the sweets left. **[4]**

$1 - \frac{25}{100} - \frac{1}{6} = \frac{7}{12}$ ⬅ There is 1 lot of sweets. Subtracting the fractions of the sweets that he has given away leaves the fraction which is left. Percentage is out of 100 so putting the 25% over 100 converts it to a fraction

.CG Maths.

**16** The diagram shows a quadrilateral and an equilateral triangle.
The perimeter of the quadrilateral is equal to the perimeter of the equilateral triangle.

$x + 2$

$5x + 4$

**Not to scale**

$9x - 5$

$6x + 8$
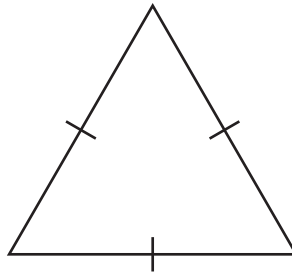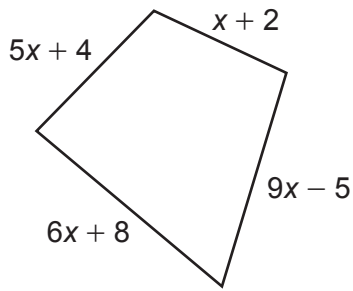
Find an expression for the length of one side of the equilateral triangle.
Give your answer in terms of $x$ in its simplest form.

$21x+9$ ← The perimeter of the quadrilateral is expressed by adding all the x terms and then the other numbers. 5 + 1 + 6 + 9 = 21 so it must be 21x. 4 + 2 + 8 - 5 = 9

Dividing the expression of the perimeter by 3 as there are 3 equal sides

......................................... $7x-3$ ..................... **[4]**

**17** Multiply out and simplify.

$(3x + y)(x + 2y)$

$3x^2+6xy+xy+2y^2$ ←
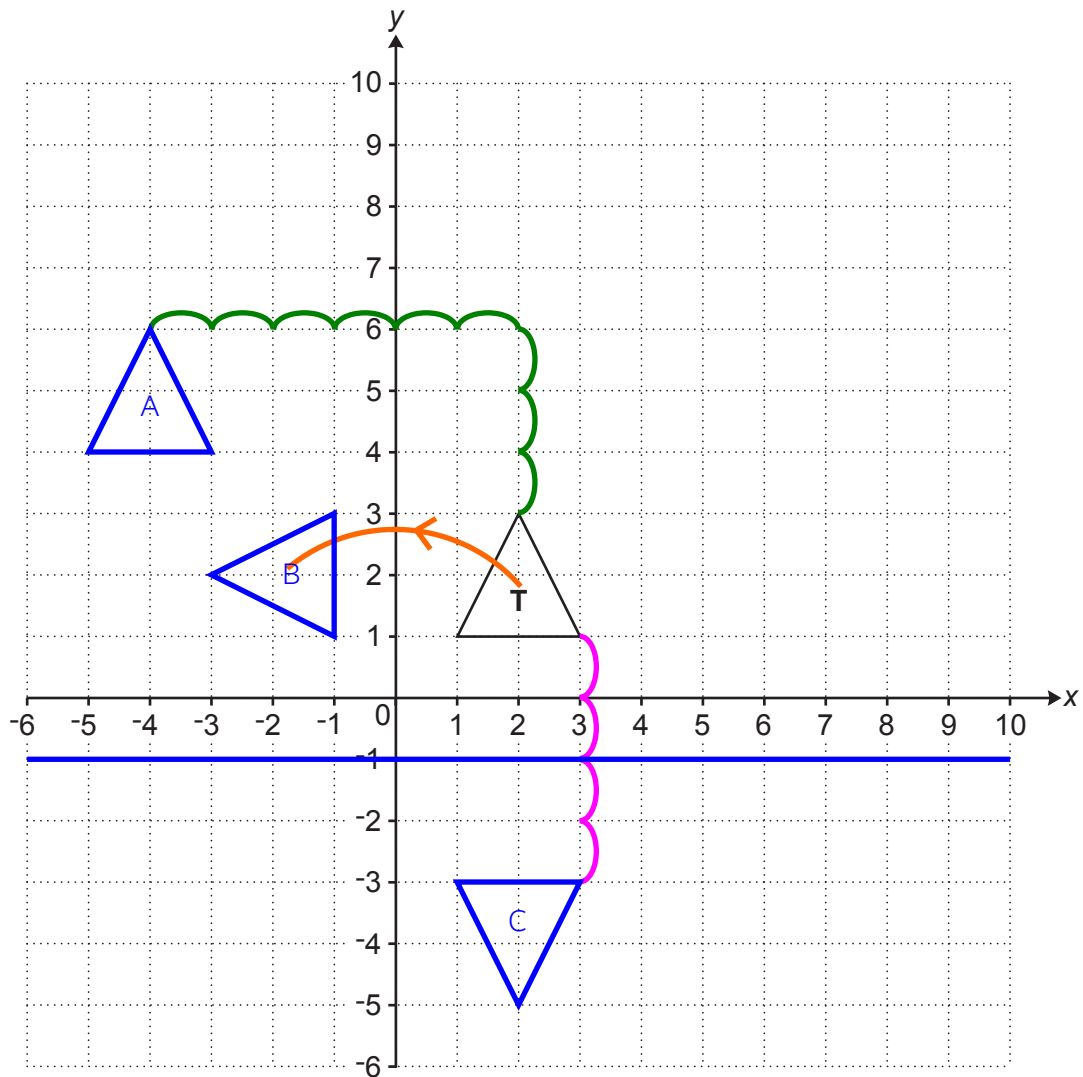- $3x \times x = 3x^2$
- $3x \times 2y = 6xy$
- $y \times x = xy$
- $y \times 2y = 2y^2$

$6xy + xy = 7xy$

......................................... $3x^2+7xy+2y^2$ ..................... **[3]**

**.CG Maths.**

**18** Triangle **T** is drawn on a coordinate grid.



**(a)** Triangle **A** is translated by $\begin{pmatrix} 6 \\ -3 \end{pmatrix}$ to give triangle **T**.

Draw and label triangle **A** on the grid. **[2]**

**(b)** Triangle **T** is rotated through 90° anticlockwise about (0, 0) to give triangle **B**.

Draw and label triangle **B** on the grid. **[2]**

**(c)** Triangle **T** is reflected in the line $y = {}^-1$ to give triangle **C**.

Draw and label triangle **C** on the grid. **[2]**

(a) A must be 6 to the left and 3 up from T. Translating the top corner then drawing the rest of the triangle.

(b) Using tracing paper to rotate shape T.

(c) Drawing the line of y = -1 then reflecting by counting the number of jumps to the line and doing the same number on the other side

**.CG Maths.**

**19** Calculate.

$$\sqrt{5.2^2 - 4.8 \times {}^-6.3}$$

Give your answer correct to **3** significant figures.

> Putting it in the calculator exactly as it is above. Then rounding the answer of 7.568355171 to 3 significant figures

.................................... 7.57 ............................ **[2]**

**20** The price of petrol decreases from £1.32 per litre to £1.02 per litre.

Calculate the percentage decrease in the price.

$\dfrac{1.02-1.32}{1.32} \times 100$

> Subtracting the £1.32 from the £1.02 expresses the decrease in the price. Putting this over the original £1.32 expresses the decrease as a fraction. Multiplying this by 100 converts it to a percentage

> The negative in the answer can be ignored as it is asking for percentage decrease

.................................... 22.7 ............................ % **[3]**

**.CG Maths.**

**21** Trams to the airport leave every 50 minutes.
Trams to the beach leave every 35 minutes.
A tram to the airport and a tram to the beach leave together at 9:30 am.

When is the next time that two of these trams leave together?

$50 = 2 \times 5^2$
$35 = 5 \times 7$

*Expressing both 50 and 35 as a product of prime factors using the calculator*

$2 \times 5^2 \times 7 = 350$

*The lowest common multiple is the highest power of each prime in both lists multiplied together. So the next time they both leave together is after 350 minutes*

$9°30° + 0°350°$

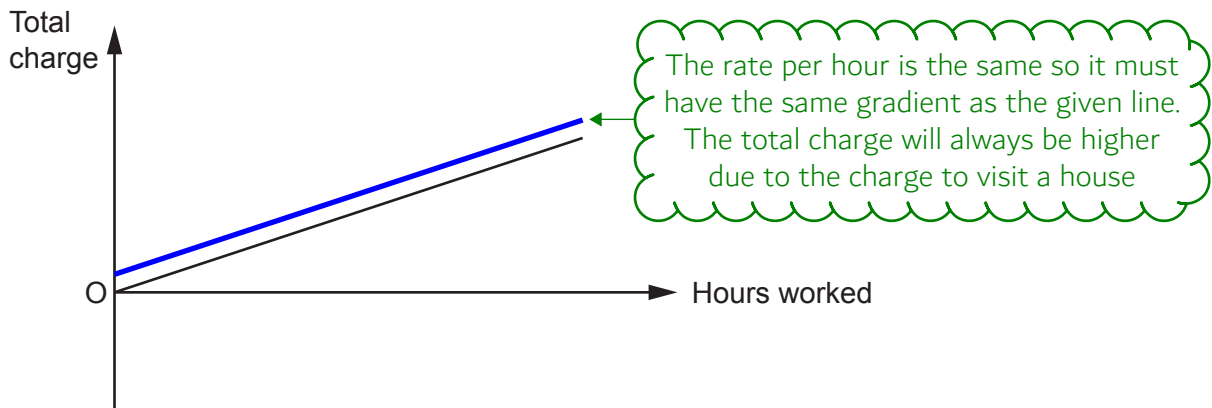*Adding 0 hours and 350 minutes to 9:30 am as sexagesimals on the calculator*

*The answer of 15°20'0" can be read as 15:20 or 3:20 pm*

..................... **15:20** ..................... **[4]**

**22** Hiro and Taylor are both electricians.
Hiro **does not** charge to visit a house but charges a fixed rate per hour for the work needed.

This graph shows the relationship between the hours worked and the total charge made by Hiro.



*The rate per hour is the same so it must have the same gradient as the given line. The total charge will always be higher due to the charge to visit a house*

**(a)** Explain how this graph shows that Hiro's total charge is directly proportional to the hours worked.

It is a straight line passing through the origin
.................................................................................................................................

............................................................................................................... **[2]**

**(b)** Taylor **does** charge to visit a house and charges the same fixed rate per hour as Hiro for the work needed.

On the axes above, draw a graph to show the relationship between the hours worked and the total charge made by Taylor. **[2]**

**Turn over**

**.CG Maths.**

**23 (a)** Eve, Jack and Ling share some money in the ratio 2 : 3 : 4.
Jack gets £720.

Work out how much Ling gets.

$\frac{720}{3} \times 4$ ← £720 is represented by 3 parts in the ratio. So dividing the £720 by 3 works out the value of 1 part of the ratio. Multiplying this by the 4 parts which represent what Ling gets works out how much Ling gets

**(a)** £ ....................... 960 ....................... **[2]**

**(b)** Amir, Beth and Casey share some money in the ratio 3 : 5 : $c$.
Casey's share is $\frac{2}{3}$ of the total.

Find the value of $c$.

$3+5$ ← This works out that there are 8 parts in the ratio which do not represent Casey

$8 \times 2$ ← These 8 parts must be 1/3 of the total as 1 - 2/3 = 1/3. So multiplying it by 2 works out the number of parts representing 2/3 of the total, which is c

**(b)** $c = $ ....................... 16 ....................... **[3]**

**.CG Maths.**

**24** The probability that Sam works from home on Monday is 0.4.
The probability that Sam works from home on Friday is 0.2.

**Monday**                                    **Friday**

0.4 — Works from home

0.2 — Works from home

0.8 — Does not work from home

0.6 — Does not work from home

0.2 — Works from home

0.8 — Does not work from home

*The probabilities on each branch must add to 1 as it is certain to either work from home or not work from home. 1- 0.4 = 0.6 and 1 - 0.2 = 0.8*
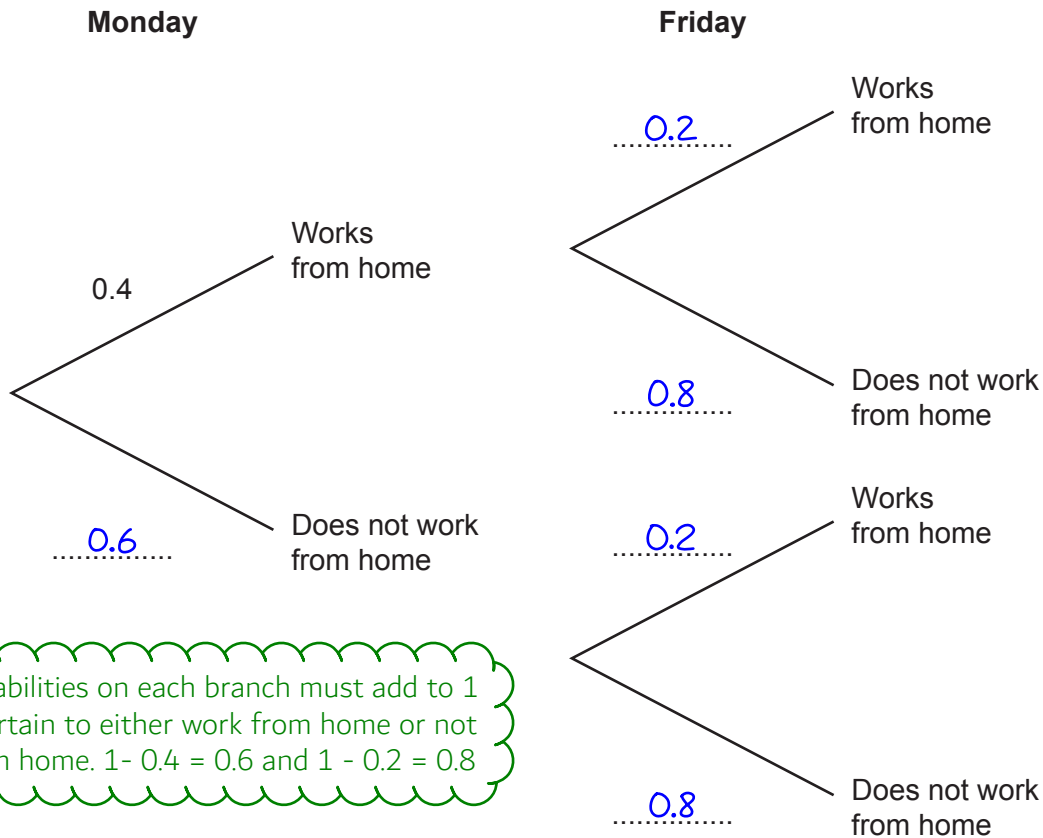
**(a)** Complete the tree diagram. **[2]**

**(b)** Work out the probability that Sam works from home on Monday but does not work from home on Friday.

0.4×0.8 ← *Works from home on Monday AND does not work from home on Friday. AND means to multiply the probabilities*

**(b)** ............................ 0.32 ............................ **[2]**

**.CG Maths.**

**25** A six-sided numbered spinner is thrown 50 times.
The score for each throw is recorded.
Some of the results are shown in the table.

An 8 was thrown $f$ times.
An unknown number on the spinner is represented by $n$.

| Score | | Frequency | |
|---|---|---|---|
| 1 | ✗ | 12 | $=12$ |
| 3 | ✗ | 2 | $=6$ |
| 5 | ✗ | 9 | $=45$ |
| 6 | ✗ | 16 | $=96$ |
| 8 | ✗ | $f$ | $=56$ |
| $n$ | ✗ | 4 | $=4n$ |
| Total | | 50 | |

2. Multiplying the scores by the frequencies works out the total score for each category

The mean score of the 50 throws is 5.5 .

Find the value of $f$ and the value of $n$.

$50 - 12 - 2 - 9 - 16 - 4$

1. Subtracting all of the other frequencies from 50 works out that f = 7

$\dfrac{215 + 4n}{50} = 5.5$

3. Adding all of the total scores for each category gives 215 + 4n. Dividing this by the total frequency of 50 expresses the mean. This must be equal to the actual mean of 5.5

$215 + 4n = 275$

4. Multiplying both sides by 50 eliminates it as the denominator on the left

$4n = 60$

5. Subtracting 215 from both sides eliminates the 215 on the left and gets the n term on its own

6. Dividing both sides by 4 eliminates the 4 on the left and gets n on its own

$f = $ ................. 7 .................
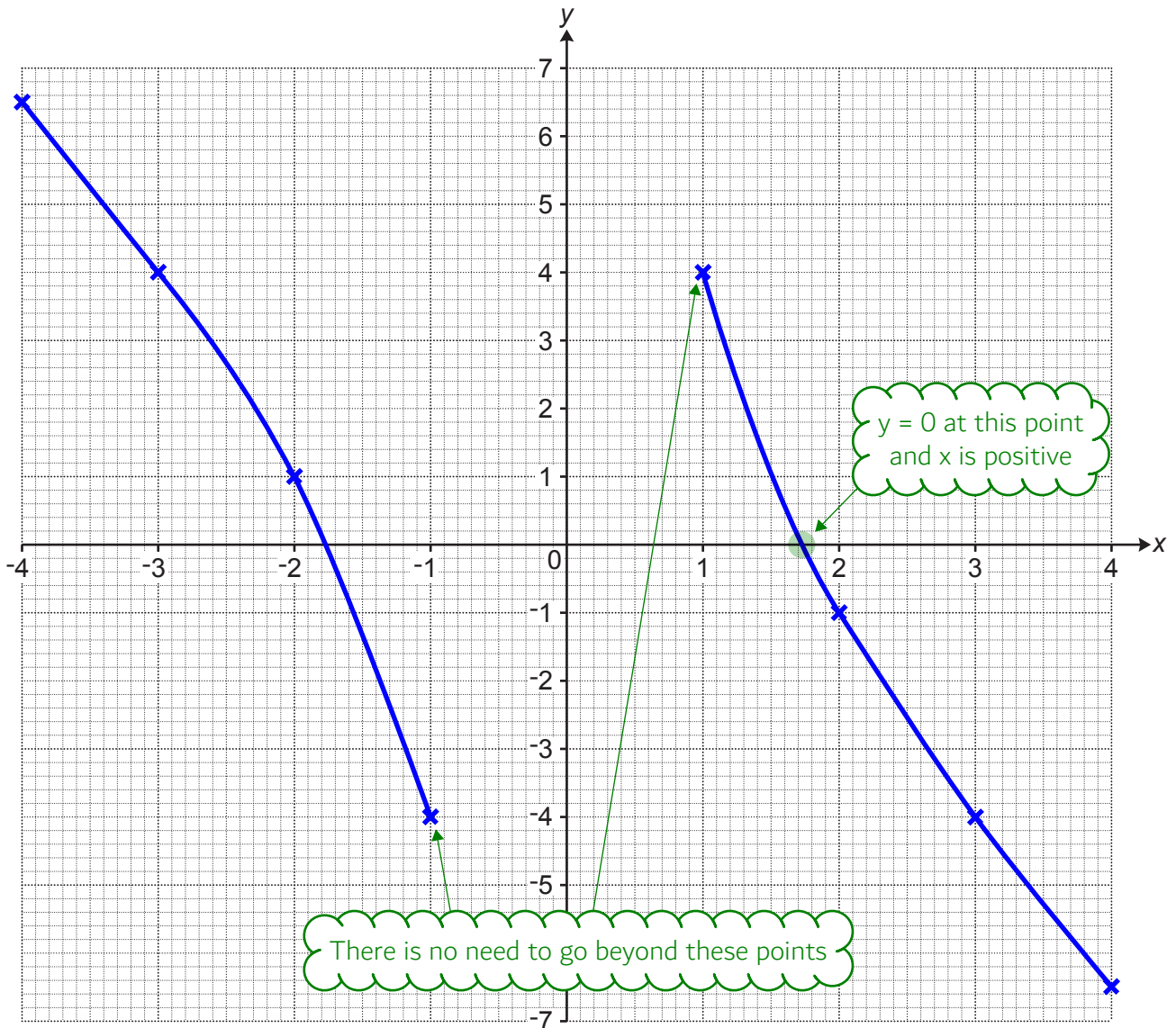
$n = $ ................. 15 .................

**[4]**

**.CG Maths.**

**26** Here is a table of values for $y = \dfrac{6}{x} - 2x$.

| $x$ | ⁻4 | ⁻3 | ⁻2 | ⁻1 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|---|
| $y$ | 6.5 | 4 | 1 | ⁻4 | 4 | ⁻1 | ⁻4 | ⁻6.5 |

**(a)** Draw the graph of $y = \dfrac{6}{x} - 2x$ for $^-4 \leqslant x \leqslant 4,\ x \neq 0$.



y = 0 at this point and x is positive

There is no need to go beyond these points

**[3]**

**(b)** Use your graph to find the positive solution of $\dfrac{6}{x} - 2x = 0$.

It is basically asking what x is when y = 0. x must be positive

Give your answer to **1** decimal place.

**(b)** $x =$ ................................ 1.7 ................................ **[1]**

**TURN OVER FOR QUESTION 27**

**Turn over**

**.CG Maths.**

**27** The diagram shows a circle inside a square of side 12 cm.
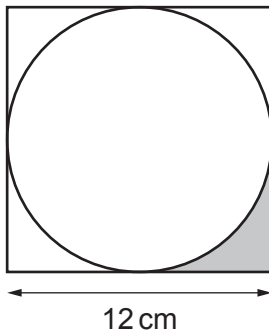


12 cm

Work out the percentage of the square that is shaded.
You must show your working.

$12^2 = 144$ ← Area of square = length$^2$. So the area of the square is 144 cm$^2$

$12 \div 2$ ← The diameter of the circle is 12 cm. Dividing this by 2 works out that the radius is 6 cm

$\pi \times 6^2$ ← Area of circle = $\pi \times$ radius$^2$. So the area of the circle is $36\pi$ cm$^2$

$144 - 36\pi$ ← Subtracting the area of the circle from the area of the square works out the area of 4 lots of the shaded area

$30.9... \div 4$ ← Dividing the area of 4 lots of the shaded area by 4 works out the shaded area

$\frac{7.7...}{144} \times 100$ ← Expressing the shaded area as a fraction of the area of the square. Converting it into a percentage by multiplying by 100

Rounding the exact answer of 5.365045915

................................................ 5.4 .................................... % **[6]**

**END OF QUESTION PAPER**

**.CG Maths.**