OCR
Oxford Cambridge and RSA

.CG Maths.
Worked Solutions

F

Thursday 4 November 2021 – Morning

GCSE (9–1) Mathematics

J560/02 Paper 2 (Foundation Tier)

Time allowed: 1 hour 30 minutes

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. If you need extra space, use the lined pages at the end of this booklet. The question numbers must be clearly shown.
• 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.

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.

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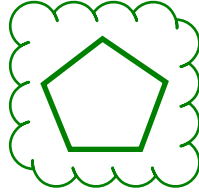
If you find any mistakes or have any requests or suggestions, please send an email to curtis@cgmaths.co.uk

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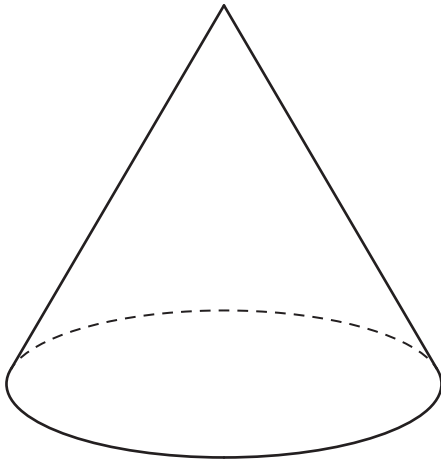Answer **all** the questions.

1 **(a)** How many sides does a pentagon have?

(a) .... 5 .... **[1]**

(b) Write down the mathematical name of this solid.

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

(c) The angles in a triangle are 40°, 50° and 90°.

Write down the mathematical name for this type of triangle.

(c) .... Right-angled triangle .... **[1]**

2 Work out.

(a) ⁻7 + 10

-7 + 10 is the same as 10 - 7

(a) .... 3 .... **[1]**

(b) 4 × ⁻2

4 x 2 = 8 so 4 x -2 = -8

(b) .... ⁻8 .... **[1]**

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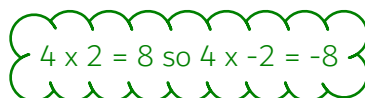
3 Work out.

(a) $9.06 \div 3$

$\begin{array}{r} 3.0\,2 \\ 3\overline{)9.0\,6} \end{array}$

Short division can be used

(a) ....3.02........................ **[1]**

(b) 15×0.6

$\begin{array}{r} 1\,5 \\ \times 0.6 \\ \hline 9.0 \end{array}$

Long multiplication can be used. As there is 1 decimal place in 0.6 there should be 1 decimal place in the answer

(b) ....9........................ **[2]**

4 Use one of these symbols $<$, $>$ or $=$ to make each statement true.

(a) $\dfrac{1}{4}$ ....$>$....... 0.025 ← 1/4 = 0.25 **[1]**

(b) 0.304 ....$<$....... 0.34 **[1]**

5 (a) Work out.

$4 + 16 \div 2$

The order of operations, BIDMAS, must be followed so the division needs to be done first.
$16 \div 2 = 8$
$4 + 8 = 12$

(a) ....12........................ **[1]**

(b) Insert one pair of brackets to make the calculation correct.

$$\left(5 \times 7 + 1\right) \div 9 = 4 \qquad \textbf{[1]}$$

Turn over

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6 In a quiz, Darcy answered 16 of the 20 questions correctly.

(a) What fraction of the questions did Darcy answer correctly?
Give your fraction in its lowest terms.

$$\frac{16}{20} = \frac{8}{10} = \frac{4}{5}$$

16 out of 20 is 16/20. It is simplified by dividing both the numerator and denominator by 2 and then by 2 again

They cannot be divided by the same amount any further without getting decimals so it doesn't go any simpler

(a) .... $\frac{4}{5}$ .... **[2]**

(b) Write the fraction as a decimal.

$$5\overline{)4.^40}\quad 0.8$$

Dividing the numerator by the denominator converts it into a fraction

(b) .... 0.8 .... **[1]**

7 (a) Write $\dfrac{13}{3}$ as a mixed number.

3 goes into 13 4 times with a remainder of 1. The 4 is the whole number and the 1 is left in the fraction

(a) .... $4\frac{1}{3}$ .... **[1]**

(b) Work out.

(i) $\dfrac{1}{3} + \dfrac{4}{9}$

$$\frac{3}{9} + \frac{4}{9}$$

Multiplied both the numerator and denominator of 1/3 by 3 to get 3/9 so that the denominators of both fractions are the same and they can be added
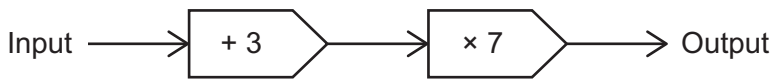
(b)(i) .... $\frac{7}{9}$ .... **[2]**

(ii) $3 \div \dfrac{1}{3}$

To divide by a fraction, keep the first number, change the division sign to a multiply and flip the second fraction. So it becomes 3 x 3/1. As 3/1 = 3, it is basically 3 x 3

(ii) .... 9 .... **[1]**

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8 Here is a function.

Input ⟶ +3 ⟶ × 7 ⟶ Output

(a) Find the output when the input is 2.

2 + 3 = 5
5 x 7 = 35

(a) .... 35 .... **[1]**

(b) Find the input when the output is 63.

63 ÷ 7 = 9
9 - 3 = 6
Doing the opposite operations in the opposite order to go from the output to the input

(b) .... 6 .... **[2]**

9 A shopper buys 4 apples costing 60 p each and 3 peaches.
They pay with a £5 note and receive 44 p in change.
Each peach costs the same amount.

Work out the cost of one peach.
You must show your working.

60
× 4
240
← Multiplying the cost of each apple by the 4 apples works out the cost of the 4 apples

500
− 44
−240
216
← There are 100 pence in a pound so multiplying the £5 by 100 converts it into 500p. Subtracting the 44p change leaves the cost of all the items. Subtracting the 240p from this leaves the total cost of the 3 peaches

072
3|2²1 6
← Dividing the total cost of the 3 peaches by the 3 peaches works out the cost of one peach

.... 72 .... p **[5]**

Turn over

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10 Ben and Sundip are making pancakes using the ingredients below.

Ingredients to make
12 pancakes

75 ml water
200 ml milk
100 g flour
50 g butter
2 eggs

(a) The ratio of the amount of water to the amount of milk needed is 75 : 200.

Write this ratio in its simplest form.

$5\overline{)7^25}$ = 1 5 $5\overline{)2^00 0}$ = 040

Dividing both sides by 5 gives the ratio 15 : 40. Both sides can be divided by 5 again to give 3 : 8. They cannot be divided any further without getting decimals

(a) ....3............. : ....8............. **[2]**

(b) Ben makes 18 pancakes.

Work out how much flour he needs.

$\frac{18}{12} = \frac{9}{6} = \frac{3}{2}$

$2\overline{)10 0}$ = 050

$\begin{array}{r} 50 \\ \times\ 3 \\ \hline 150 \end{array}$

Dividing the 18 pancakes by the 12 in the recipe works out how many lots of the recipe is made. The fraction simplifies to 3/2. Then doing 3/2 of 100g by dividing the 100 by 2 and multiplying the result by 3

(b) ....150............. g **[2]**

(c) Sundip has 225 g of butter and 10 eggs.
She has plenty of the other ingredients.

Work out the maximum number of pancakes that she can make.

$50\overline{)2\,2^25\,^{25}.0}$ = 004.5

Dividing the 225g of butter by the 50g needed to make 12 pancakes works out that there is enough butter to make 4.5 lots of 12 pancakes

$10 \div 2 = 5$

Dividing the 10 eggs by the 2 needed to make 12 pancakes works out that there are enough eggs to make 5 lots of 12 pancakes

$\begin{array}{r} 4.5 \\ \times\ 12 \\ \hline 9\ 0 \\ 45\ 0 \\ \hline 54.0 \end{array}$

The butter is the limiting factor as this is the least number of lots of 12 pancakes. So working out 4.5 lots of 12 to work out how many pancakes can be made

(c) ....54............. **[4]**

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11 Ali (A), Blake (B), Rowan (R) and Sam (S) are in a relay team.
Sam always runs fourth in the team.
The order for the other three is chosen at random.

(a) Complete this table to show all the possible orders for the team.
The first row has been completed for you.
You may not need to use all the rows.

First	Second	Third	Fourth
A	B	R	S
A	R	B	S
B	A	R	S
B	R	A	S
R	A	B	S
R	B	A	S

The outcomes are systematically listed

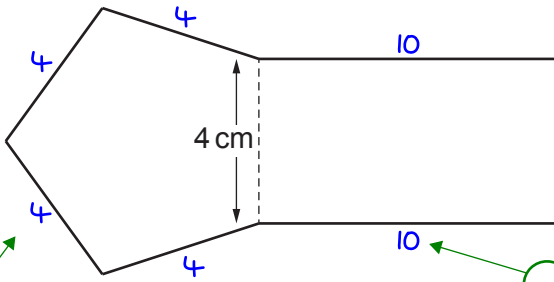**[2]**

(b) Find the probability that Ali will run first.

2 out of the 6 possible orders for the team have Ali running first

(b) .... $\frac{2}{6}$ .... **[2]**

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12 The shape below is formed by a rectangle of width 4 cm and a regular pentagon.
For the rectangle, the ratio of the width to the length is 2 : 5.

4

4

10

4 cm

Not to scale

4

Opposite sides on a rectangle are equal

4

10

Work out the perimeter of the shape.

The width of the rectangle is 4cm and this is represented by 2 parts of the ratio. Dividing the 4cm by 2 works out that 1 part of the ratio is worth 2cm. Multiplying the 2cm by 5 works out that 5 parts of the ratio represent 10cm, which is the length of the rectangle

The pentagon is regular so all of it's sides are the same length

Perimeter is the length of all of the outside edges added together. 4 + 4 + 4 + 4 + 4 + 10 + 10 = 40

..................................40.......................... cm **[4]**

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13 (a) Reece is given this question.

> Write 20 as a product of prime factors.
> Give your answer in index form.

Reece's answer is $2 \times 2 \times 5$.

Is Reece correct?
Explain your answer.

No, it isn't in index form ····· The answer should be 2^2 x 5 ··

·· **[1]**

(b) Complete the power of 2.

2^3 = 2 x 2 x 2 = 8. A negative power means '1 over'

$$\frac{1}{8} = 2^{\boxed{-3}}$$ **[1]**

(c) Work out.

$$\sqrt{81} \times 2^3$$

±9×8 ⟵ $\sqrt{81}$ = ±9
2^3 = 2 x 2 x 2 = 8

(c) ·····················±72···················· **[3]**

Turn over

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14 A car mechanic has a tin containing 5 litres of engine oil.
    Each week they use 450 millilitres of this oil for their vehicles.

    The car mechanic says

    After 9 weeks I will have used over 80% of the oil in this tin.

    Are they correct?
    Show how you decide.

$$\begin{array}{r} 450 \\ \times\ \ \ 9 \\ \hline 4050 \end{array}$$

Multiplying the 450 millilitres used each week by the 9 weeks works out that they use 4050 millilitres after 9 weeks

$$\begin{array}{r} 500 \\ \times\ \ \ 8 \\ \hline 4000 \end{array}$$

There are 1000 millilitres in 1 litre so multiplying the 5 litres by 1000 works out that there are 5000 millilitres. Dividing this by 10 works out that 10% of the tin is 500 millilitres. Multiplying this by 8 works out that 80% of the tin is 4000 millilitres

Yes

The 4050 millilitres used is more than the 4000 millilitres which is 80% of the tin. Therefore they are correct

....

.... **[5]**

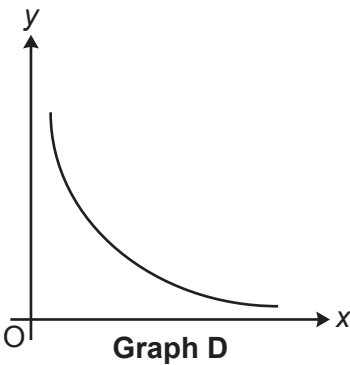**.CG Maths.**

15 Solve the inequality.

$2(x+5) < 16$

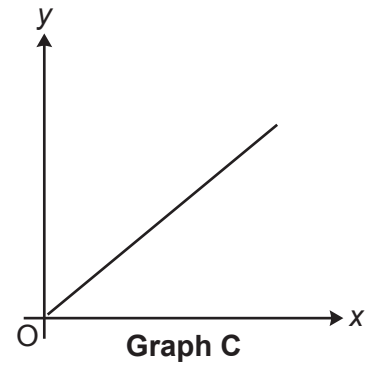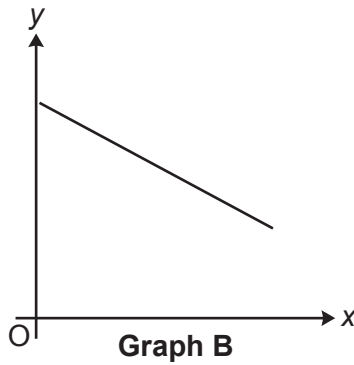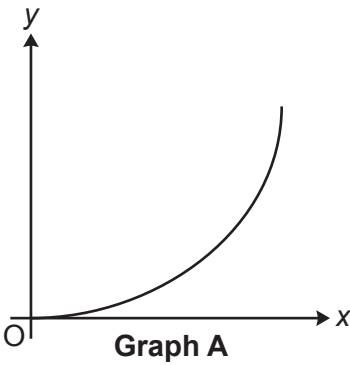$x+5<8$ ← Dividing both sides by 2 eliminates the 2 on the left

Subtracting 5 from both sides eliminates the 5 on the left and gets x on its own

.... $x<3$ .... **[3]**

16 Here are sketches of five graphs.

Graph A

Graph B

Graph C
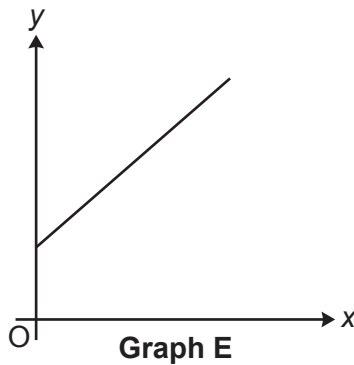
Graph D

Graph E

Write the letter of the graph that represents the following relationships.

(a) *y* is directly proportional to *x*.

Doubling x doubles y → **(a)** .... C .... **[1]**

(b) *y* is inversely proportional to *x*.

Doubling x halves y → **(b)** .... D .... **[1]**

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17 The diagram shows a prism.

5 cm

Not to scale

3 cm

8 cm

4 cm

6 cm

2cm
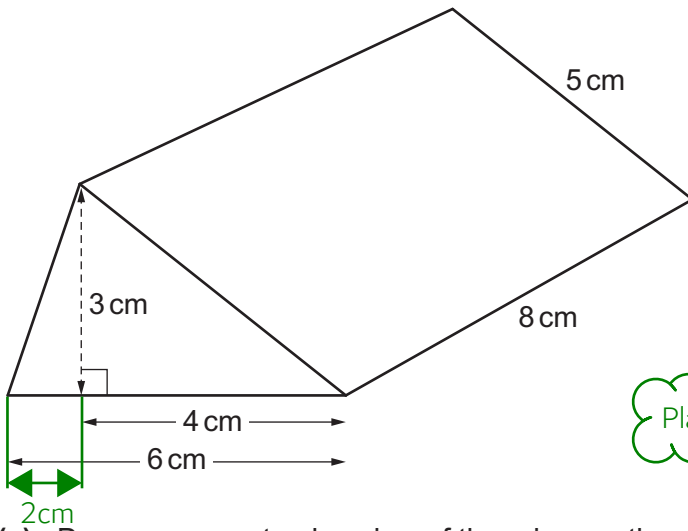
Plan means the view from directly above

(a) Draw an accurate plan view of the prism on the one-centimetre square grid below.

[3]

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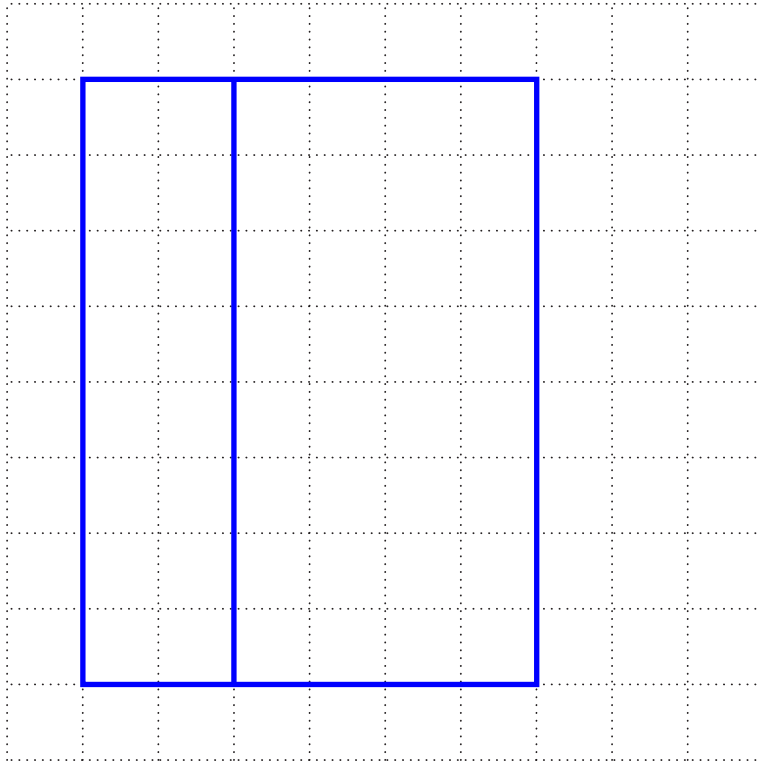
(b) Show that the volume of the prism is 72 cm³. **[2]**

$\frac{1}{2} \times 6 \times 3 \times 8 = 72$

Volume of prism = cross sectional area x length. The length of the prism is 8cm. The cross section is the triangle at the front. Area of triangle = 1/2 x base x height. The base is 6cm and the height is 3cm

(c) A cuboid with a square base also has a volume of 72 cm³.
The height of the cuboid is 2 cm.

Work out the length of one side of the square base.

$x \times x \times 2 = 72$

Volume of cuboid = length x width x height. Let x be the length of the square base of the cuboid. As all the sides of a square are the same, the width is also x. The height is 2. Forming an expression of the volume of the cuboid and setting it equal to the actual volume of 72

$x^2 = \frac{72}{2}$

$x \times x = x^2$. Dividing both sides by 2 to get the x^2 on its own

$2\overline{)7\,2}^{\,3\,6}$

Dividing the 72 by 2

$x = \sqrt{36}$

Square rooting both sides eliminates the square on the x

Length cannot be -6cm

(c) ....6.......................... cm **[3]**

Turn over

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18 The table shows the marks obtained by 10 students in spelling tests in January and February.

Mark in January	26	53	50	48	30	66	70	44	37	38
Mark in February	42	58	68	58	66	82	86	60	48	50

The marks for the first six students are plotted on the scatter diagram.

The dashed line represents all the possible points which would have no improvement. The circled point is furthest above this line so is for the student who made the greatest improvement
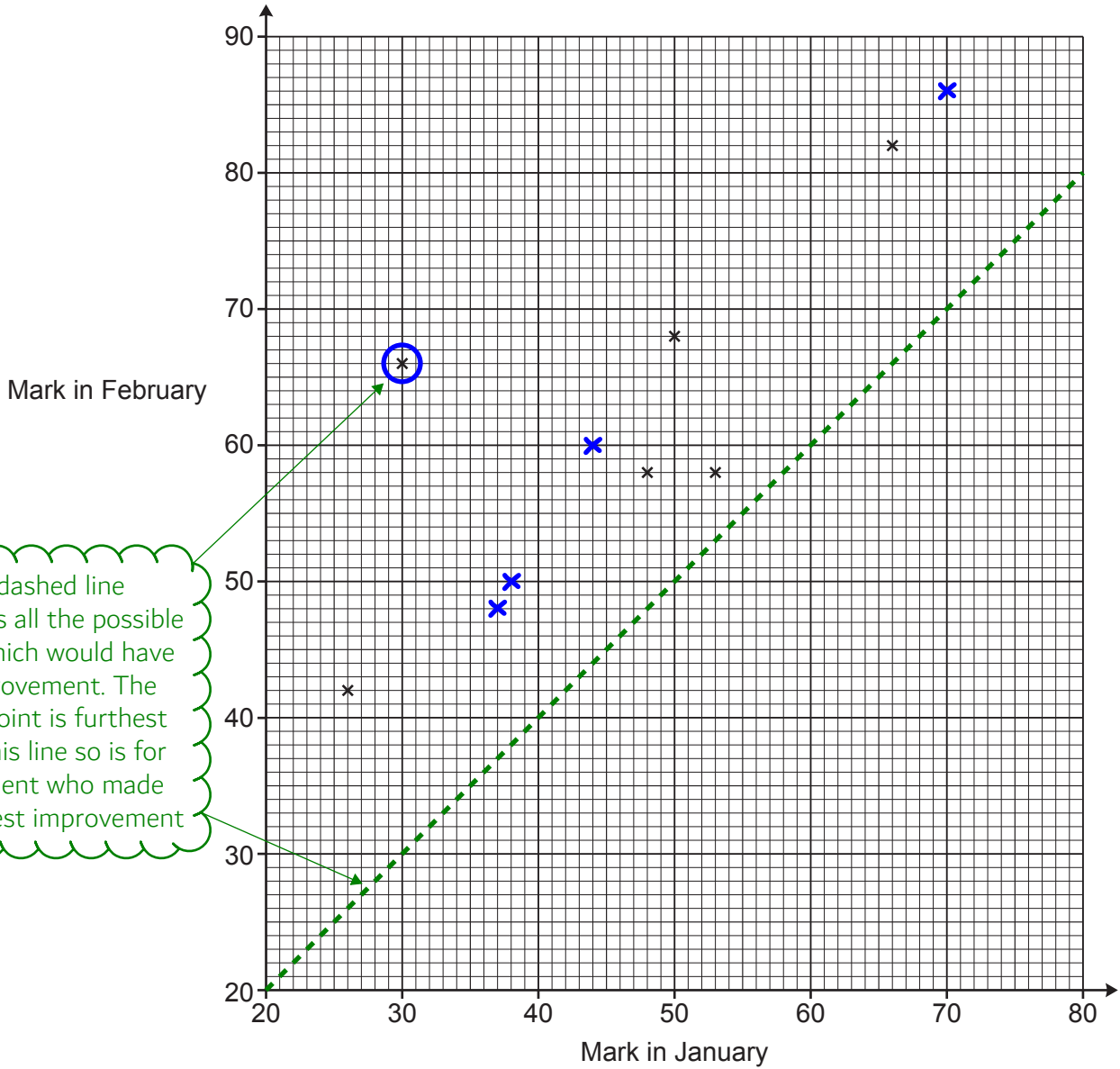
(a) Plot the marks for the remaining four students. **[2]**

(b) Describe the type of correlation shown in the completed scatter diagram.

Positive

As the mark in February increases as the mark in January increases **[1]**

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(c) **(i)** On the scatter diagram, **circle** the student that made the greatest improvement in their marks from January to February. **[1]**

(ii) Work out the percentage change in this student's marks from January to February.

66
−30
36

Percentage change = (new - original)/original x 100. The new is the mark in February which is 66. The original is the mark in January which is 30. First working out that the (new - original) is 36

0 1.2
30)3⁶6.0

Dividing the result by the original

1.2 x 100 = 120

(c)(ii) ....120...................................... % **[3]**

(d) Another student, Kai, scored 79 marks in the test in January but was absent for the test in February.

Kai says

I could use a line of best fit on the scatter diagram to estimate the marks I may have achieved in the test in February.

Is Kai's method reliable?
Give a reason for your answer.

No, this is outside of the range of data given
....

.....................The trend may not continue to rise in a straight line........................... **[1]**

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19 A worker received a 10% pay increase in 2017 and a further 10% pay increase in 2018.
The worker says

Over these two years, my pay increased by 10% + 10% = 20%.

The worker is incorrect.

Work out the correct percentage increase.
You must show your working.

$$\begin{array}{r} 1.1 \\ \times 1.1 \\ \hline 1\ 1 \\ 1\ 1\ 0 \\ \hline 1.21 \end{array}$$

100% + 10% increases to 110%. Dividing this by 100 converts it into 1.1 as a decimal multiplier. Multiplying the 1.1 by 1.1 represents an increase of 10% then another increase of 10%. As there is 1 decimal place in both 1.1s, there should be 2 decimal places in the answer

21%

Converting 1.21 into a percentage by multiplying it by 100 gives 121%, which is an increase of 21%

.... **[5]**

20 Force is measured in newtons (N).
A force of 198.5 N is applied to a rectangular surface of length 4.9 cm and width 4.1 cm.

Work out an **estimate** of the pressure, in N/cm^2, applied to this rectangular surface.

[The formula for pressure is: Pressure $= \dfrac{\text{Force}}{\text{Area}}$]

$$\frac{200}{5 \times 4}$$

Rounding all values to 1 significant figure gives a pressure of 200N, a length of 5cm and a width of 4cm. Area of rectangle = length x width. Substituting the force and area into the formula to find pressure

5 x 4 = 20
200/20 = 10

.................................**10**.................................. N/cm^2 **[4]**

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21 (a) Complete this table for $y = x^2 - 3$.

x	-3	-2	-1	0	1	2	3
y	6	1	-2	-3	-2	1	6

(-3)² = 9
9 - 3 = 6
0² = 0
0 - 3 = -3

[2]

(b) Draw the graph of $y = x^2 - 3$ for values of x from -3 to 3.
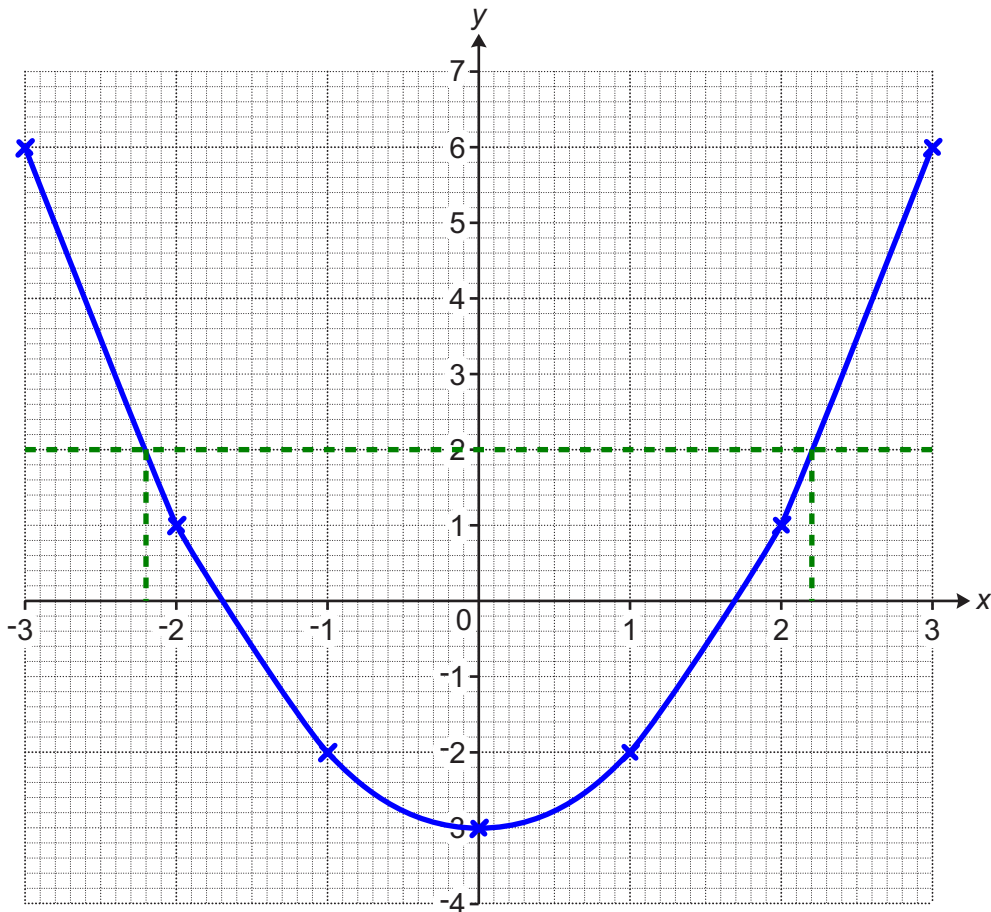
[3]

(c) Use your graph to solve $x^2 - 3 = 2$.

It is basically asking what x is when y = 2. Reading across from 2 to the line and down to the x-axis works out estimates for the solutions to the equation

(c) $x =$ ....-2.2........ or $x =$ ....2.2........ **[2]**

Turn over

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22 A journalist is going to do a survey to find out whether people aged 15 or less spend more time playing computer games than people aged more than 15.

The journalist says their sample will be the first 20 people leaving a particular shop after 9 am next Monday.

(a) Give **one** reason why the journalist's sample is unlikely to give reliable information.

Small sample .... The larger the sample, the more reliable the data ....

.... **[1]**

(b) Make **three** suggestions to help the journalist obtain a sample that may give more reliable information.

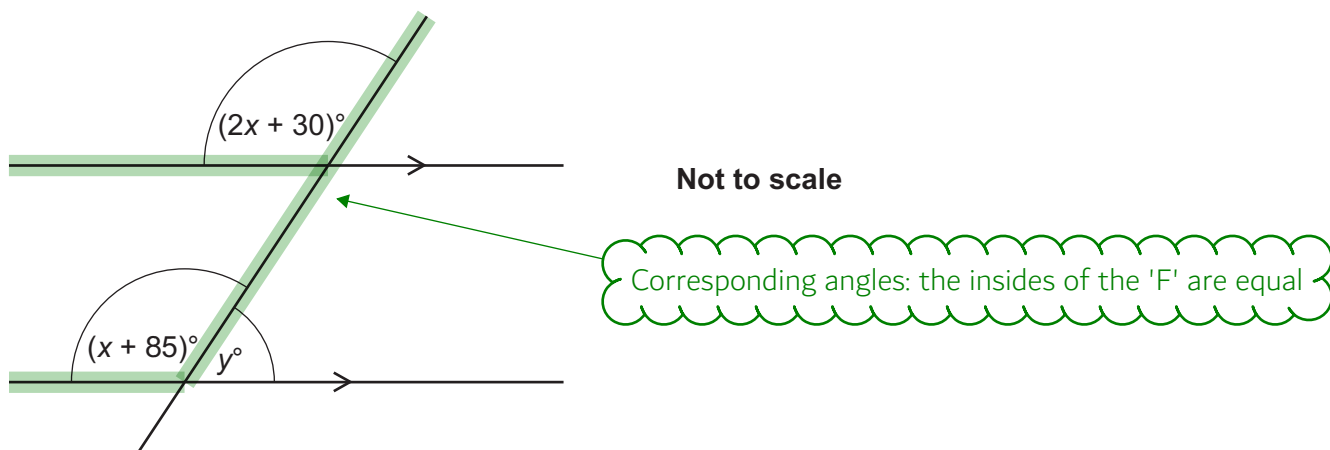1 Larger sample ....

....

2 Vary the time .... The sample was only taken after 9am on a Monday ....

....

3 Vary the location .... The sample was only taken outside a particular shop ....

....

[3]

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23 The diagram shows a straight line crossing two parallel lines.

$(2x + 30)°$

Not to scale

Corresponding angles: the insides of the 'F' are equal

$(x + 85)°$ $y°$

Find the value of y.
You must show your working.

$2x + 30 = x + 85$ ← They are equal as they are corresponding angles

$x + 30 = 85$ ← Subtracting x from both sides to collect all the x on the side with the most

$x = 55$ ← Subtracting 30 from both sides to get x on its own

$\begin{array}{r} 55 \\ +85 \\ \hline 140 \end{array}$ ← Working out that the (x + 85) angle is 140°

$\begin{array}{r} 180 \\ -140 \\ \hline 40 \end{array}$ ← There are 180° around a point on a straight line. So subtracting the 140° angle from 180 leaves angle y

$y =$ ....40...................... **[6]**

END OF QUESTION PAPER

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