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Monday 9 June 2014 – Morning

GCSE MATHEMATICS B

J567/03 Paper 3 (Higher Tier)

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Geometrical instruments
- Tracing paper (optional)

Duration: 1 hour 45 minutes

J567703

3059372584

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The quality of written communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **100**.
- This document consists of **24** pages. Any blank pages are indicated.

WARNING

No calculator can be used for this paper

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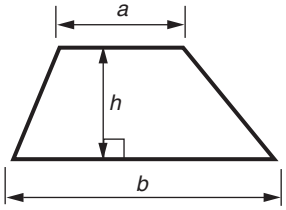
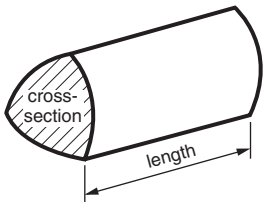
Formulae Sheet: Higher Tier

Area of trapezium $= \frac{1}{2}(a + b)h$



Volume of prism = (area of cross-section) × length

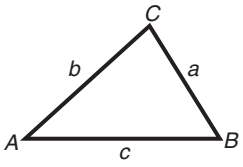


In any triangle *ABC*

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

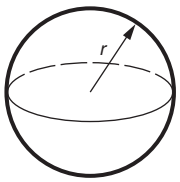
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$



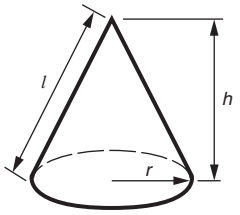
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$,
where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

PLEASE DO NOT WRITE ON THIS PAGE

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Answer **all** the questions.

1 Students at a sports college choose activities for games.

(a) In Year 7 they chose between rounders and athletics in the ratio 1 : 4.
There are 60 students in Year 7.

Work out how many chose athletics.

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

(b) In Year 8 they chose between badminton and swimming in the ratio 3 : 5.

If 42 students chose badminton, work out how many chose swimming.

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

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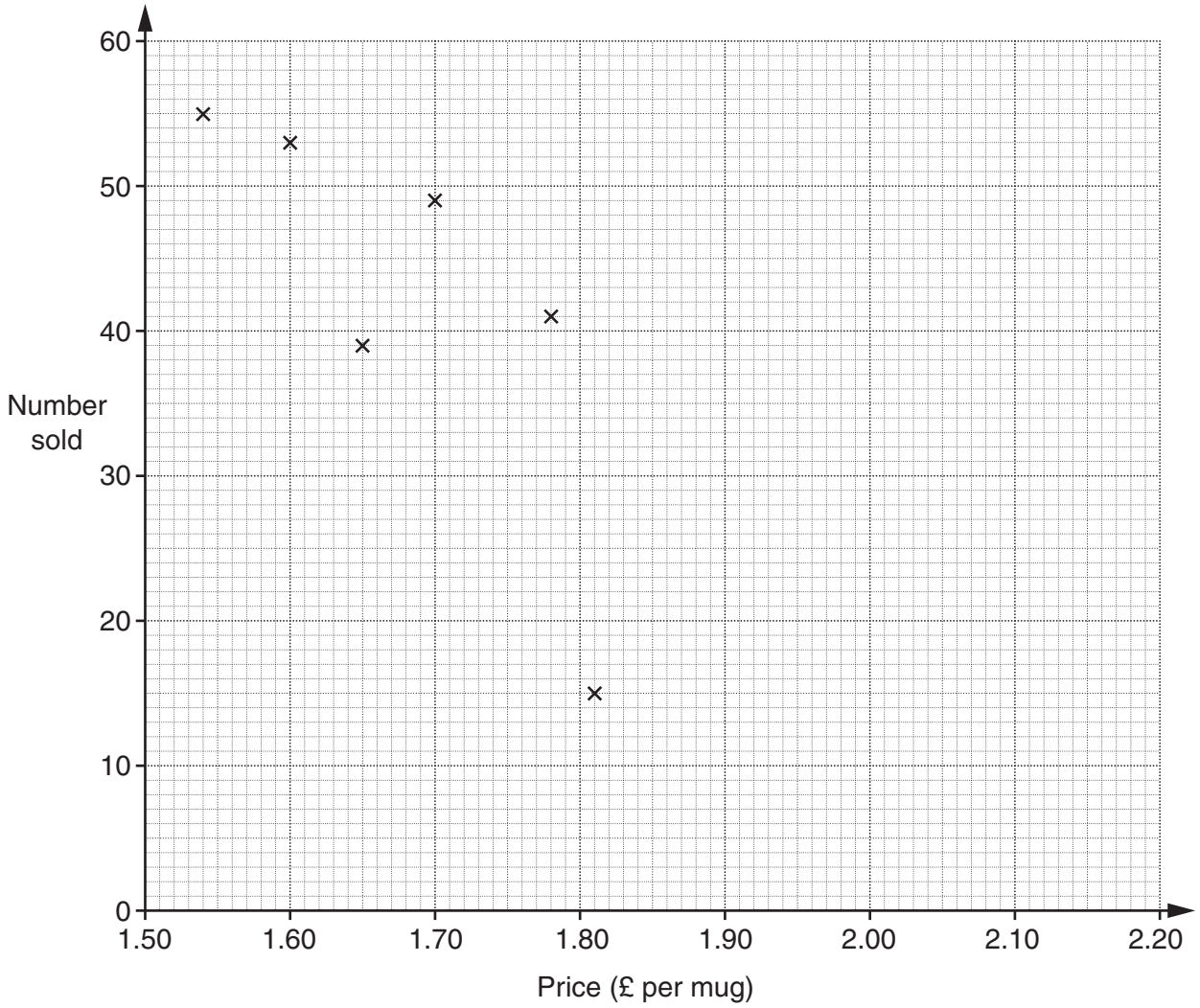
2 Chico sells coffee in his café.
He changes the price of a mug of coffee every day.
The table shows the number of mugs of coffee he sells and the price on each of ten days.

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
Price (£ per mug)	1.54	1.60	1.65	1.70	1.78	1.81	1.88	2.05	2.14	2.20
Number sold	55	53	39	49	41	15	40	25	28	21



(a) The first six points have been plotted on the scatter diagram.

Complete the scatter diagram by plotting the last four points. **[2]**

(b) Describe the correlation shown.

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

(c) Draw a line of best fit on the diagram. **[1]**

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(d) The café closed early one day.

Put a ring around the cross that shows this day. **[1]**

(e) One day Chico charges £2.00 per mug of coffee.

Use the diagram to estimate how much money **in total** Chico takes this day on coffee.

(e) £ ..... **[2]**

3 **(a)** Work out the value of $5x^2 + 2x$ when $x = 3$.

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

(b) Work out the value of $3a - 5b$ when $a = 6$ and $b = -2$.

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

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4 Work out.

$$5\frac{3}{5} - 2\frac{1}{6}$$

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

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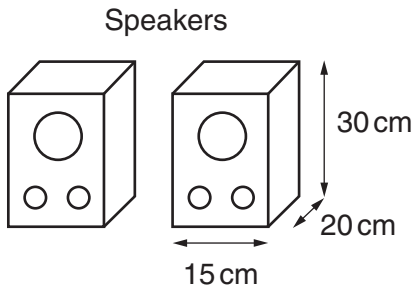
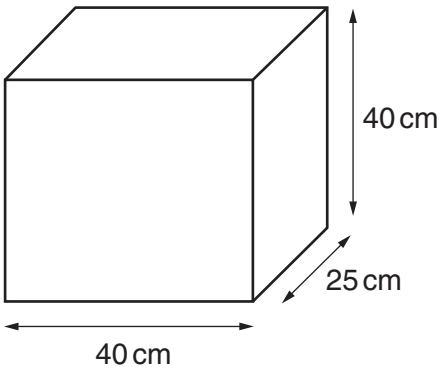
5 **(a)** A hi-fi speaker is a cuboid measuring 15 cm by 20 cm by 30 cm.
Two of these speakers are packed into a box with internal measurements 40 cm by 25 cm by 40 cm.





The rest of the space inside the box is filled with polystyrene.

Calculate the volume of polystyrene.

(a) ..... cm^3 **[4]**

(b) An amplifier is packed into a box measuring 20 cm by 15 cm by 10 cm.

Calculate the surface area of the box.

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

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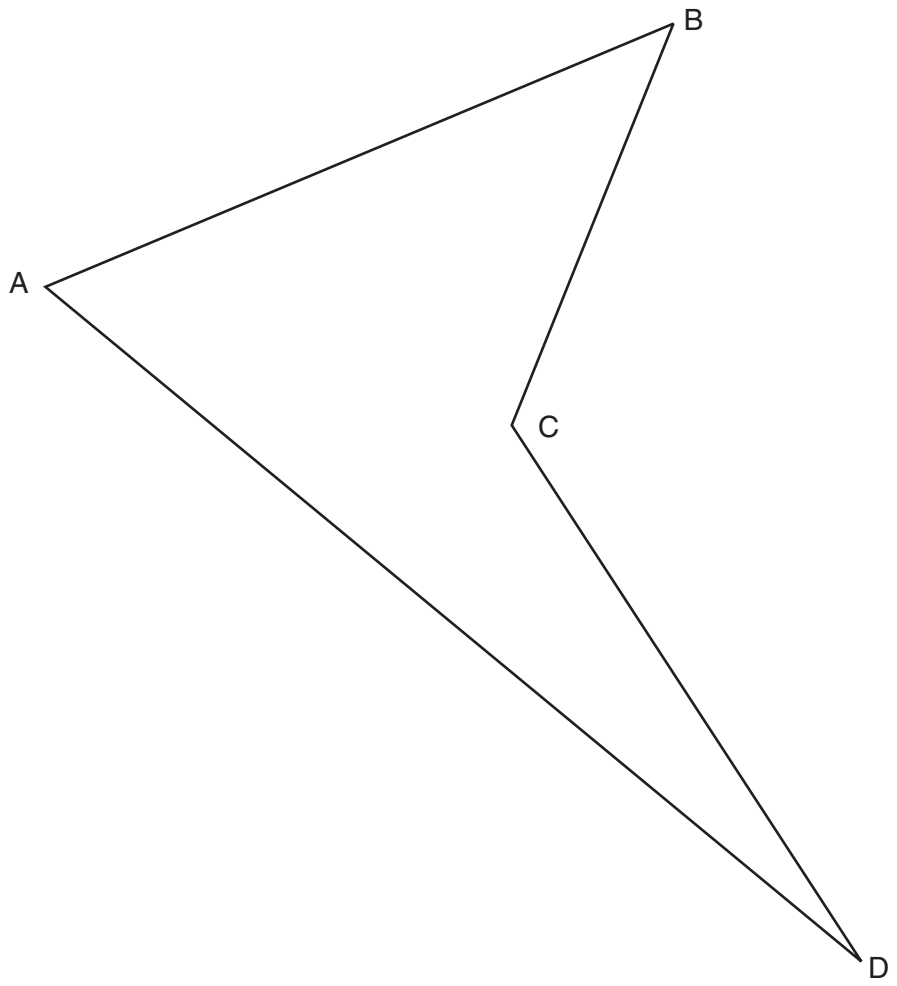
6 The diagram shows a park ABCD.



Scale: 1 cm represents 100 m

The council want to put a shed inside the park and it must be

- nearer to AB than AD
- less than 400 m from C.

Shade the region where they can put the shed.
You must show all your construction arcs. **[4]**

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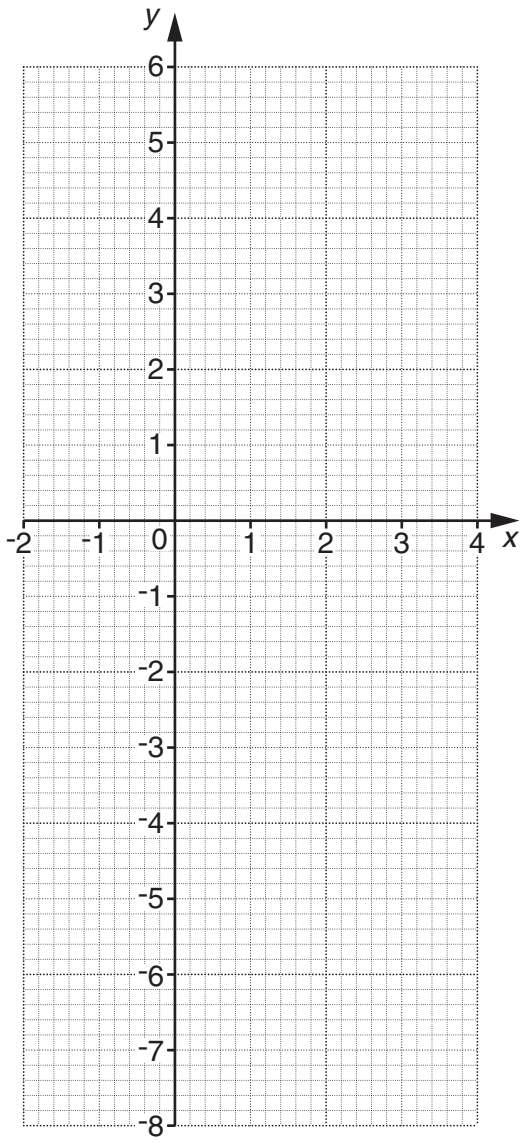
7 **(a)** Complete this table for $y = 2x - 3$.

x	-2	-1	0	1	2	3	4
y	-7	-5		-1			5

[1]

(b) Draw the graph of $y = 2x - 3$ for values of x from -2 to 4.



[2]

(c) Write down the gradient of the line $y = 2x - 3$.

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

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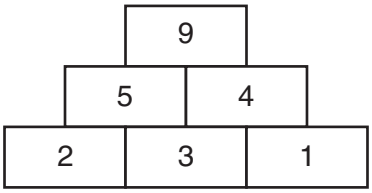
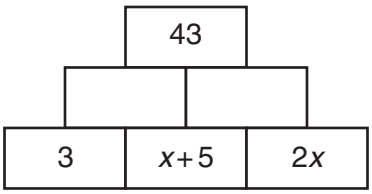
8 Here is a number pyramid.
The value in each cell is found by adding the values in the two cells beneath it.



In the number pyramid below, find the value of x.
Show all your working.



$x =$ ..... **[4]**

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9 Winnie drives 184 miles.
She drives 60 miles on ordinary roads and the rest on a motorway.

She completes the journey in $3\frac{1}{2}$ hours.
She drives at an average speed of 40 mph on ordinary roads.

Work out her average speed on the motorway.

..... mph **[4]**

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10 **(a)** Multiply out.

$5(3x - y)$

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

(b) Solve.

$5x + 17 = x + 3$

(b) $x =$ ..... **[3]**

(c) Rearrange $y = 2x - 3$ to make x the subject.

(c) $x =$ ..... **[2]**

(d) Rearrange $u = 5t^2$ to make t the subject.

(d) $t =$ ..... **[2]**

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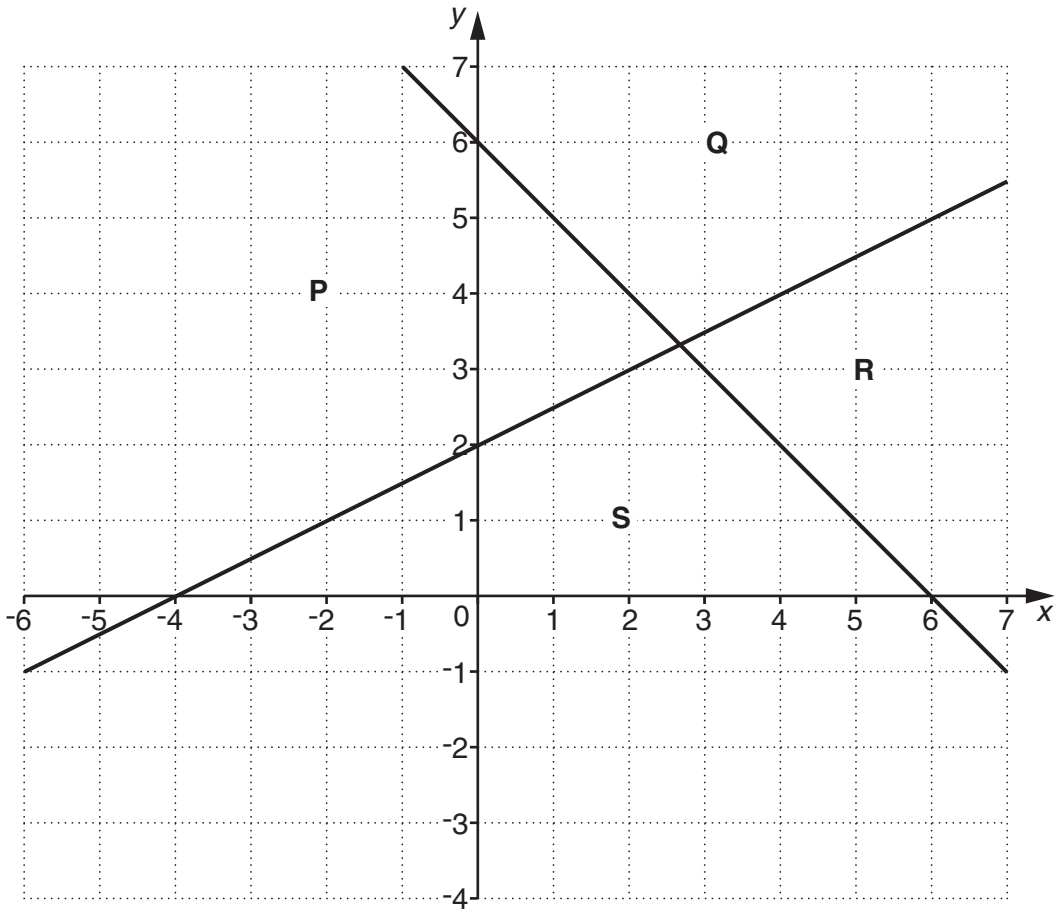
11 This coordinate grid is divided into four regions, **P**, **Q**, **R** and **S**.



Choose the correct regions to complete these sentences.

Regions ..... and ..... satisfy the inequality $x + y \geqslant 6$.

Region ..... satisfies the inequalities $x + y \leqslant 6$ and $y \geqslant \frac{1}{2}x + 2$.

[2]

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12 (a) (i) Write 5 400 000 in standard form.

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

(ii) Write 4.63×10^{-4} as an ordinary number.

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

(b) The UK's Gross Domestic Product (GDP) in 1987 was $\$7 \times 10^{11}$ and in 2007 it was $\$2.8 \times 10^{12}$.

Work out the increase in GDP between 1987 and 2007.
Write your answer in standard form.

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

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13 Pet insurance costs £180 each year.
There is a discount of 5% if it is bought online.

Calculate the cost of one year's pet insurance after the discount.

£ ..... **[3]**

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14 Imogen went fishing and recorded the weight of each fish she caught.
The table shows her results.

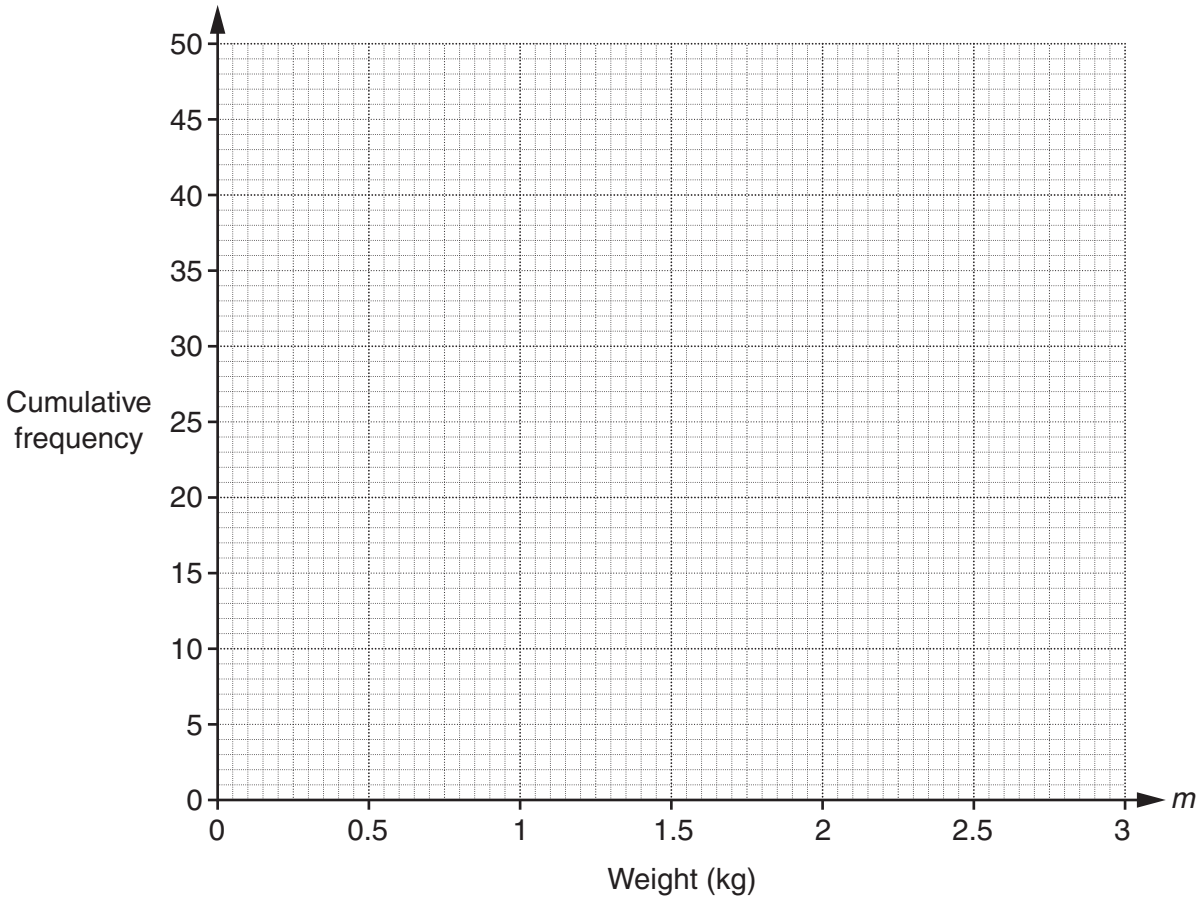
Weight ($m$kg)	$0 < m \leqslant 0.5$	$0.5 < m \leqslant 1$	$1 < m \leqslant 1.5$	$1.5 < m \leqslant 2$	$2 < m \leqslant 3$
Number of fish	10	5	15	16	4

(a) Complete this cumulative frequency table for Imogen's results.

Weight ($m$kg)	$m \leqslant 0.5$	$m \leqslant 1$	$m \leqslant 1.5$	$m \leqslant 2$	$m \leqslant 3$
Cumulative frequency					

[2]

(b) Draw the cumulative frequency graph for her results.



[2]

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(c) The median weight of fish Ruth caught is 1.2 kg.

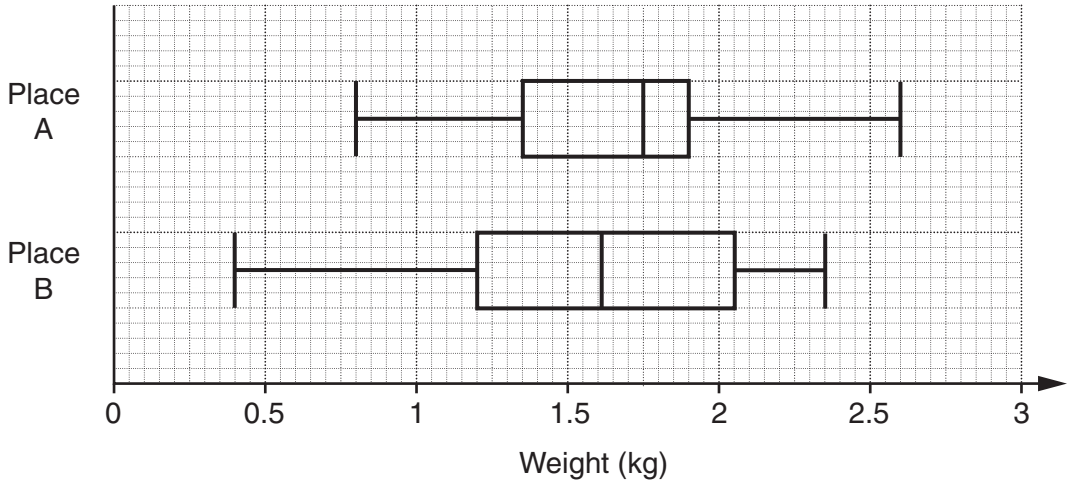
Is Imogen's median higher or lower than Ruth's?
Show how you decide.

..... **[1]**

(d) Use your graph to work out the percentage of fish Imogen caught that were over 1.8 kg.

(d) ..... % **[3]**

(e) The box plots summarise the weights of fish that Calvin caught at place A and place B.



Write **two** different comments comparing the weights of fish caught at the two places.

1 .....

.....

2 .....

.....

[2]

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15 **(a)** Write $y = x^2 + 12x + 24$ in the form $y = (x + p)^2 + q$.

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

(b) Hence state

(i) the minimum value of $y = x^2 + 12x + 24$,

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

(ii) the value of x at which this minimum occurs.

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

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16 **(a)** Expand and simplify.

$$(1 + \sqrt{3})(4 + 2\sqrt{3})$$

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

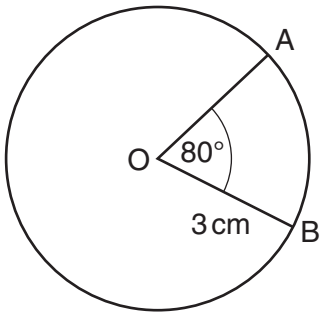
(b) Rationalise the denominator in this expression.

$$\frac{3 + \sqrt{2}}{\sqrt{2}}$$

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

(c) Here is a circle, centre O.

Find the area of the sector OAB in terms of π.
Write your answer in its simplest form.



Not to scale

(c) ..... cm^2 **[3]**

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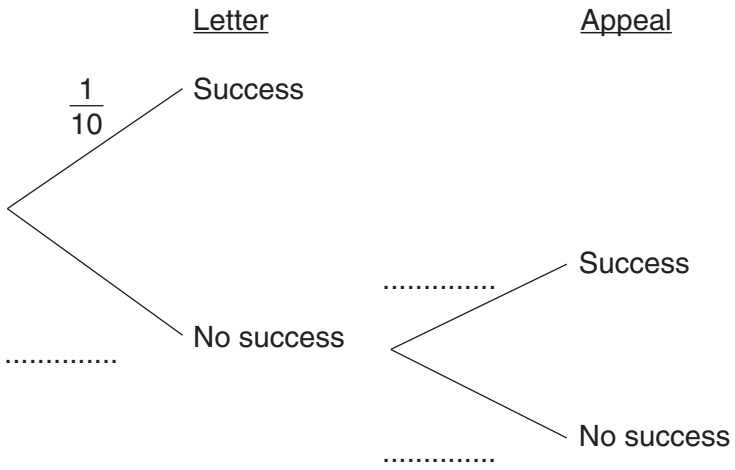
17 Terry applies for funding to set up a community skatepark.
He writes a letter of application.

The probability of this being successful is $\frac{1}{10}$.

If his letter is unsuccessful, he can appeal. The probability of success at the appeal is $\frac{1}{3}$.

(a) Complete the tree diagram.



[2]

(b) Work out the probability that he is successful in getting funding.

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

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18 $\overrightarrow{PQ} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$

(a) Work out $3\overrightarrow{PQ}$.

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

(b) If Q = (7, $^{-}$5), write down the coordinates of P.

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

19 Write $0.\dot{7}\dot{2}$ as a fraction in its simplest terms.

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

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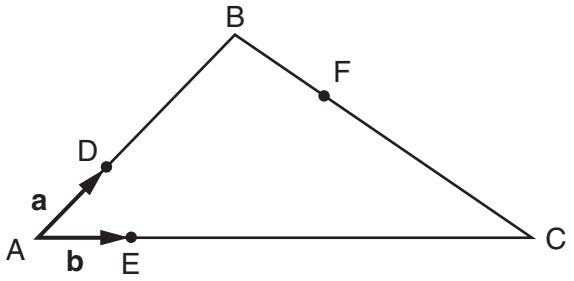
20 **(a)** In the diagram below, ABC is a triangle.

$\overrightarrow{AD}$ = **a** and $\overrightarrow{AE}$ = **b**

- D is a point on AB such that AB = 4AD
- E is a point on AC such that AC = 4AE
- F is a point on BC such that BC = 4BF



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Write these vectors in terms of **a** and **b** in their simplest form.

(i) $\overrightarrow{AB}$

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

(ii) $\overrightarrow{BC}$

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

(iii) $\overrightarrow{EF}$

(iii) ..... **[2]**

(b) What do your answers from **(a)(i)** and **(a)(iii)** tell you about AB and EF?

..... **[1]**

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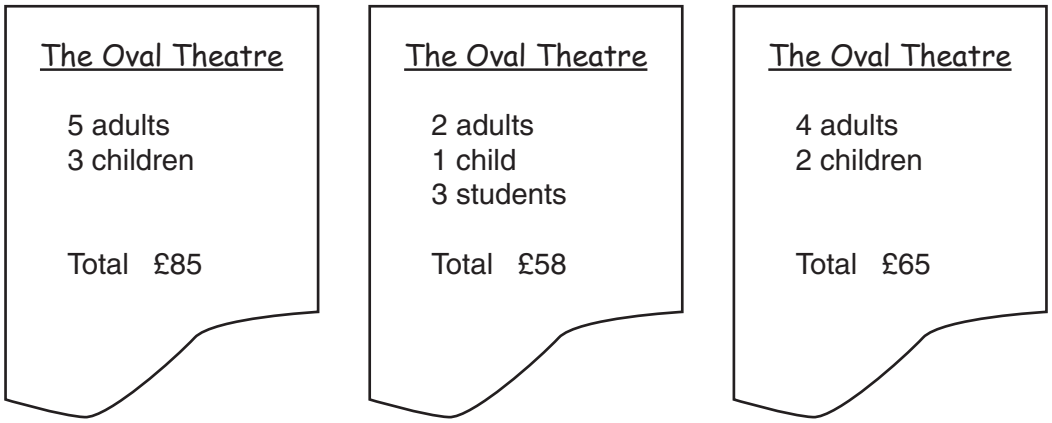
21* At The Oval Theatre there are three different ticket prices, adult, child and student.
Henri finds three receipts for tickets for the same performance.



Work out the price for an adult and the price for a child.

Adult price £ .....

Child price £ ..... **[5]**

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