OCR
Oxford Cambridge and RSA

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Thursday 21 May 2015 – 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

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.
- 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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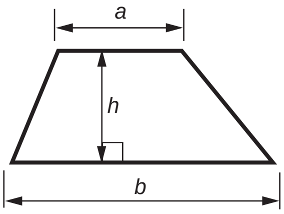
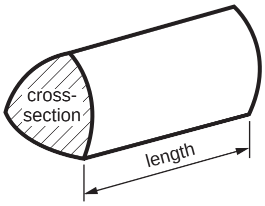
Turn over

Formulae Sheet: Higher Tier

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



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

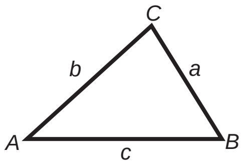


In any triangle *ABC*

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

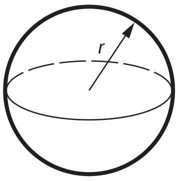
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



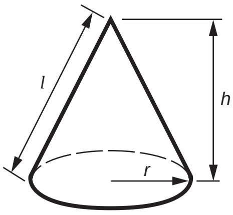
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

Curved surface area of cone = πrl



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 **(a)** Highstone Builders mix cement and sand in the ratio 1 : 5.
They need to make 240 m^3 of the mixture.

Work out how much sand they need.

(a) ____________________________ m^3 **[2]**

(b) Sturdy Construction mix cement and sand in the ratio 2 : 7.

Work out how much sand they need to mix with 22 m^3 of cement.

(b) ____________________________ m^3 **[2]**

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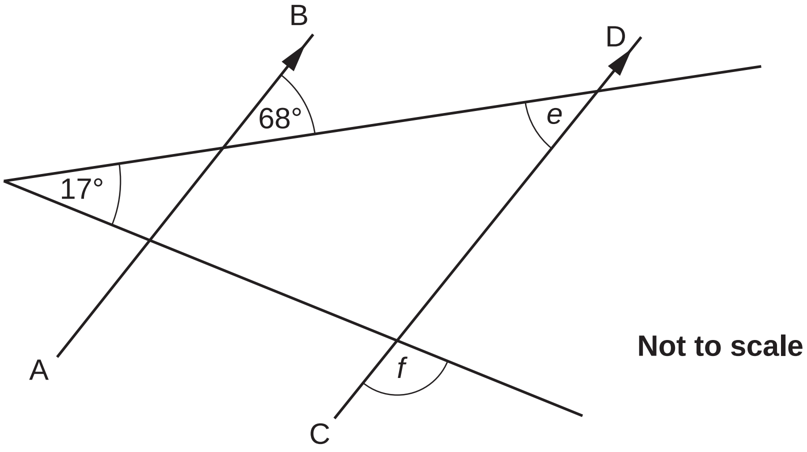
2 In the diagram AB is parallel to CD.


B
D
68°
e
17°
A
f
C
Not to scale

Work out the following angles, giving reasons for your answers.

(a) Angle *e* = ________________° because ____

____ **[1]**

(b) Angle *f* = ________________° because ____

____

____ **[3]**

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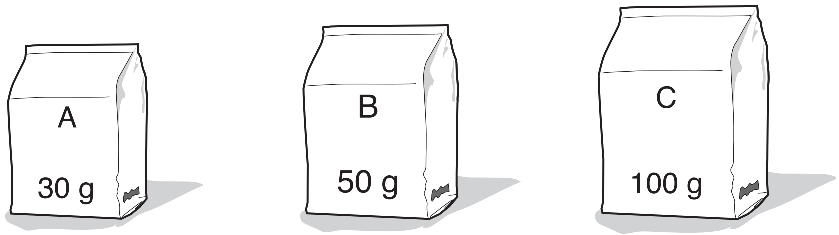
3 **(a)** The cost of a packet of spice is 80p.
The cost is increased by 15%.

Work out the new cost of the packet.

(a) ______________________ p **[3]**

(b) Here are three packets of a different spice.



23p 39p 80p

Which packet offers the best value for money?
Show clearly how you decide.

(b) ______________________ **[3]**

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4 **(a)** Multiply out.

$5(2x + 3)$

(a) ______________________________ **[1]**

(b) Factorise completely.

$3x^2 - 12x$

(b) ______________________________ **[2]**

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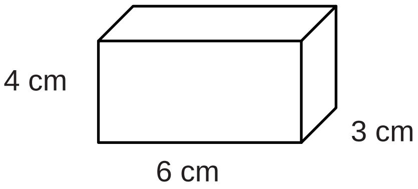
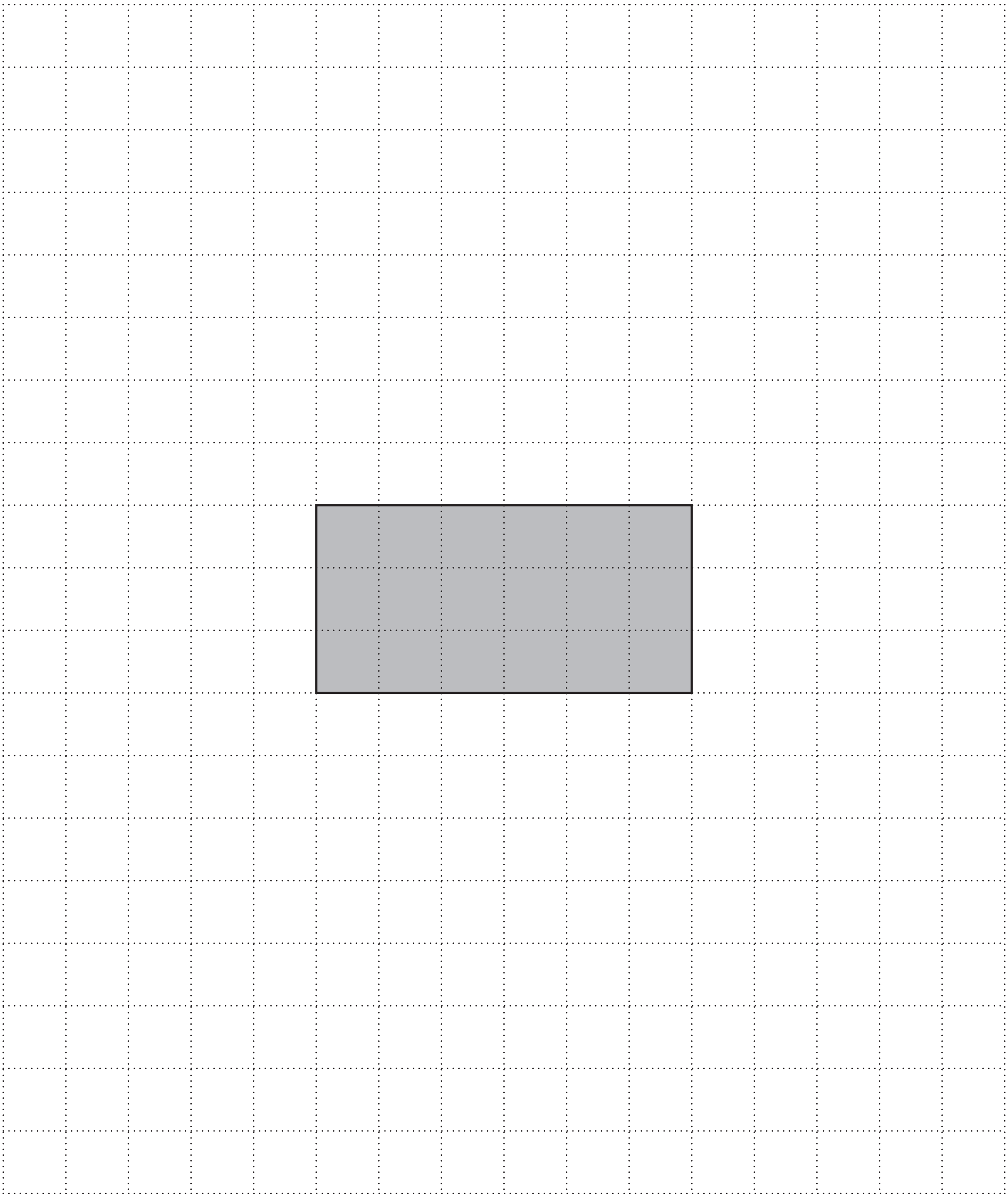
5 The diagram shows a cuboid.



Complete the net of this cuboid on the one-centimetre square grid below.



[3]

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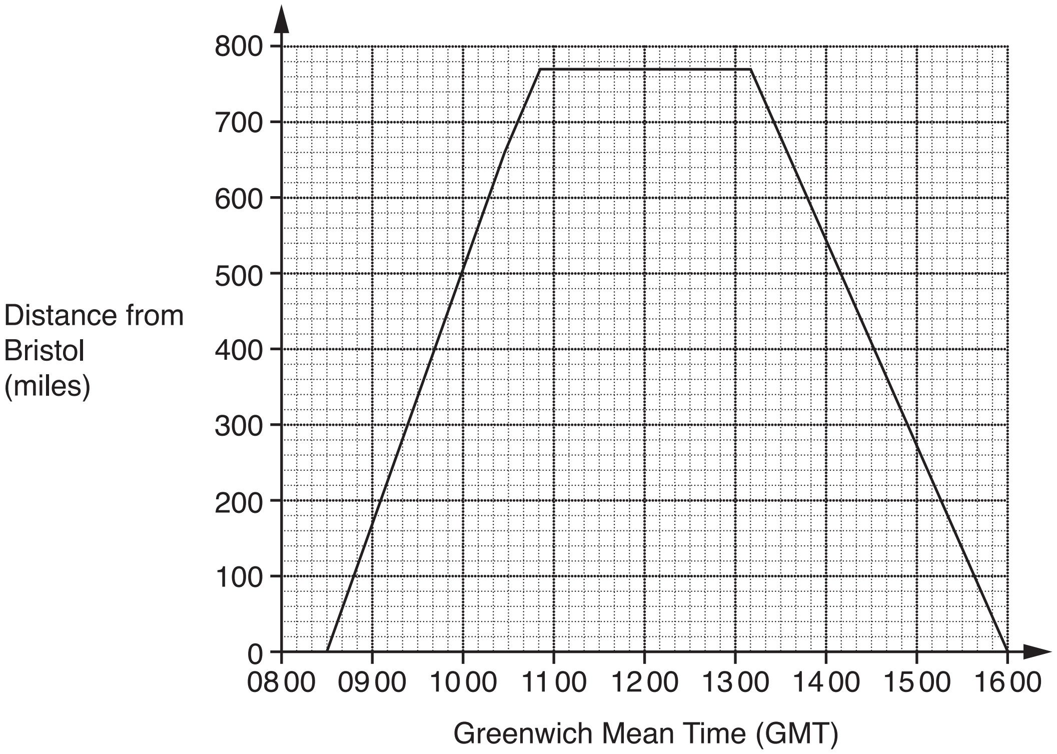
6 The graph shows the journey of a plane from Bristol to Barcelona and back.



(a) **(i)** Use the graph to complete this table.

Time (GMT)	08 30	10 30
Distance from Bristol (miles)	0	

[1]

(ii) Use the table to work out the average speed of the plane on the outward journey from Bristol to Barcelona.
Give the units of your answer.

(a)(ii) ____________________ __________ **[3]**

(b) The local time in Barcelona is one hour **ahead** of GMT.

What was the **local time** when the plane landed at Barcelona?

(b) ________________________________ **[1]**

(c) The plane flew over a beacon which is 280 miles from Bristol.

Write down the GMT times when the plane flew over the beacon.

(c) __________________ and __________________ **[2]**

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7* A family has four daughters, Molly, Daisy, Rosie and Tilly.

- Daisy is six years older than Molly.
- Molly is four years younger than Tilly.
- Rosie is one year older than double Molly's age.
- The total of their ages is 51.

Find the age of each of the four girls. **[5]**

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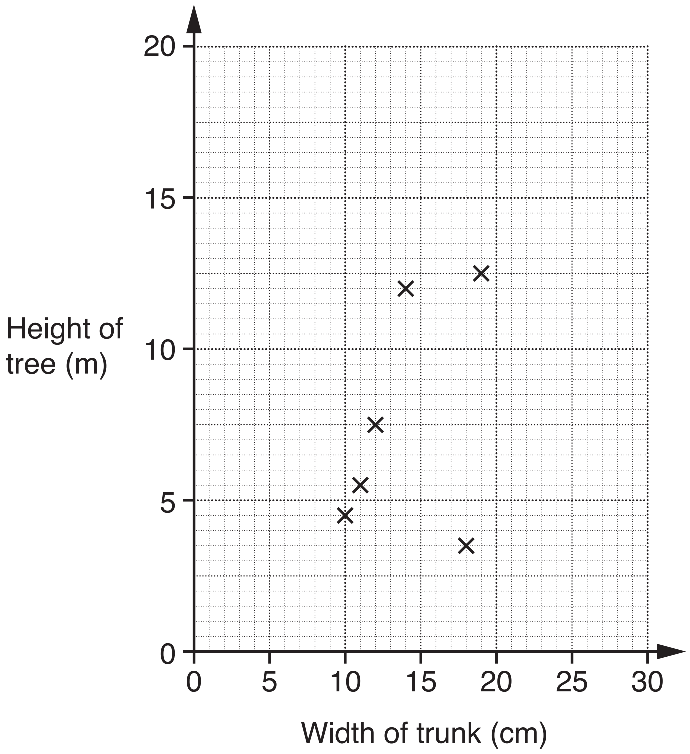
8 Amber measures the heights of some young trees and the widths of their trunks.
The results are shown in the table below.

Width of trunk (cm)	10	11	12	14	18	19	22	23	28	29
Height of tree (m)	4.5	5.5	7.5	12	3.5	12.5	11.5	16	15	18



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

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

(b) State the correlation shown by the scatter diagram.

(b) ______________________________ **[1]**

(c) Use your diagram to describe the relationship between the width of a tree trunk and the height of the tree.

____ **[1]**

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

(ii) Amber has a tree with a trunk width of 25 cm.

Use your diagram to estimate the height of this tree.

(d)(ii) ______________________________ m **[1]**

(e) One of these trees is from a different species.

On the diagram put a circle around the point for that tree. **[1]**

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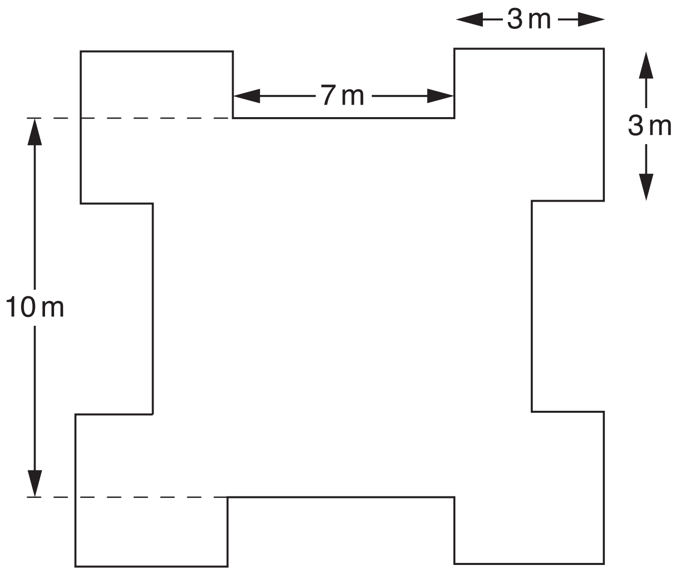
9 The diagram shows the plan of a castle.
The plan has four lines of symmetry.



Not to scale

Work out the area of the plan.

______________________________m^2 **[4]**

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10 **(a)** Solve.

$7x - 2 = 3x + 20$

(a) $x =$ ______________________________ **[3]**

(b) Rearrange this formula to make r the subject.

$A = 4 + r^2$

(b) ______________________________ **[2]**

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PMT

11 Magda is conducting a survey on travel.

(a) Here is one of her questions.

Do you agree that public transport is better now than it was five years ago?

☐ Yes ☐ No ☐ Don't know

Explain what is wrong with her question.

[1]

(b) Write a suitable question, with response boxes, to find out how many train journeys a person takes in a month.
Use 20 journeys as a maximum number. **[2]**

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(c) Magda wants to take a stratified random sample from a group of people.

Which of these statements best describes a stratified random sample?

Statement A: You go through the population and pick every tenth person.

Statement B: You select a month at random and pick people who were born in that month.

Statement C: The population is divided into groups, each group having something in common, and the same proportion is randomly selected from each group to form the sample.

Statement D: You put all the names of the members of the population into a hat and take out some names at random.

(c) Statement ______________________________ **[1]**

(d) Magda decides to ask a sample of people her questions.

Criticise each of these methods for collecting the information.

(i) Stand outside the railway station and select people randomly.

____

____

____ **[1]**

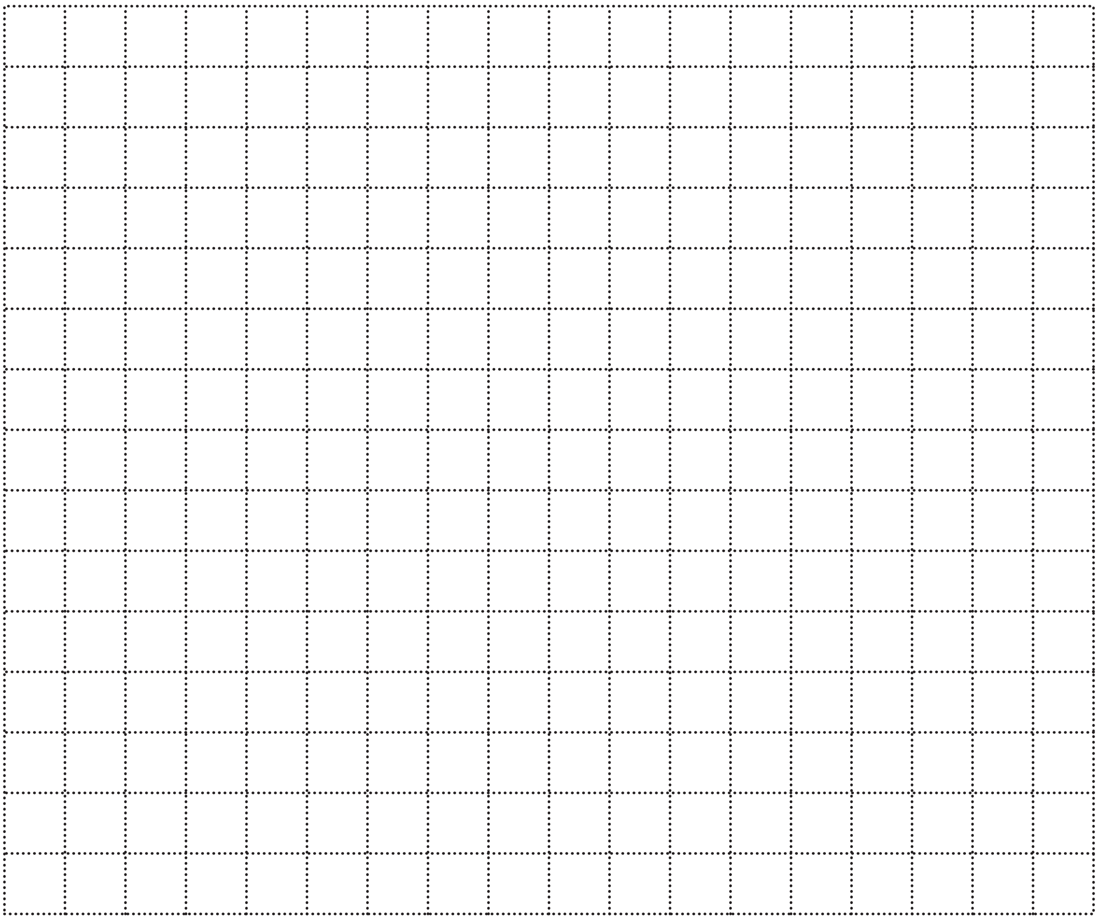
(ii) Select telephone numbers at random from a directory and telephone them.

____

____

____ **[1]**

12 Here is a grid.



Find the **single** transformation that is equivalent to

- reflection in $x = {}^{-}1$

followed by

- reflection in $x = 2$.

You may use the grid to help you.

____ **[3]**

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13 **(a)** Solve these simultaneous equations algebraically.

$4x - 2y = 2$
$3x + \quad y = 14$

(a) $x =$ ____________________

$y =$ ____________________ **[3]**

(b) Write the expression $x^2 - 10x + 10$ in the form $(x - a)^2 - b$.

(b) ____________________ **[3]**

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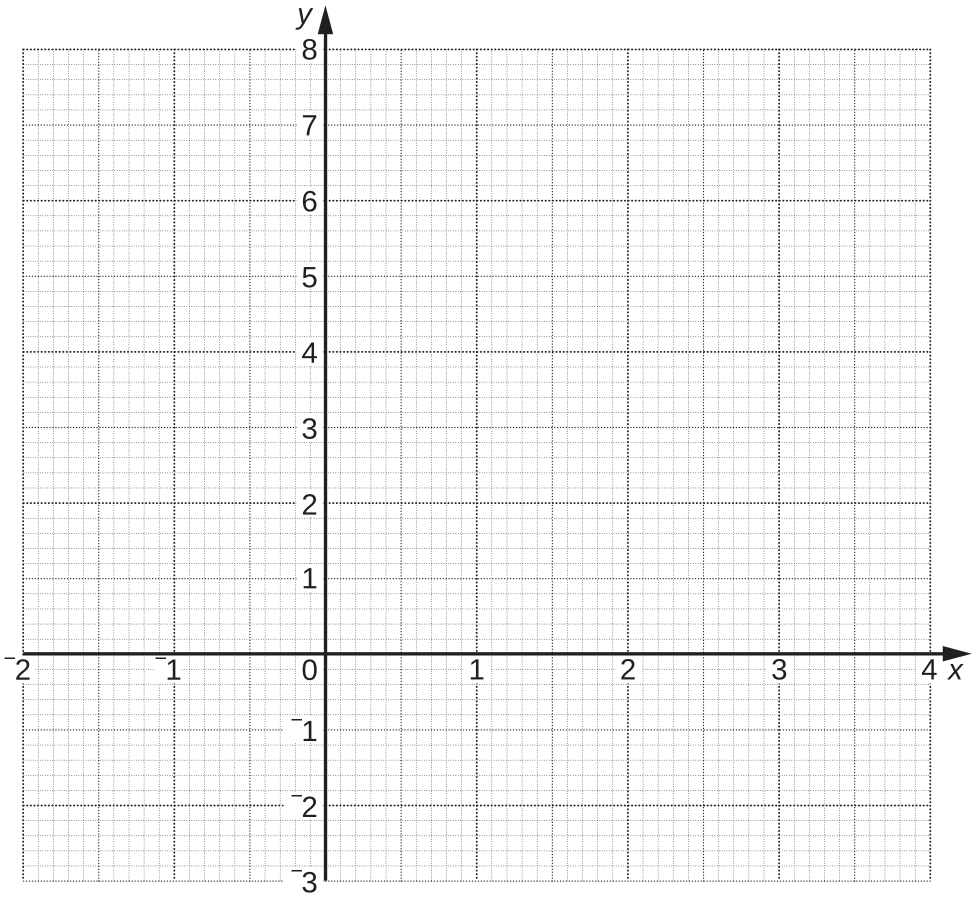
14 **(a)** Complete this table for $y = x^2 - 2x - 1$.

x	$^-2$	$^-1$	0	1	2	3	4
y	7	2	$^-1$		$^-1$	2	7

[1]

(b) Draw the graph of $y = x^2 - 2x - 1$ for values of x from $^-2$ to 4.



y
8
7
6
5
4
3
2
1
0
-1
-2
-3
-2
-1
1
2
3
4
x

[3]

(c) Use the graph to solve the equation $x^2 - 2x - 1 = 0$.

(c) $x =$ ______________ or $x =$ ______________ **[2]**

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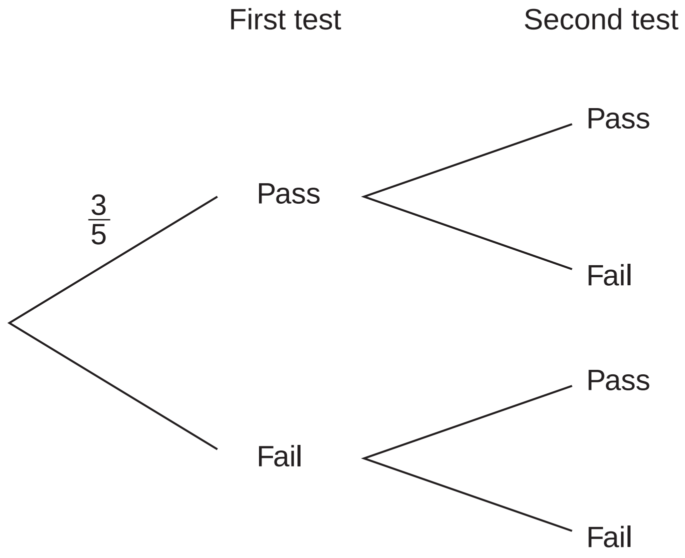
15 A pottery factory makes teapots.
Each teapot has to go through two stages of quality testing.
If it passes **both tests** it is called ‘perfect’ otherwise it is called ‘faulty’.

The probability that any teapot will pass the first test is $\frac{3}{5}$.

If it passes the first test the probability that it passes the second test is $\frac{3}{4}$.

If it fails the first test the probability that it passes the second test is $\frac{1}{3}$.

(a) Complete the tree diagram below.



[2]

(b) Work out the probability that a teapot will be called ‘faulty’.

(b) ____________________________ **[3]**

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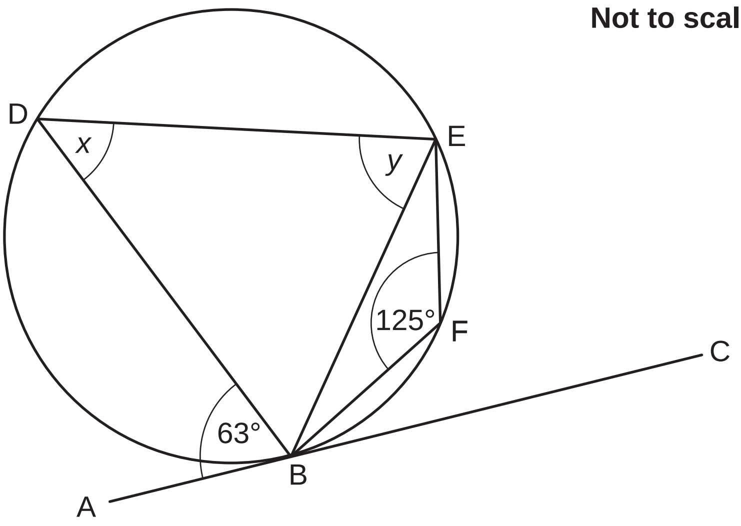
16 In the diagram, BDEF are points on the circumference of a circle.
AC is the tangent to the circle at B.
Angle ABD = 63° and angle EFB = 125°.


Not to scale
D
E
F
C
B
A
x
y
125°
63°

Find each of these angles, giving a reason for your answers.

(a) x = ______________° because ____

____ **[2]**

(b) y = ______________° because ____

____ **[2]**

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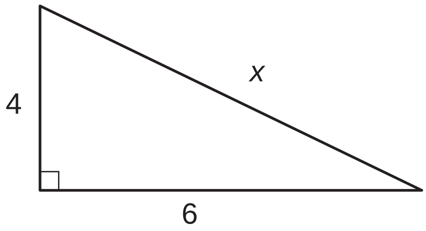
17 **(a)** The diagram shows a right-angled triangle.

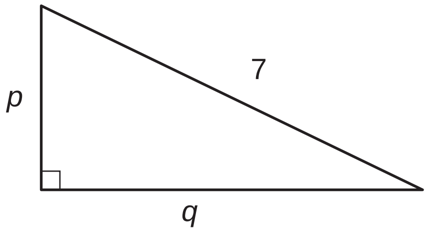


Not to scale

Show that x can be written as $2\sqrt{13}$.

[3]

(b) The diagram shows another right-angled triangle.



Not to scale

Find **two** different pairs of values for p and q where p is an integer.
Write any surd in its simplest form.

(b) p = ______________ and q = ______________

p = ______________ and q = ______________ **[3]**

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18 **(a)** Write these numbers in standard form.

(i) 670 000

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

(ii) 0.0092

(ii) ______________________________ **[1]**

(b) Here is Joel's answer to one question in his homework.

$$(6.8 \times 10^5) \div (2 \times 10^{-3}) = 3.4 \times 10^2$$

Explain how you can tell his answer is wrong.

____

____ **[1]**

19 Write $0.\dot{3}2\dot{4}$ as a fraction in its simplest form.

______________________________ **[3]**

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20 **(a)** Write this expression as a single power of x.

$$\left(\frac{x^9}{x^{-3}}\right)^{\frac{1}{2}}$$

(a) ______________________________ **[2]**

(b) Simplify.

$$\frac{x^2+2x-15}{x^2-9}$$

(b) ______________________________ **[4]**

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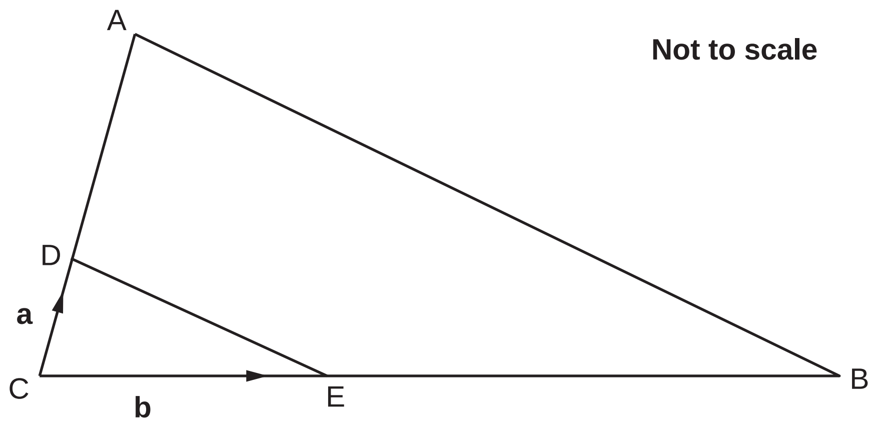
21 In the diagram ABC is a triangle.



D is a point on CA such that CA = 4CD.
E is a point on CB such that CB = 4CE.
$\overrightarrow{CD} = \mathbf{a}$ and $\overrightarrow{CE} = \mathbf{b}$.

Show that lines DE and AB are parallel. **[4]**

END OF QUESTION PAPER

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