

Candidate Name	Centre Number	Candidate Number
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GCSE

185/10

MATHEMATICS

HIGHER TIER

PAPER 2

A.M. FRIDAY, 11 June 2010

2 hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3.14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution especially when a calculator is used.

Unless stated, diagrams are not drawn to scale.

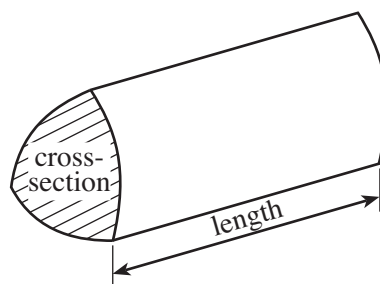
Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	5	
2	4	
3	8	
4	7	
5	7	
6	7	
7	6	
8	8	
9	4	
10	2	
11	6	
12	6	
13	2	
14	5	
15	7	
16	7	
17	5	
18	4	
TOTAL MARK		

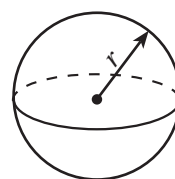
Formula List

Volume of prism = area of cross-section \times length



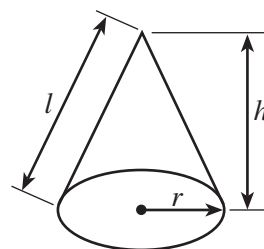
Volume of sphere = $\frac{4}{3} \pi r^3$

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



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

Curved surface area of cone = $\pi r l$

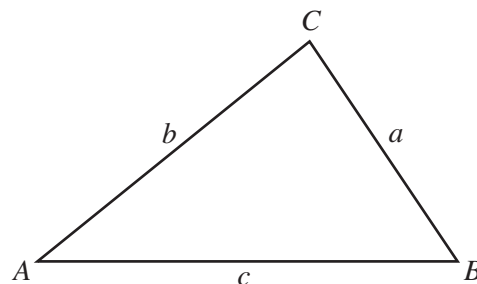


In any triangle ABC

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 = $\frac{1}{2} ab \sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

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

Standard Deviation

Standard deviation for a set of numbers

x_1, x_2, \dots, x_n , having a mean of \bar{x} is given by

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n}} \quad \text{or} \quad s = \sqrt{\frac{\sum x^2}{n} - \left\{ \frac{\sum x}{n} \right\}^2}$$

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1. A survey is carried out by asking people questions as they come out of a fish and chip shop. A section of the survey questionnaire is shown below.

1. How old are you?

Put a tick ✓ in the box: 15 to 20 ☐ 21 to 30 ☐ 30 to 40 ☐ Older than 40 ☐

2. Do you ever go to a fish and chip shop to buy take-away food?

Put a tick ✓ in the box: Yes ☐ No ☐

3. How did you pay? What method of payment did you use?

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(a) Explain why this is a biased survey.

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[1]

(b) State **two** criticisms about the design of question 1 in the survey.

(i)

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(ii)

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[2]

- (c) (i) What is the problem with the design of question 3 in the survey?

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- (ii) Show how question 3 in the survey could be improved.

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[2]

2. Here is a recipe for spaghetti with a tomato and basil sauce to serve 4 people.

Ingredients to serve 4 people	
For the spaghetti 400 g/14 oz plain flour 4 eggs	For the sauce 4 tablespoons olive oil 2 onions 800 g/28 oz fresh chopped tomatoes 20 leaves of fresh basil

- (a) Complete a version of this recipe to serve 10 people.

Ingredients to serve 10 people	
For the spaghetti g/..... oz plain flour eggs	For the sauce tablespoons olive oil onions g/..... oz fresh chopped tomatoes leaves of fresh basil

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[3]

- (b) Use the information given in the recipe to complete this statement.

100 g is oz

[1]

3. (a) Solve $7x + 2 = 3 + 5x$.

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[3]

- (b) Factorise $8x + 16$.

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- (c) Simplify $a^5 \times a^2$.

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[1]

- (d) Expand $b(b + 3)$.

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[2]

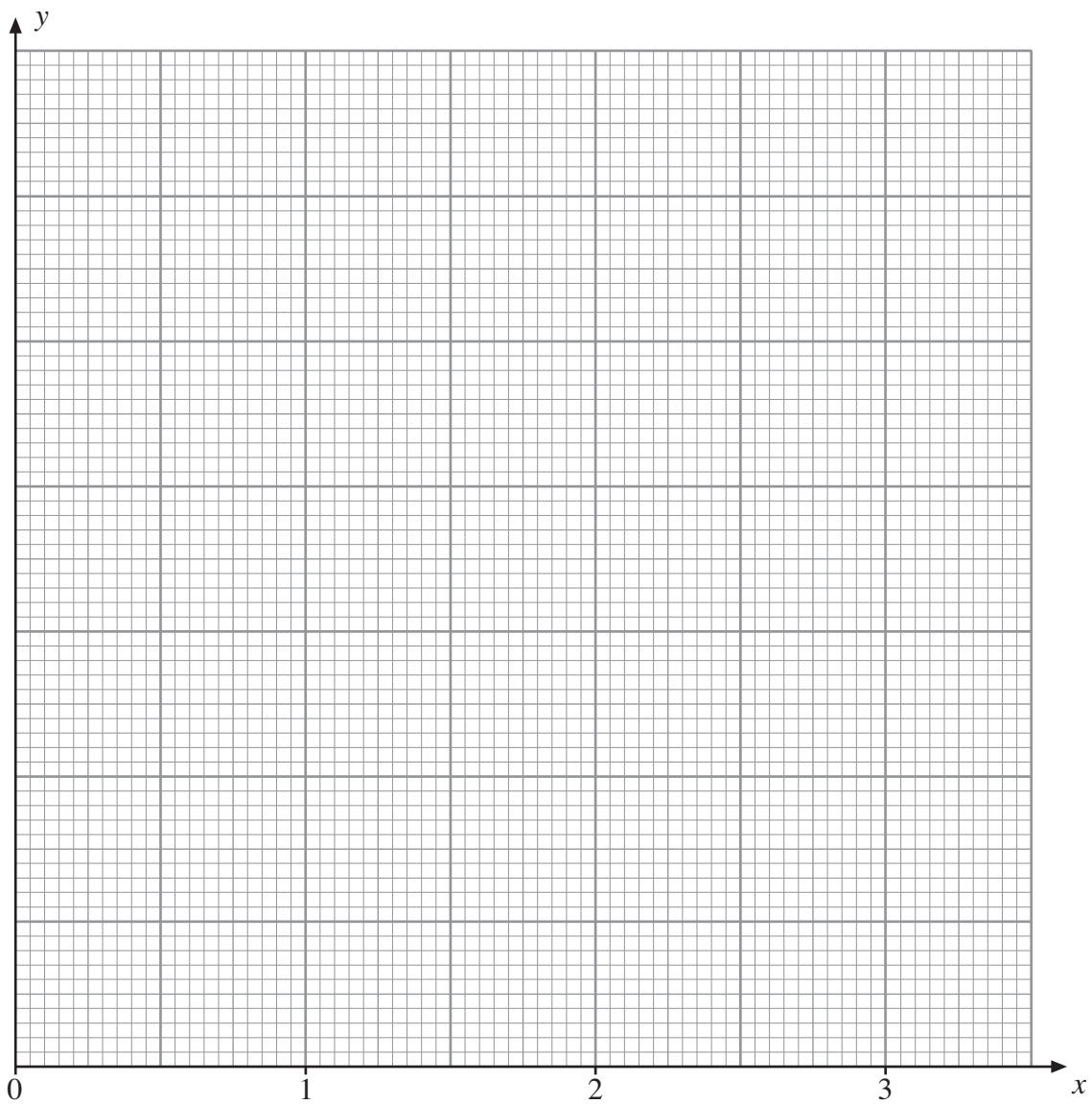
4. (a) Use the graph paper below to draw the graph of the straight line $y = 12 - 4x$.

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[4]

(b) Find the coordinates of the mid-point of a line joining $A(3, -1)$ and $B(8, 5)$.

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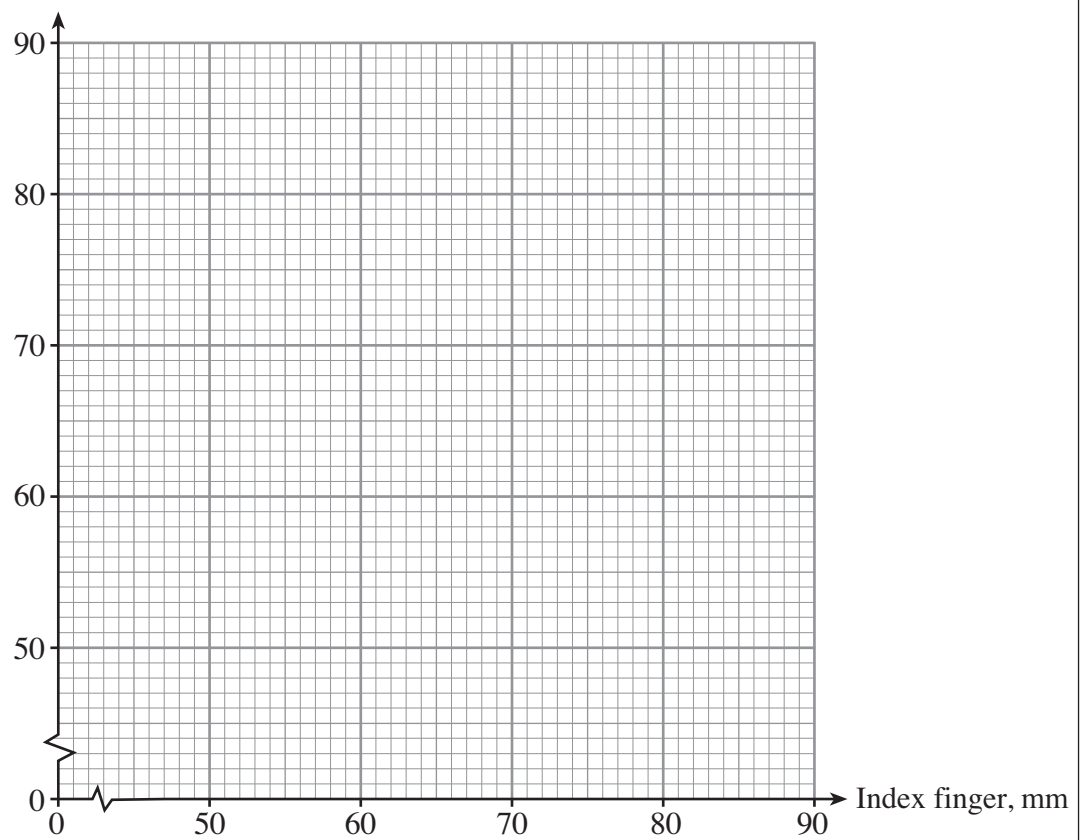
5. A number of students measured the length of their index finger in millimetres and the length of their arm in centimetres.

Index finger, mm	60	72	85	75	56	80	83
Length of arm, cm	58	66	76	68	58	70	66

- (a) Draw a scatter diagram to clearly display these measurements.

[3]

Length of arm, cm



- (b) The mean length of the students' index finger is 73 mm and their mean arm length is 66 cm. Draw a line of best fit on your scatter diagram.

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[2]

- (c) State the type of correlation shown in the scatter diagram.

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[1]

- (d) Another student measures the length of her index finger and records that it is 63 mm. Write down an estimate for the length of her arm in cm.

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[1]

6. (a) Michael bought a scooter for £800 on 1st January 2008.
Every year the value of the scooter depreciates by 5% of its value at the start of the year.
Find the value of the scooter on 1st January 2010.

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[4]

- (b) Catrin has her hair cut every four weeks.
She has about 1 inch cut off every four weeks in order to keep her hair about the same length.
Approximately how fast does her hair grow in millimetres per day?

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7. (a) The heights of 60 children were measured to the nearest centimetre. The table shows a grouped frequency distribution of these heights.

Height, h , to the nearest centimetre	Number of children
$153 \leq h \leq 157$	10
$158 \leq h \leq 162$	23
$163 \leq h \leq 167$	27

Find an estimate for the mean height of these children.

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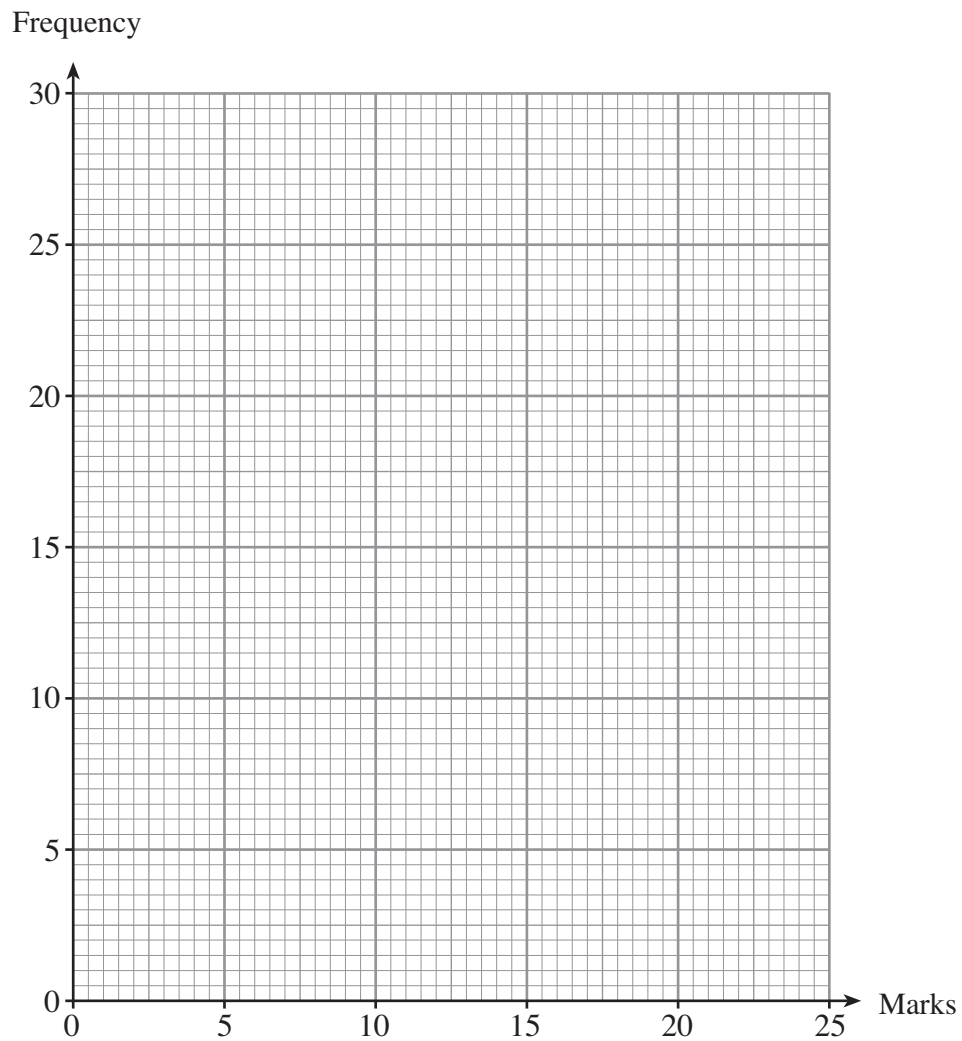
[4]

- (b) The marks obtained in a test taken by 60 children were recorded.
The table shows a grouped frequency distribution of the results.

Mark	1 to 5	6 to 10	11 to 15	16 to 20	21 to 25
Frequency	4	10	30	14	2

On the graph paper below, draw a frequency polygon to show the data.

[2]



8. (a) Alice buys a necklace costing 56.42 euros.
The exchange rate is £1 = 1.24 euros.
How much does the necklace cost in pounds?

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[2]

- (b) Miriam lives in France.
Recently, she visited the UK and bought a watch for £211.50, which included VAT at 17.5%.
When Miriam returned home she claimed back the VAT in euros.
The exchange rate was £1 = 1.24 euros.
How many euros did Miriam receive?

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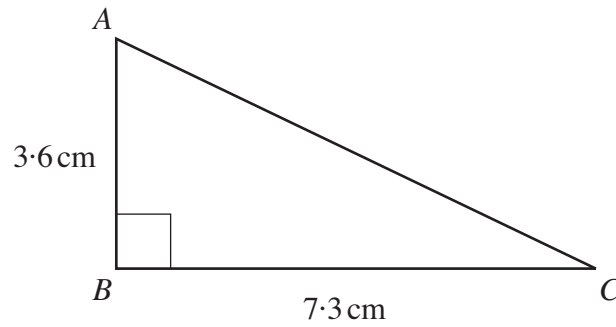
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[6]

9.

*Diagram not drawn to scale.*Find the length of AC .

Give your answer to an appropriate degree of accuracy.

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[4]

10. Make P the subject of the formula

$$V = \sqrt{PR}.$$

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[2]

11. (a) Write the following numbers in standard form.

(i) 0.034

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(ii) six million

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[2]

(b) Calculate, giving your answers in standard form.

(i) $(4.5 \times 10^{17}) \times (7.8 \times 10^{-11})$

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(ii) $\frac{1.45 \times 10^{11}}{8.43 \times 10^{-4}}$

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[4]

12. (a)

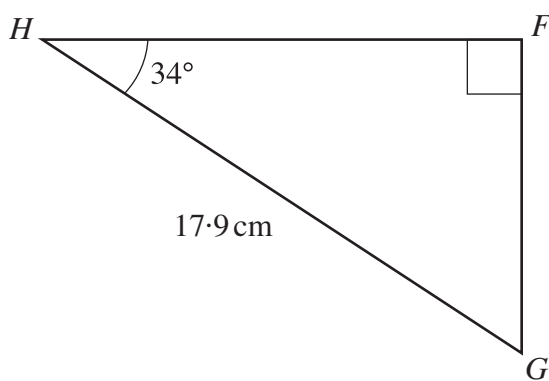


Diagram not drawn to scale.

Calculate the length of FG .

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[3]

(b)

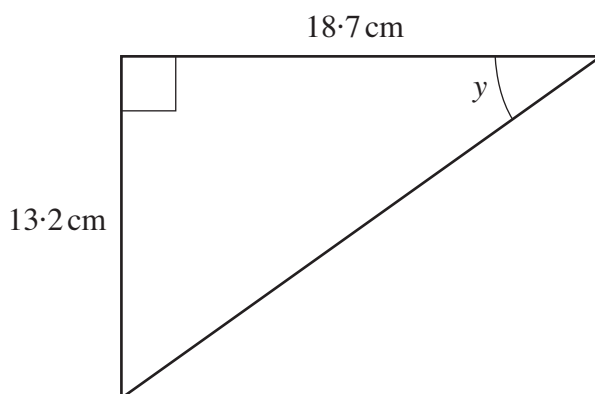


Diagram not drawn to scale.

Calculate the size of the angle y .

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13. The diagram shows a quadrilateral $OABC$.

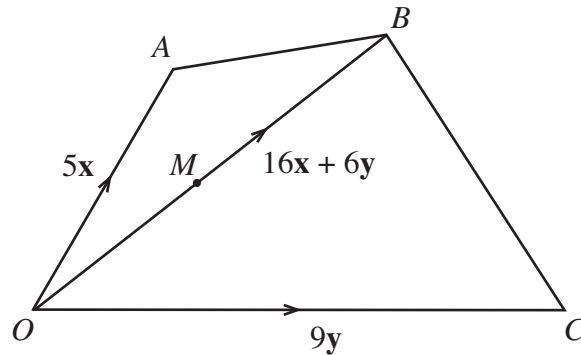


Diagram not drawn to scale.

In the quadrilateral $OABC$, the vectors \mathbf{OA} , \mathbf{OB} and \mathbf{OC} are given by $\mathbf{OA} = 5\mathbf{x}$, $\mathbf{OB} = 16\mathbf{x} + 6\mathbf{y}$ and $\mathbf{OC} = 9\mathbf{y}$.

Given that M is the midpoint of OB , express **each** of the following in terms of \mathbf{x} and \mathbf{y} in their simplest form.

(a) \mathbf{OM}

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[1]

(b) \mathbf{AC}

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[1]

14. (a) Given that y is inversely proportional to x , and that $y = 12$ when $x = 2$, find an expression for y in terms of x .

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- (b) Use the expression you found in (a) to complete the following table.

x	0.1	2	
y		12	8

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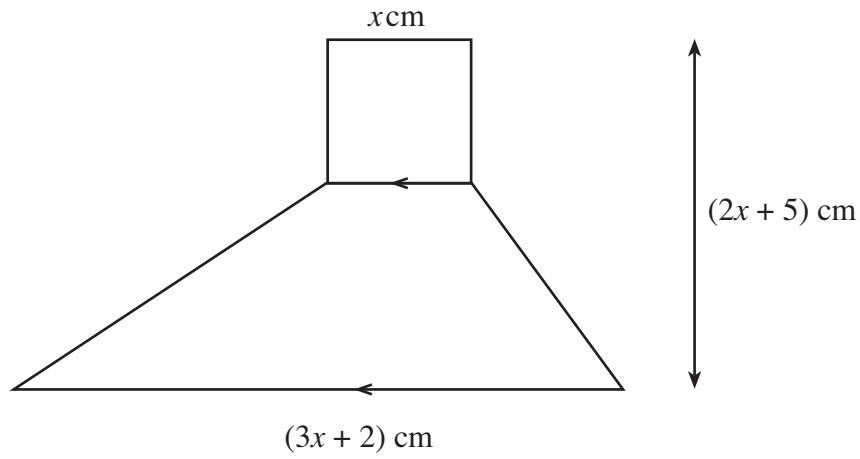
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15. A composite shape is made by joining a square and a trapezium as shown. The dimensions are shown on the diagram.



- (a) Show that the area of the trapezium is $(2x^2 + 11x + 5) \text{ cm}^2$.

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- (b) The total area of the composite shape is 15 cm^2 .
Find x correct to two decimal places.

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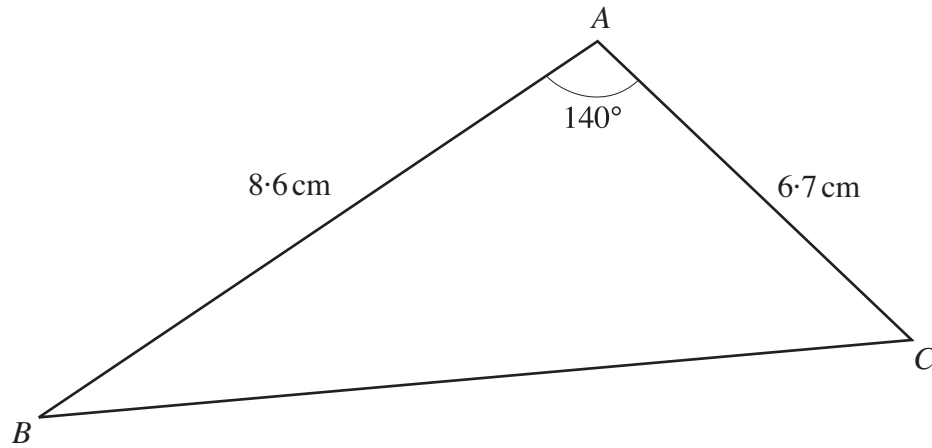
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16.

*Diagram not drawn to scale.*(a) Find BC .

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[3]

(b) Calculate the area of triangle ABC .

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[2]

(c) Hence, find the perpendicular distance between A and BC .

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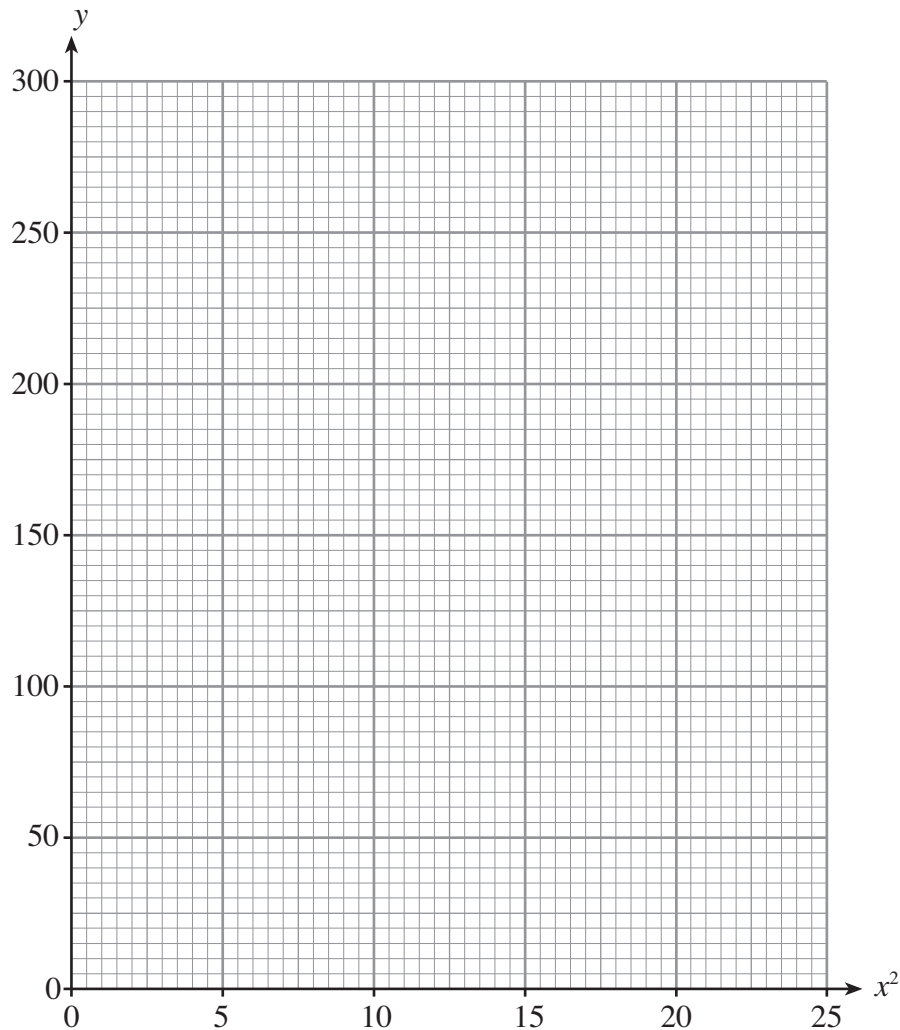
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17. During an experiment the value of a variable y was found for different values of x . The results are recorded in the following table.

x	1	2	3	4	5
y	190	170	130	70	0

- (a) On the graph paper below, plot the values of y against the values of x^2 .

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- (b) It is known that y is approximately equal to $ax^2 + b$.
Use your graph to estimate the values of a and b .

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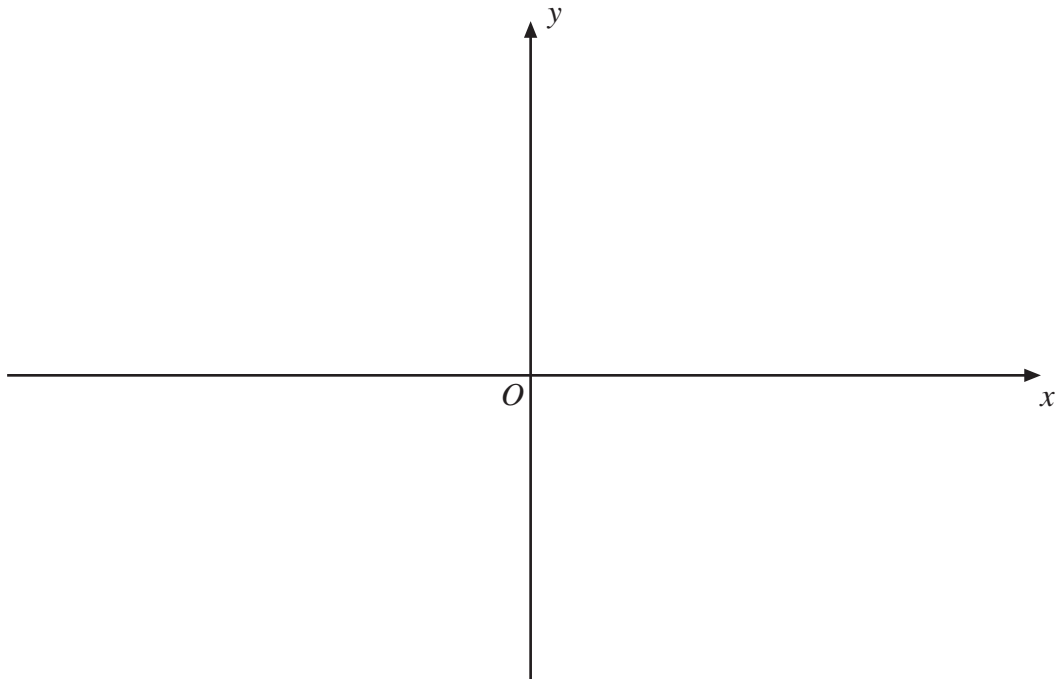
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18. (a) Using the axes below, **sketch** the graph of $y = \sin x$ for values of x from -180° to 180° .

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- (b) Find **all** solutions of the following equation in the range -180° to 180° .

$$\sin x = -0.788$$

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