Candidate Name	Centre Number	Candidate Number
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GCSE

185/05

MATHEMATICS (2 Tier)

HIGHER TIER

PAPER 2

A.M. WEDNESDAY, 12 November 2008

2 hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	3	
2	2	
3	3	
4	5	
5	4	
6	3	
7	5	
8	4	
9	3	
10	7	
11	4	
12	3	
13	4	
14	4	
15	2	
16	5	
17	4	
18	6	
19	6	
20	5	
21	2	
22	3	
23	7	
24	3	
25	3	
TOTAL MARK		

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 when appropriate.

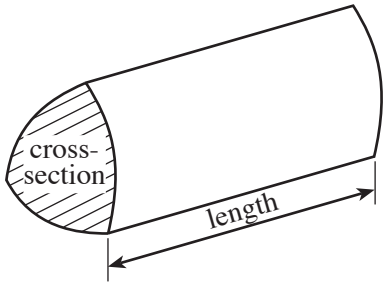
Unless stated, diagrams are not drawn to scale.

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.

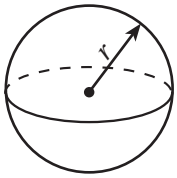
Formula List

Volume of prism = areas of cross-section × length



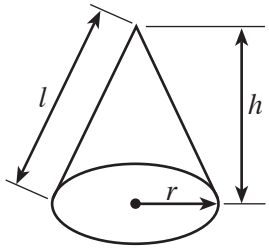
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

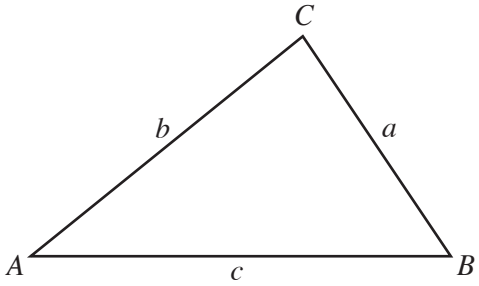


In any triangle ABC

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

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

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

1.

Currency Exchange

28 Euros for £20

with no exchange fee

Geraint wishes to change pounds into Euros so that he has 350 Euros to take on holiday.
How much will Geraint have to pay to buy 350 Euros?

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[3]

2. Find the value of $\frac{2{\cdot}6 \times 3{\cdot}9}{4{\cdot}8 - 1{\cdot}5}$, giving your answer to 1 decimal place.

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[2]

3. The diagram shows a trapezium $ABCD$.

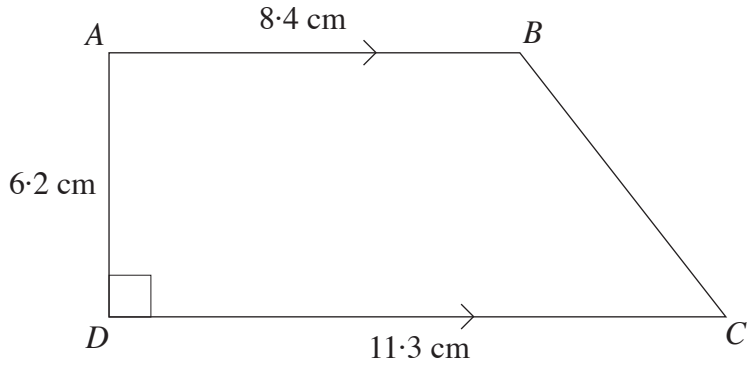

Diagram not drawn to scale.

Given that $AB = 8{\cdot}4$ cm, $AD = 6{\cdot}2$ cm, $DC = 11{\cdot}3$ cm and $A\hat{D}C = 90°$, calculate the area of the trapezium. Clearly indicate the units of your answer.

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[3]

4.

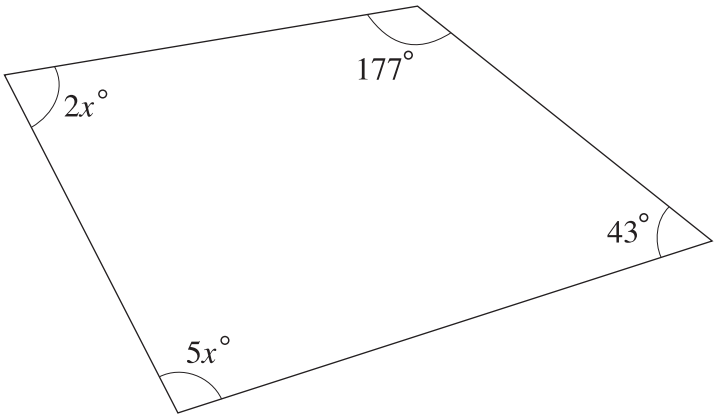

Diagram not drawn to scale.

The diagram shows a quadrilateral with interior angles of $2x^\circ$, $5x^\circ$, 43° and 177°. Write down an equation in terms of x. Solve your equation to find the value of x. Hence write down the size of the smallest angle in the quadrilateral.

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[5]

Examiner only

5. *(a)* Draw the graph of $y = 3x + 1$ on the graph paper below.

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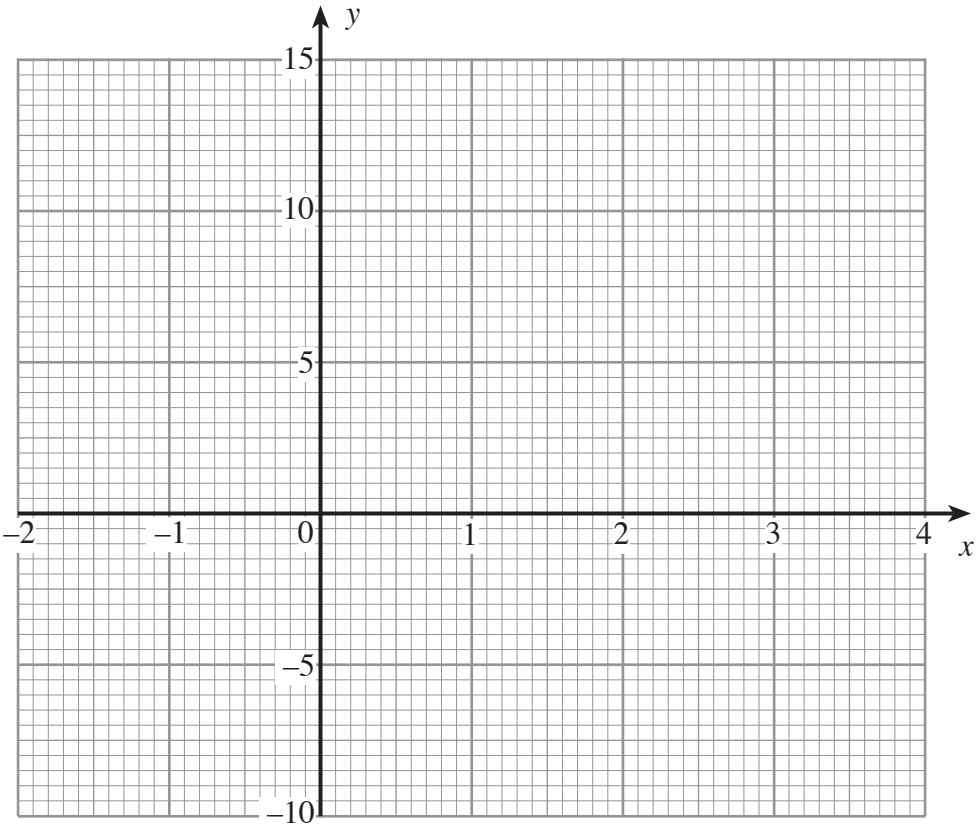
[3]



(b) State the coordinates of the point where the graph of $y = 3x + 1$ intersects the y-axis.

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[1]

6. A jeweller buys a ring for £570 and sells it at a profit of 38% . What is the selling price?

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[3]

7. In both parts *(a)* and *(b)* of this question you should give your answer to an appropriate degree of accuracy.

A circular disc has a radius of 6·3 cm.

(a) Calculate the area of one surface of the disc.

[2]

(b) Calculate the perimeter of the disc.

[3]

8. A business declares that, in each year, its office equipment depreciates at the rate of 18% of its value at the beginning of that year. Find, to the nearest £100, the value of its office equipment at the end of 3 years of depreciation, if its value at the beginning of the period was £35 000.

[4]

9. Solve the following equation.

$$3(9 - 2x) = 83 - 13x$$

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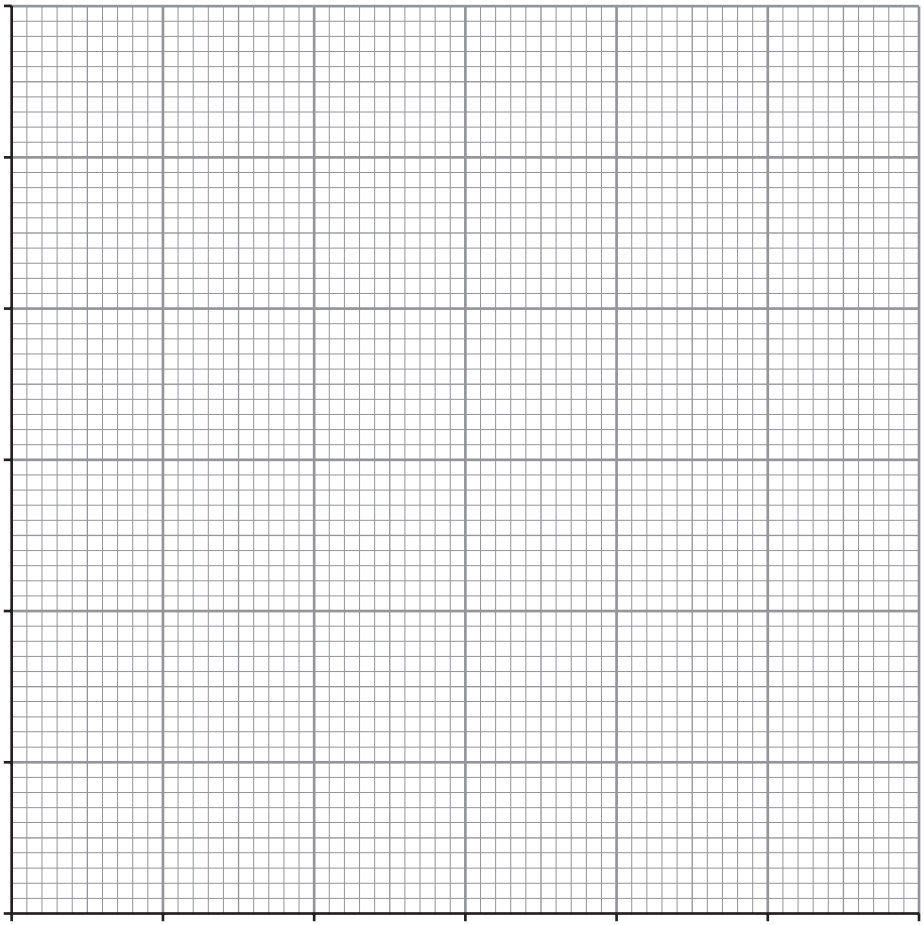
[3]

10. The duration, in minutes, of each of 150 phone calls was recorded. The table shows a grouped frequency distribution of the results.

Duration of phone call in minutes (t)	Number of phone calls
$0 < t \leqslant 5$	36
$5 < t \leqslant 10$	58
$10 < t \leqslant 15$	26
$15 < t \leqslant 20$	18
$20 < t \leqslant 25$	10
$25 < t \leqslant 30$	2

(a) On the graph paper below, draw a grouped frequency diagram for the data.

[3]



(b) Find an estimate for the mean duration of a phone call.

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[4]

11. In the diagram, *ABCD* is a rectangle with *AB* = 65 cm and the diagonal *AC* = 90 cm. Calculate the perimeter of the rectangle.

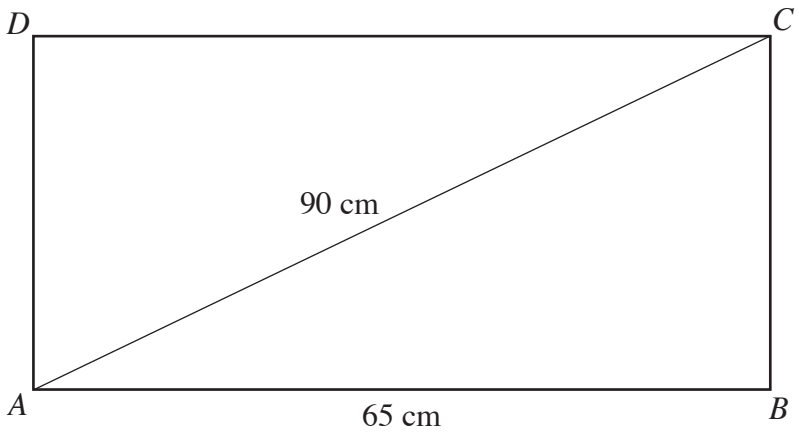

Diagram not drawn to scale.

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[4]

12. The uniform cross-section *ABCD* of a solid block is a parallelogram with *DC* = 10·6 cm and the perpendicular distance between the parallel sides, *EF*, is 8·2 cm as shown below.
The length of the block is 15·7 cm.

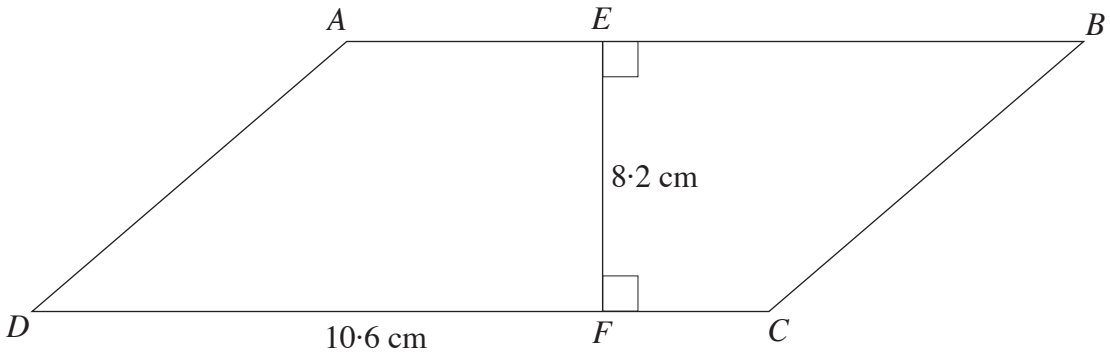

Diagram not drawn to scale.

Calculate the volume of the block.

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[3]

13. A solution to the equation

$$x^3 + 3x - 8 = 0$$

lies between 1·5 and 1·6.

Use the method of trial and improvement to find this solution correct to 2 decimal places.

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[4]

14. Solve the following simultaneous equations by an algebraic (not graphical) method.

$$5x + 4y = -6$$
$$2x + 6y = 13$$

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[4]

15. Find, in standard form, the value of $(3{\cdot}7 \times 10^{-5}) \times (8{\cdot}2 \times 10^{-6})$.

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[2]

16. *(a)* Expand the following expression, simplifying your answer as far as possible.

$$(x - 4)\,(x + 6)$$

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[2]

(b) Make c the subject of the formula

$$a = \sqrt{bc - d}.$$

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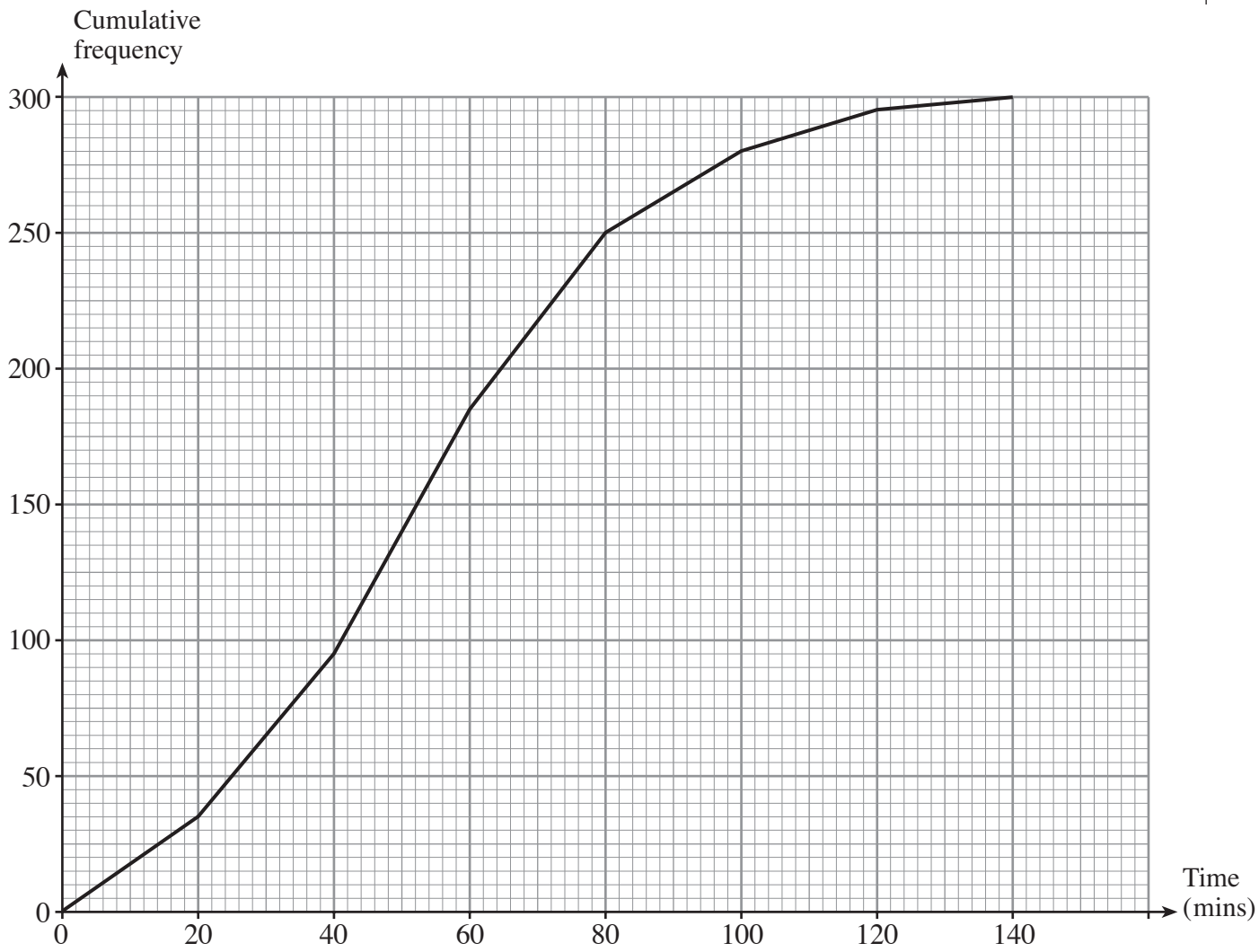
[3]

Examiner only

17. The waiting times of 300 patients at an outpatients department were measured in minutes. Below is a cumulative frequency polygon of the results.



Use the cumulative frequency polygon to find an estimate for

(a) the inter-quartile range,

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[2]

(b) how many patients had a waiting time greater than an hour and a half.

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[2]

Turn over.

Examiner only

18.

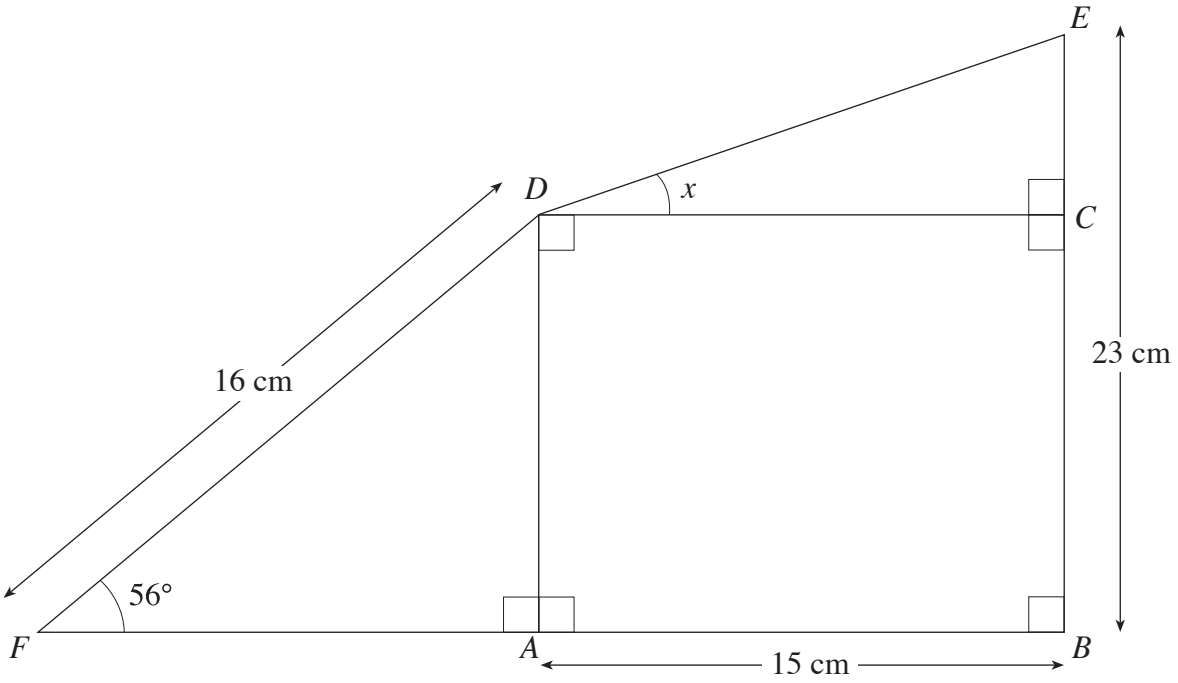

Diagram not drawn to scale.

Find the size of the angle marked x in the above diagram.

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[6]

19. The diagram shows a hexagonal prism.

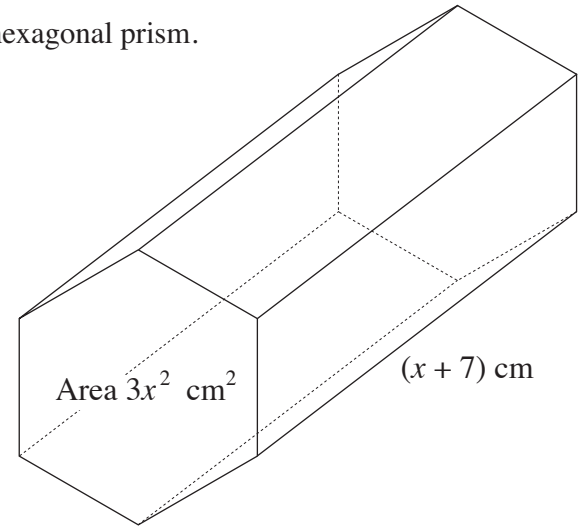

Diagram not drawn to scale.

The area of the cross-section of the prism is $3x^2$ cm^2 and the length of the prism is $(x + 7)$ cm. The volume of the prism is $(3x^3 + 2x + 1)$ cm^3.

(a) Show that $21x^2 - 2x - 1 = 0$.

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(b) Use the quadratic formula to solve $21x^2 - 2x - 1 = 0$, giving solutions correct to two decimal places.

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[3]

(c) Hence evaluate the volume of the prism, giving your answer correct to one decimal place.

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[1]

20. Given that y is inversely proportional to x, and that $y = 3$ when $x = 2$,

(a) find an expression for y in terms of x,

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[3]

(b) use the expression you found in *(a)* to complete the following table.

x	-1	2	
y		3	0·1

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[2]

21. Express $0\cdot8\dot{2}\dot{3}$ as a fraction.

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[2]

22.

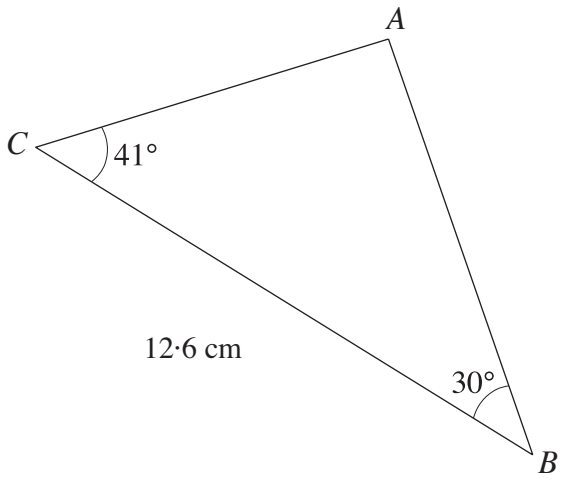

Diagram not drawn to scale.

In the triangle ABC, $A\hat{C}B = 41°$, $A\hat{B}C = 30°$ and $BC = 12{\cdot}6$ cm. Calculate the length of AC.

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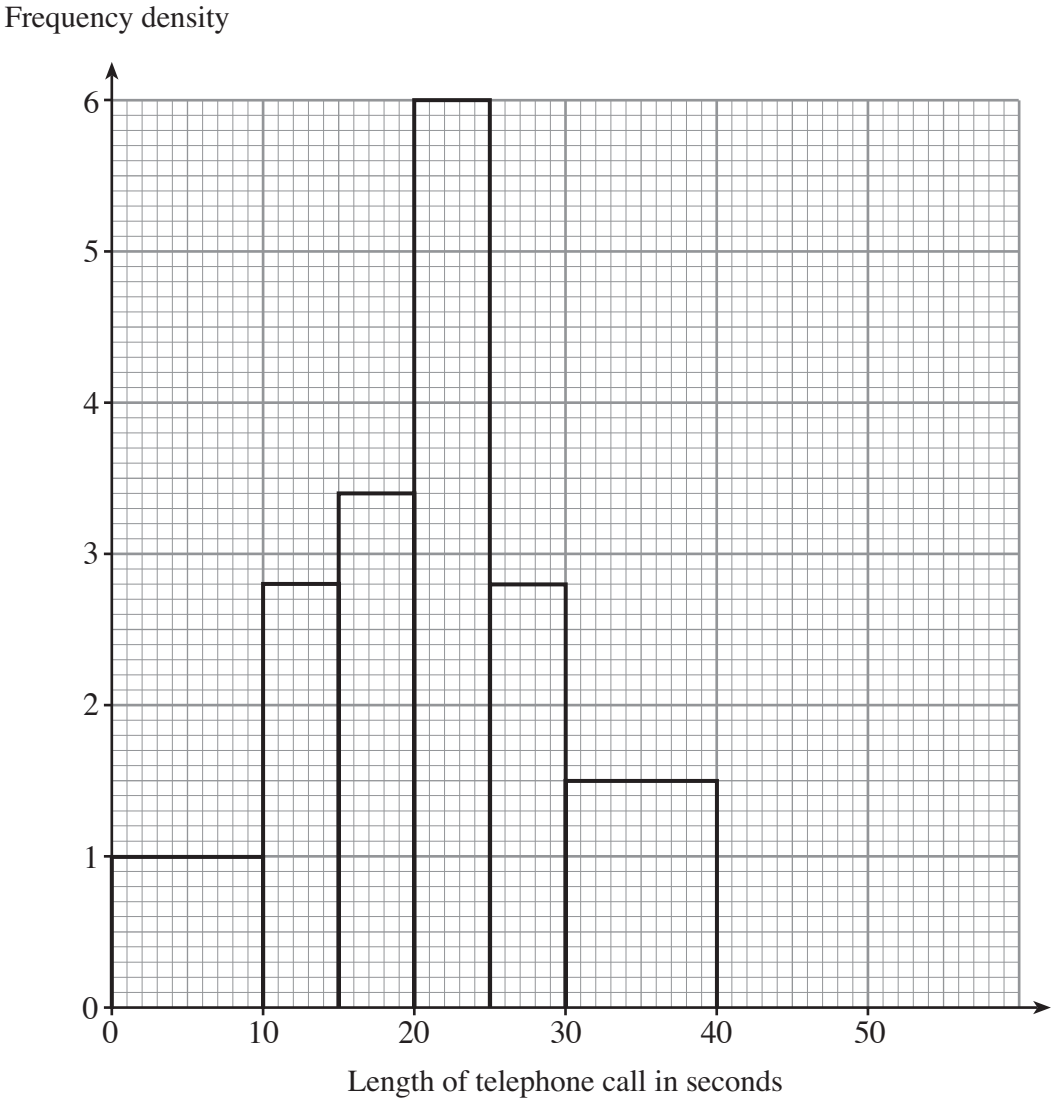
[3]

23. The histogram below illustrates the lengths of telephone calls made to a directory enquiry service between 9.00 a.m. and 9.05 a.m. on the 5th of March this year.



(a) Use the histogram to calculate how many telephone calls were made to the directory enquiry service between 9 a.m. and 9.05 a.m. on 5th of March this year.

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[3]

(b) Use the histogram to estimate the median length of a telephone call made to the directory enquiry service between 9.00 a.m. and 9.05 a.m. on the 5th of March this year.

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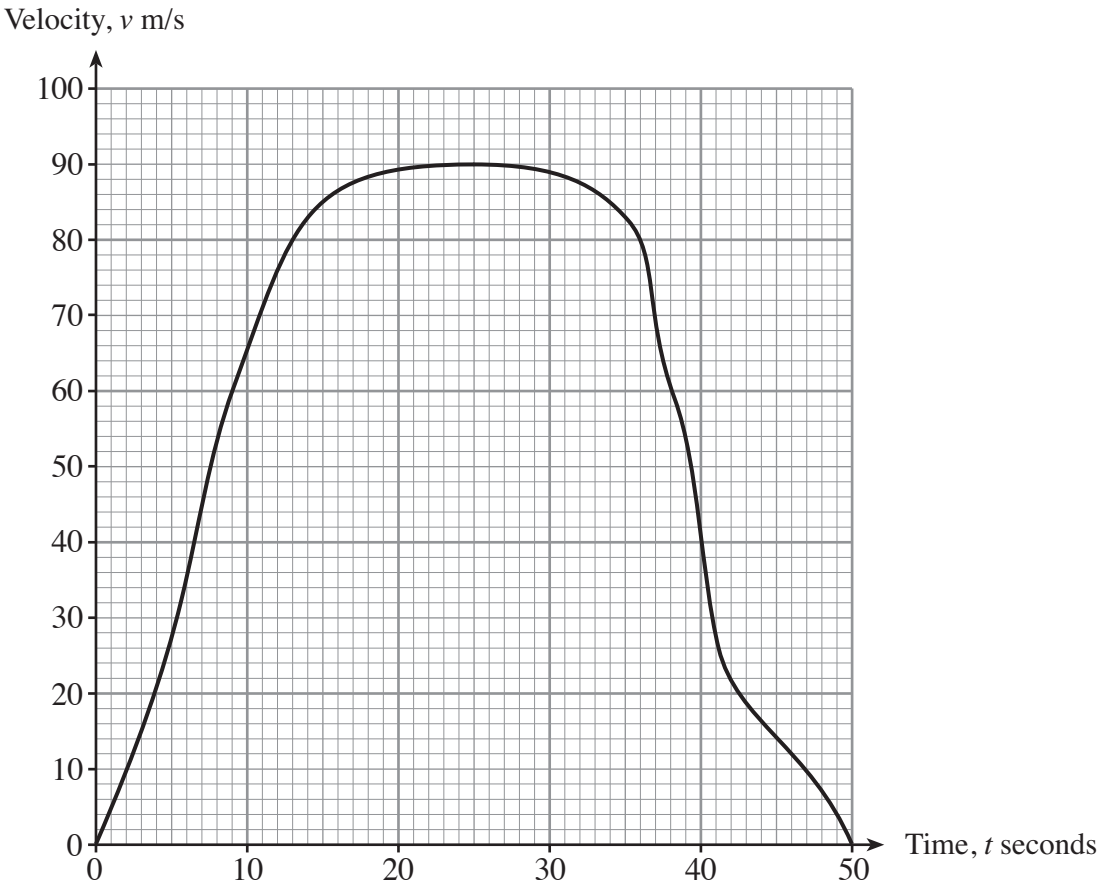
[4]

24. A scientific experiment was carried out. The velocity of an object was recorded over a period of 50 seconds, starting at $t = 0$ seconds. The results of the experiment were plotted on a graph, as shown below.



Use the graph to estimate the acceleration at $t = 15$ seconds.

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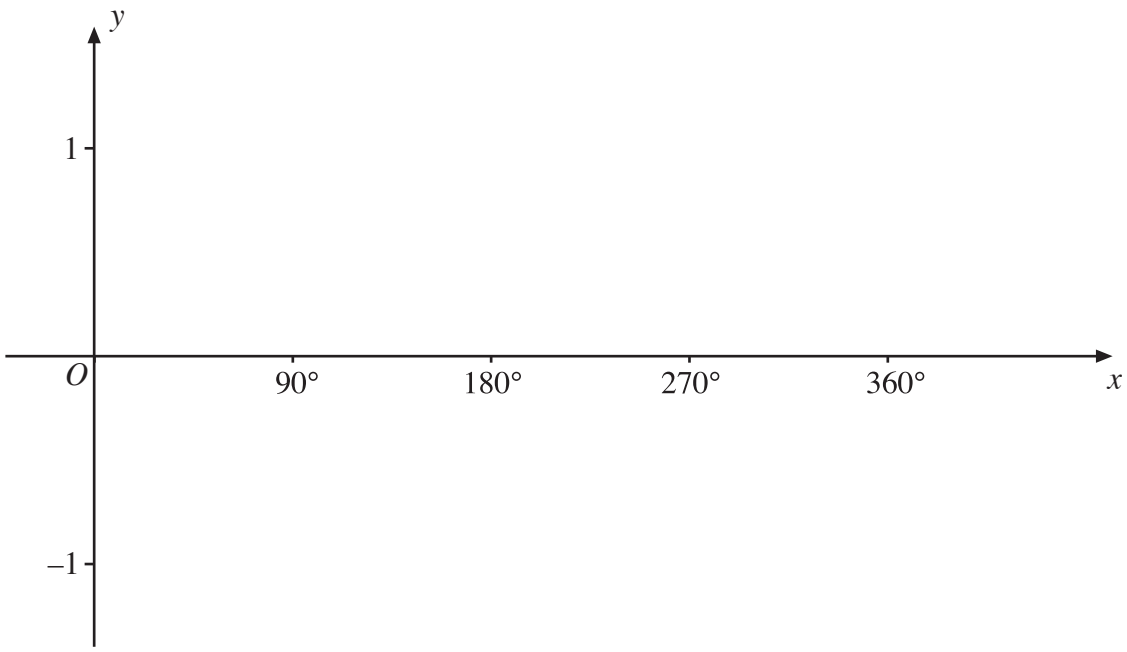
[3]

25. *(a)* Using the axes below, **sketch** the graph of $y = \sin x$ for values of x from 0° to 360°.

[1]



(b) Find **all** solutions of the following equation in the range 0° to 360°.

$$\sin x = -0{\cdot}8$$

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[2]