

Candidate Name	Centre Number	Candidate Number
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GCSE

185/10

MATHEMATICS (2 Tier)

HIGHER TIER

PAPER 2

A.M. MONDAY, 1 June 2009

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.

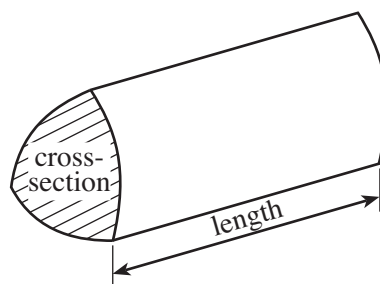
Scale drawing solutions will not be acceptable where you are asked to calculate.

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	7	
3	13	
4	4	
5	4	
6	2	
7	6	
8	4	
9	6	
10	8	
11	5	
12	8	
13	3	
14	3	
15	6	
16	8	
17	4	
18	4	
TOTAL MARK		

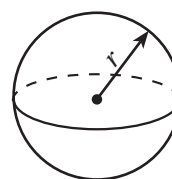
Formula List

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



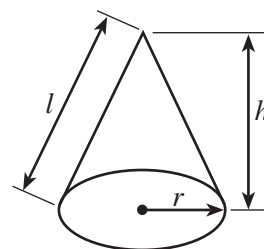
Volume of sphere = $\frac{4}{3} \pi r^3$

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



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

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

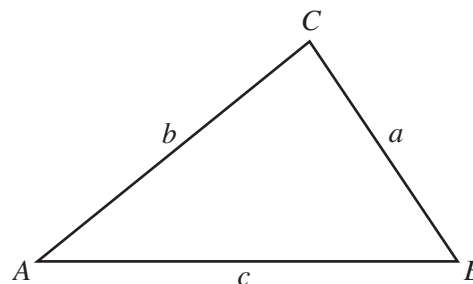


In any triangle ABC

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

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

1. Jim has one spin of the spinner shown below.

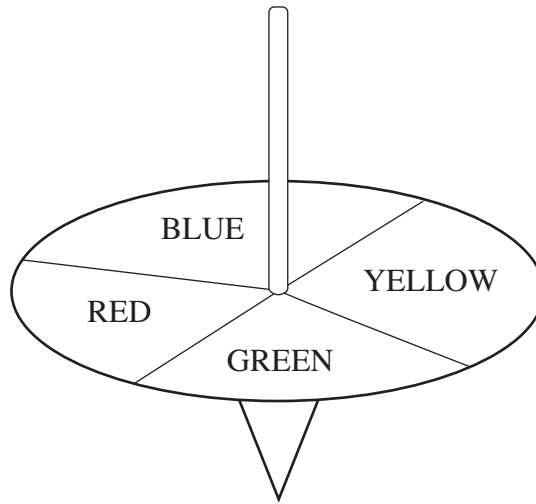


Diagram not drawn to scale.

- (a) The table below shows the probabilities of Jim obtaining YELLOW, GREEN, BLUE with one spin of the spinner. Complete the table by inserting the probability that Jim obtains RED with one spin of the spinner.

Colour	YELLOW	GREEN	BLUE	RED
Probability	0.26	0.24	0.37	

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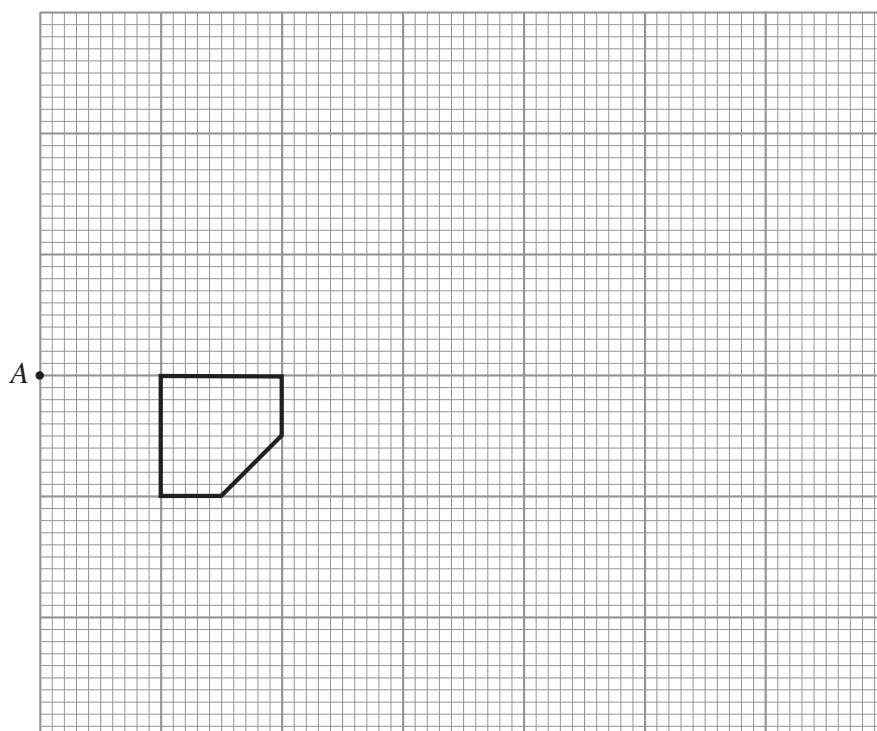
- (b) In a game, a player chooses two colours on the spinner and wins the game if either of the colours chosen is obtained with one spin of the spinner. Which **two** colours would you choose to have the best chance of winning?

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- (c) Find the probability of obtaining either GREEN or BLUE on the spinner.

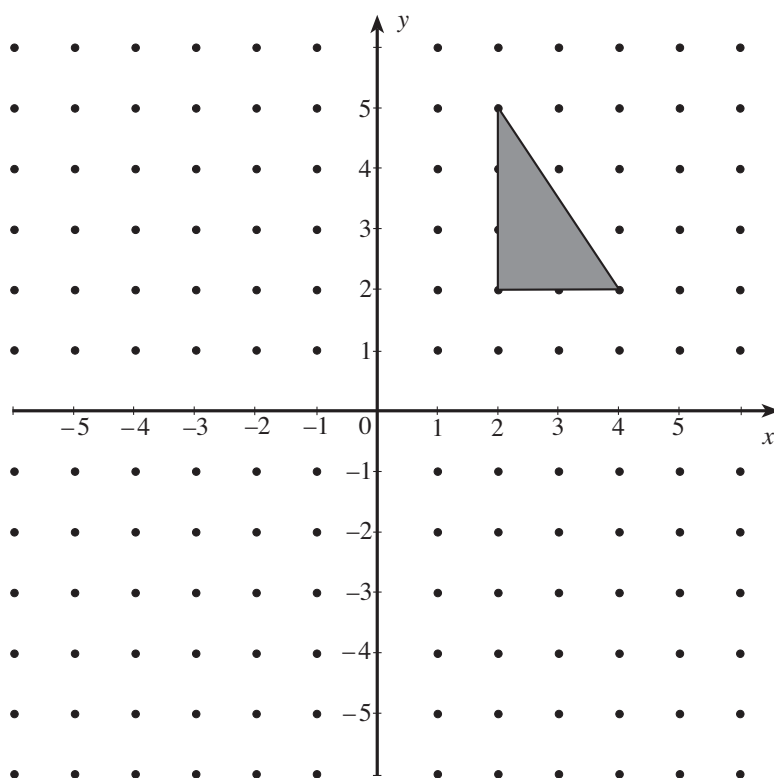
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2. (a) Enlarge the shape shown on the grid by a scale factor of 2 using A as the centre of enlargement.



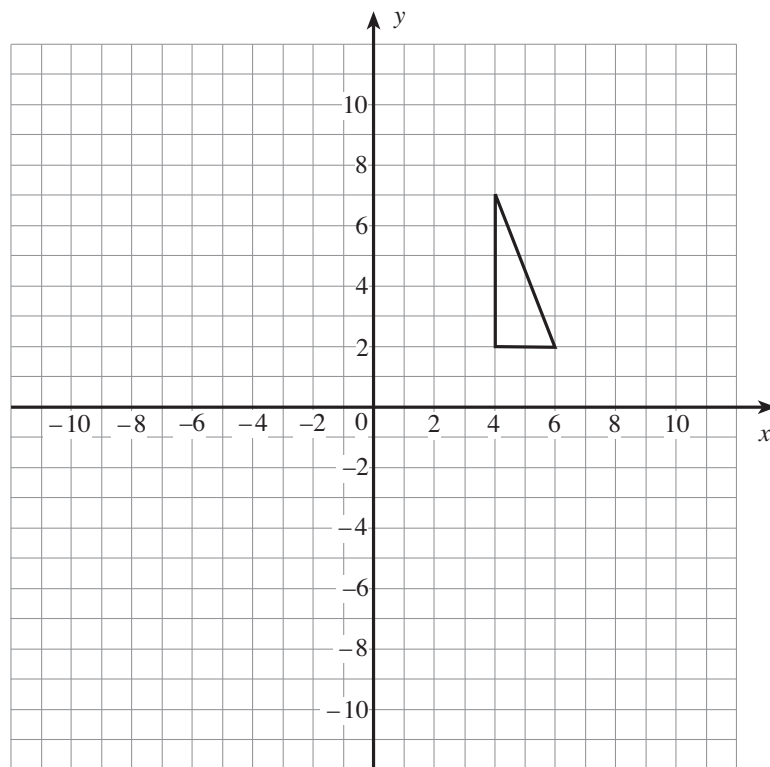
[3]

- (b) Reflect the triangle in the line $x = 1$.



[2]

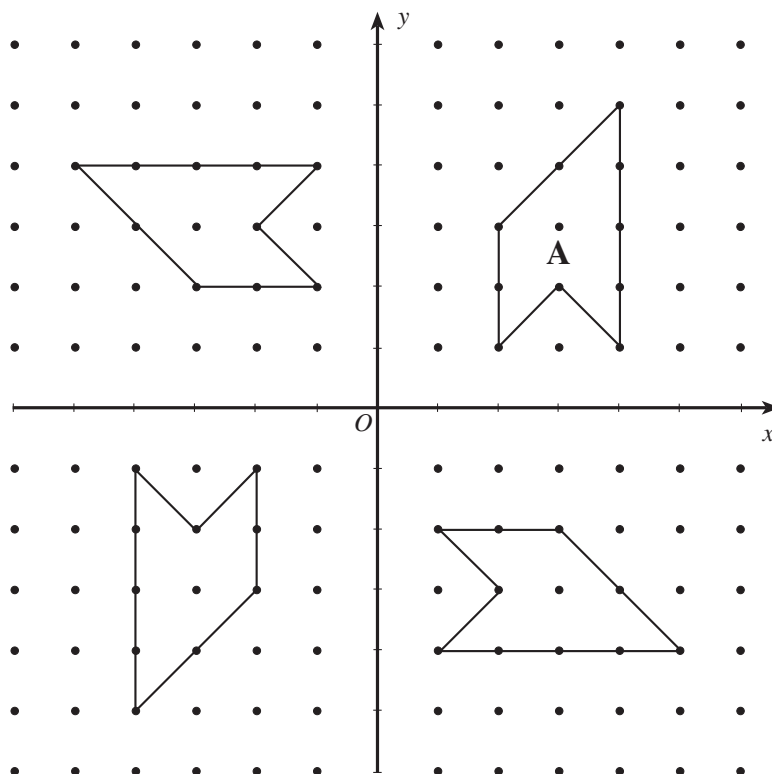
- (c) Translate the triangle shown 9 to the left and 3 down.



[1]

- (d) Indicate with the letter **B** on the diagram which one of the shapes shown may be obtained by rotating shape A through 90° clockwise about O .

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3. (a) A journey of 57 miles takes 1 hour 30 minutes. Calculate the average speed of the journey in m.p.h.

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- (b) The price of a digital radio, originally priced at £132, is increased by 12%. Calculate the increased price of the digital radio.

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- (c) The exchange rate for pounds into euros is $\text{£}1 \equiv 1.44$ euros. Richard goes on holiday. He changes £400 into euros. When on holiday he spends 180 euros. On returning home he decides to keep the euros he has left towards his next holiday. Using the same exchange rate how much are these euros worth in pounds?

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- (d) Find $\frac{4.5 \times 3.4}{7.8 - 5.9}$ correct to one decimal place.

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4. Using your knowledge of prime factors, explain why 24×54 is a square number.

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5. Sixty pupils ran a distance of 200 metres. The table shows the grouped frequency distribution of the times taken by the pupils.

Time taken, t seconds	Number of pupils
$30 < t \leq 34$	2
$34 < t \leq 38$	9
$38 < t \leq 42$	30
$42 < t \leq 46$	11
$46 < t \leq 50$	8

Find an estimate for the mean of the time taken by the sixty pupils.

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6. Explain why $5x^3 + 2x^2 + x = 20$ has a solution between $x = 1.4$ and $x = 1.5$. Show all your calculations.

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8. (a) Make p the subject of the following formula.

$$q = 8p - 45$$

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- (b) Solve the inequality $15t < 4t + 7$.

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9. An intelligence test with a total possible score of 80 marks was given to 60 students. The following table shows a grouped frequency distribution of their results.

Score on the test	0 - 19	20 - 39	40 - 59	60 - 79
Number of students	5	10	35	10

Notice that no student scored full marks in the intelligence test.

- (a) Complete the following cumulative frequency table.

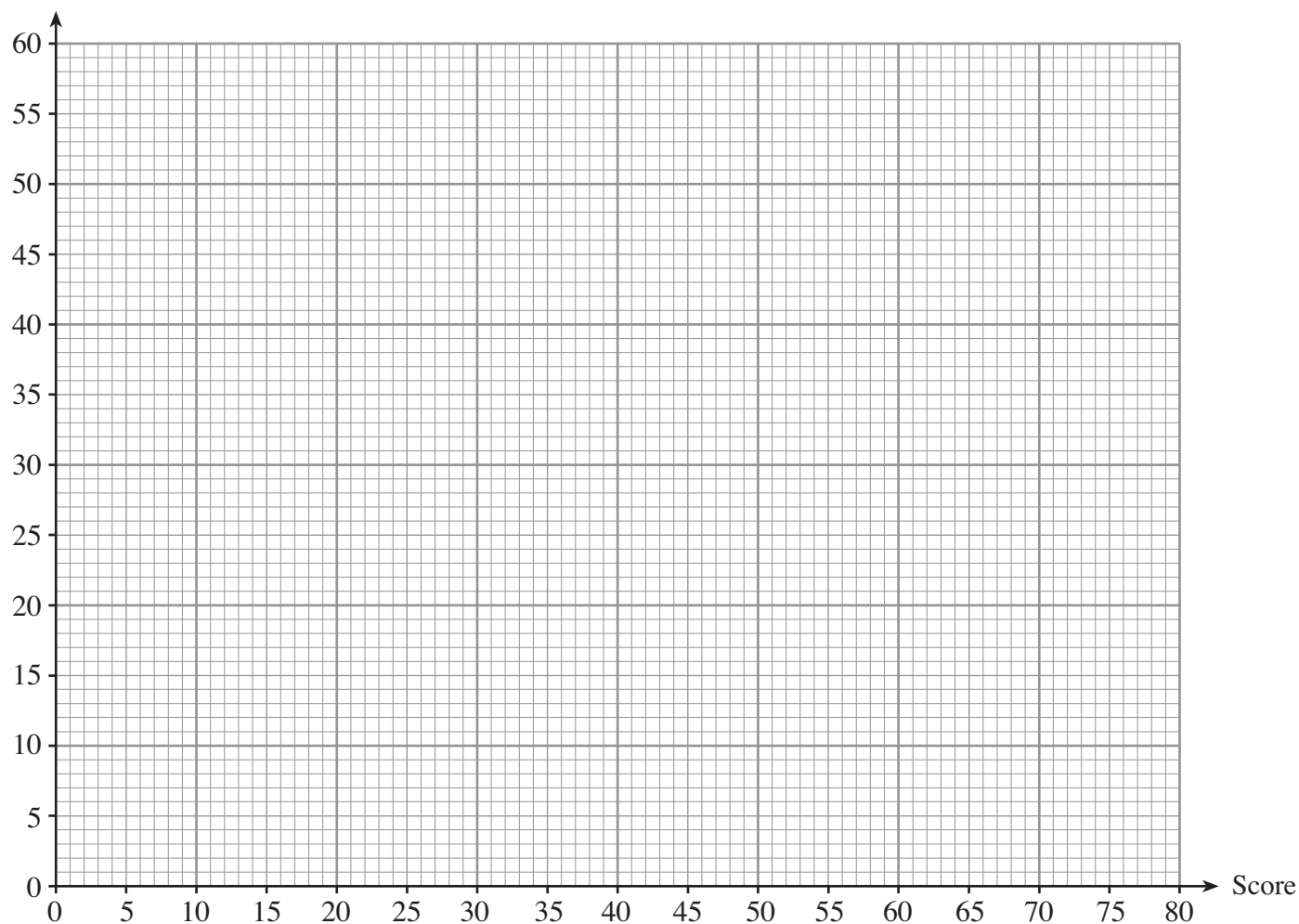
Score on the test	< 20	< 40	< 60	< 80
Cumulative frequency	5			

[1]

(b) On the graph paper below, draw a cumulative frequency diagram to show this information.

[3]

Cumulative
frequency



(c) The estimated median score for a second group of students who took this intelligence test was 40 marks. Which group of students had the higher estimated median score, and by how much?

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10. (a) Three people share £4500 in the ratio 2 : 5 : 8.
How much does each person receive?

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- (b) A badge has the shape of a semicircle with diameter 56 mm.
Find the area of the badge.

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- (c) The price of a watch bought on holiday abroad includes 5% tax. The tax can be reclaimed at the airport when returning to the United Kingdom.
The watch costs 68.25 dollars including the tax.
Calculate how much tax can be reclaimed at the airport.

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11. (a) Simplify $(3x^2y^4) \times (2x^7y^5)$.

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- (b) Expand and simplify $(x + 8)(x - 2)$.

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- (c) Factorise $a^3 + 4a^2$.

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13. A bag contains 10 marbles of which 2 are yellow, 3 are blue and 5 are red. Two marbles are selected at random from the bag. Calculate the probability that exactly one of the selected marbles is blue.

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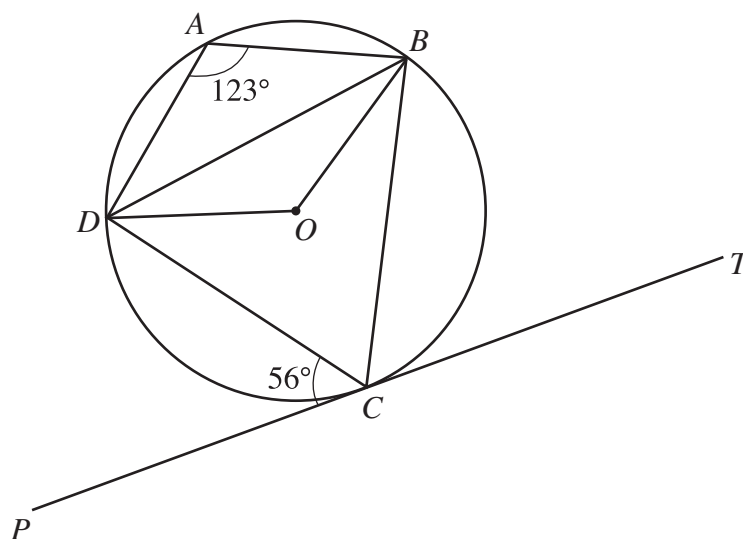
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14.

*Diagram not drawn to scale.*

Four points A , B , C and D lie on the circumference of the circle centre O .

The tangent TP touches the circle at C , $\widehat{DCP} = 56^\circ$ and $\widehat{DAB} = 123^\circ$.
Find **each** of the following angles.

(a) \widehat{DBC}

[1]

(b) \widehat{BCD}

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(c) \widehat{DOB}

[1]

15. The diagram shows triangle ABC .

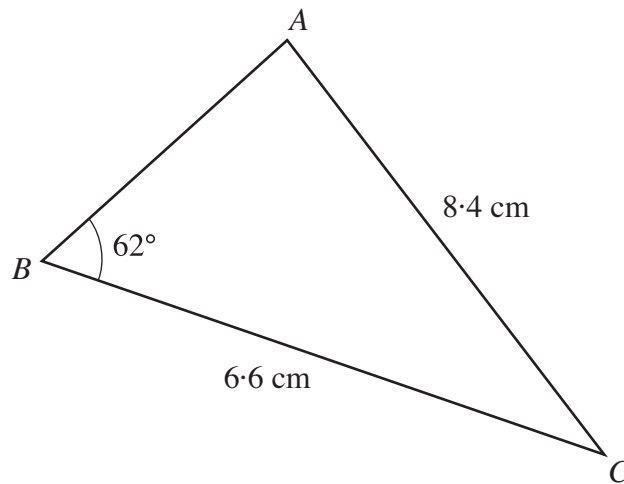


Diagram not drawn to scale.

You are given that $BC = 6.6 \text{ cm}$, $AC = 8.4 \text{ cm}$ and $\hat{ABC} = 62^\circ$.

(a) Calculate the size of the acute angle BAC .

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(b) Calculate the area of the triangle ABC .

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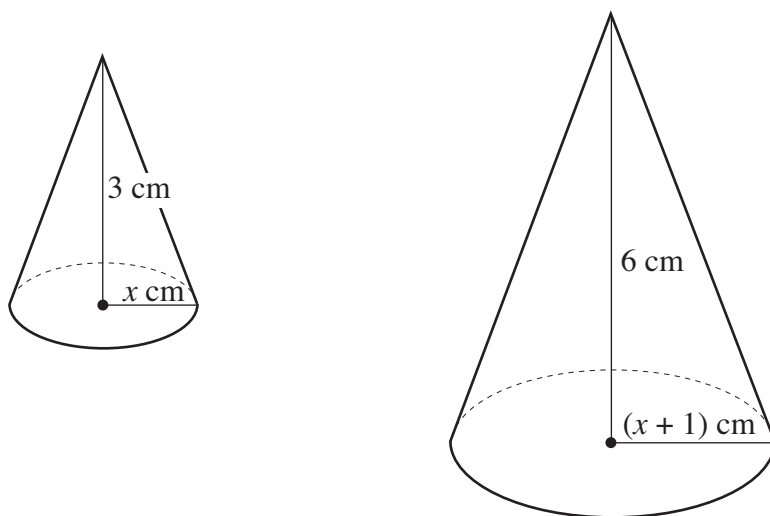
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16. Two cones are shown in the diagram below. The radius of the smaller cone is x cm and the height is 3 cm. The radius of the larger cone is $(x + 1)$ cm and the height is 6 cm.



Diagrams not drawn to scale.

- (a) The total volume of the two cones together is 102π . Show that $3x^2 + 4x - 100 = 0$.

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- (b) Calculate the radius of the larger cone to an appropriate degree of accuracy.

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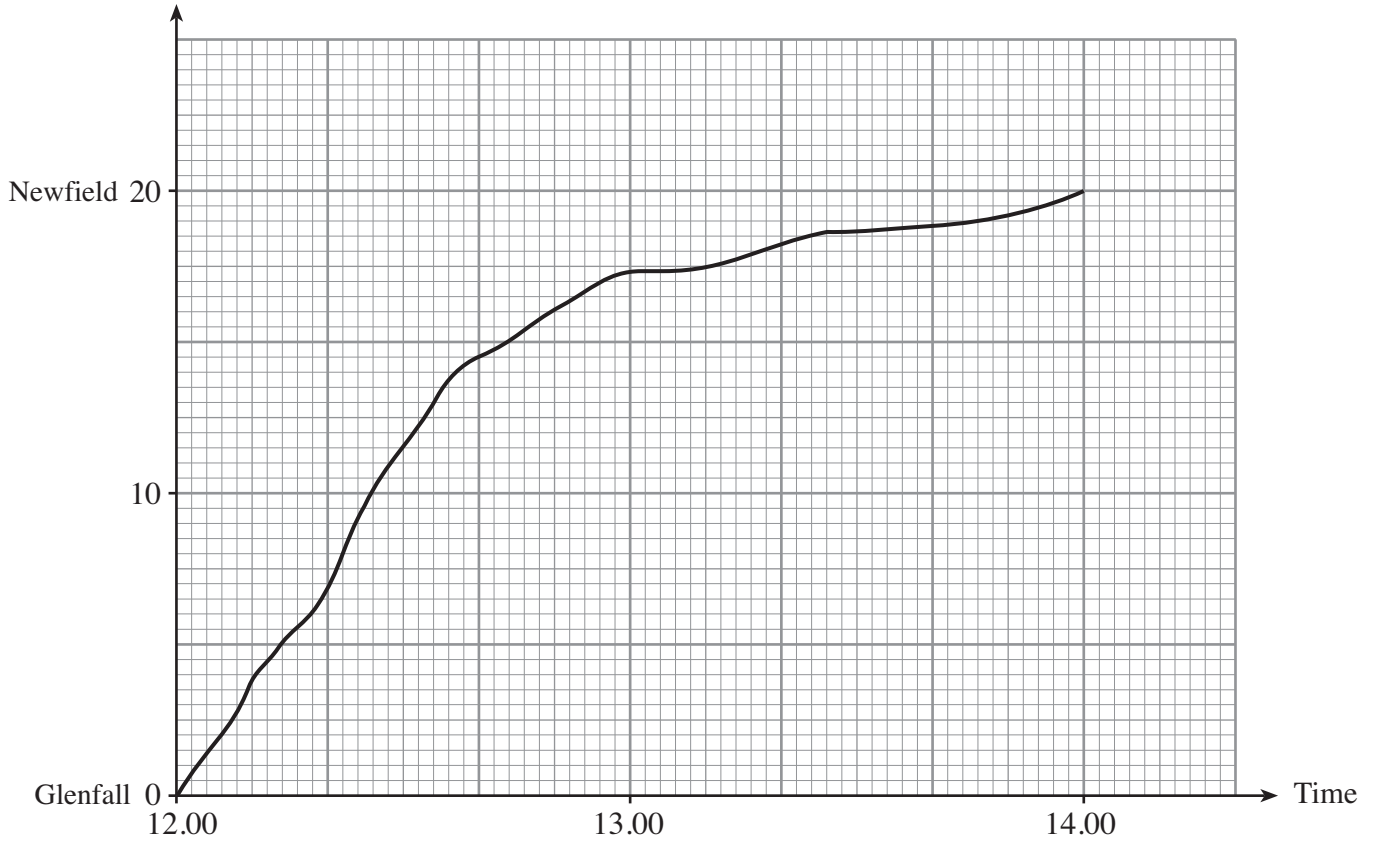
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17. A cyclist travels a 20 km route starting at 12.00 from Glenfall and reaching Newfield at 14.00. The following diagram is a distance-time graph for the journey.

Distance from Glenfall in km



Use the graph to estimate the speed in km/h of the cyclist at 12.30.

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18. Express $\frac{x}{3x+1} - \frac{2}{8x-1}$ as a single fraction in its simplest form.

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