

**GENERAL CERTIFICATE OF SECONDARY EDUCATION  
MATHEMATICS B (MEI)**

**B293A**

Paper 3 Section A  
(Higher Tier)

Candidates answer on the question paper

**OCR Supplied Materials:**  
None

**Other Materials Required:**

- Geometrical instruments
- Tracing paper (optional)

**Monday 18 May 2009  
Afternoon**

**Duration: 45 minutes**



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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**MODIFIED LANGUAGE**

**INSTRUCTIONS TO CANDIDATES**

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Show your working. Marks may be given for a correct method even if the answer is incorrect.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

**INFORMATION FOR CANDIDATES**

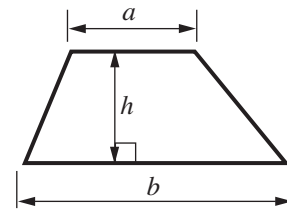
- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this Section is **36**.
- This document consists of **12** pages. Any blank pages are indicated.

**WARNING**

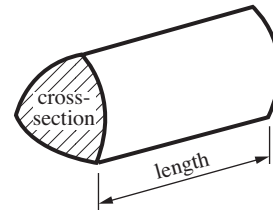
**No calculator can be used for Section A of this paper**

## Formulae Sheet: Higher Tier

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



**Volume of prism** = (area of cross-section)  $\times$  length

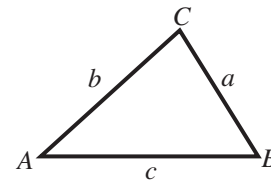


**In any triangle  $ABC$**

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

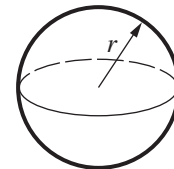
**Cosine rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

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



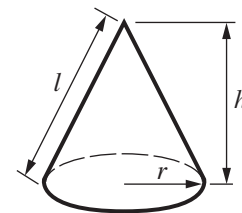
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

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



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

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



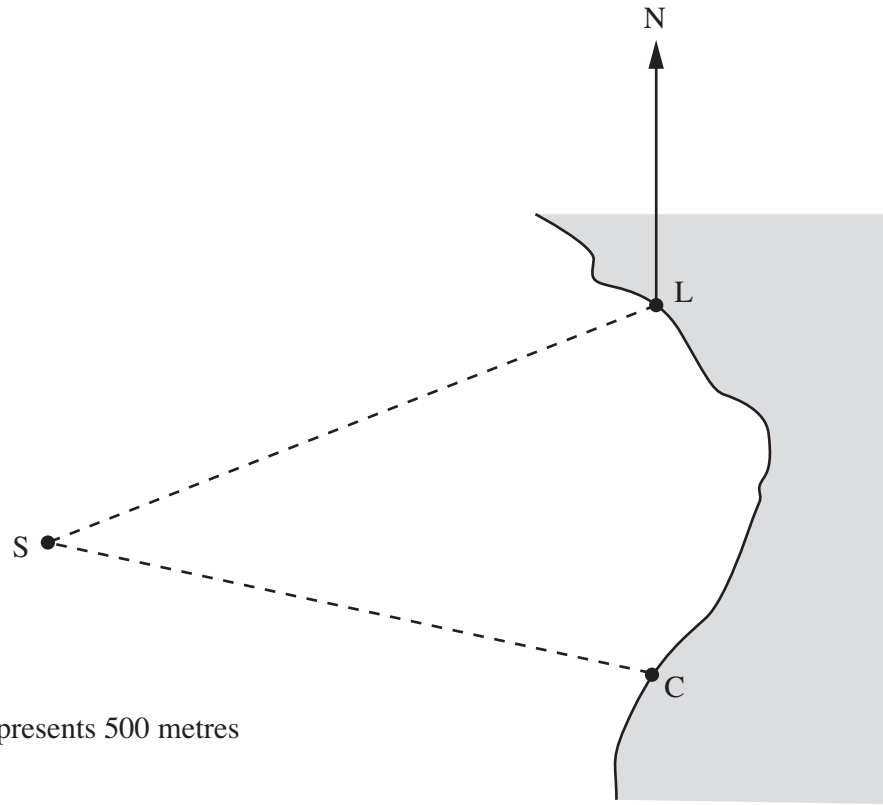
**The Quadratic Equation**

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**

- 1 The diagram shows part of a coastline.  
 There is a coastguard station at C and a lighthouse at L.  
 There is a ship at sea at point S.



Scale: 1 cm represents 500 metres

- (a) Find the actual distance of the ship from the coastguard station.  
 Give the units of your answer.

(a) ..... [3]

- (b) Find the bearing of the ship from the lighthouse.

(b) .....° [1]

- 2 Paul is estimating the number of fish in a lake some months from now. He uses this formula.

$$n = 50 + (10 - r)m$$

$n$  is the number of fish.

$r$  is the number of fish removed each month.

$m$  is the number of months from now.

- (a) Find the value of  $n$  when  $m = 7$  and  $r = 3$ .

(a) ..... [2]

- (b) If  $r = 12$ , explain why this formula will not work for large values of  $m$ .

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

**5**

**3** Solve this equation.

$$\frac{x}{4} - 1 = 7$$

..... [2]

4 Gina and Hilary carry out a survey of vehicles that pass the school gates. They carry out their survey from Monday to Thursday of one week between 0830 and 0930.

They record the vehicles in 3 categories.

- A Cars
- B Commercial vehicles (vans, lorries, etc)
- C Buses, coaches and taxis

They find that the ratio of vehicles in the three categories A : B : C is 11 : 5 : 2.

(a) Gina wants to know the probability that the first vehicle past the gates after 0830 on Friday will be a car.

Hilary says that this is  $\frac{11}{18}$ .

(i) Explain how Hilary obtained this value.

.....  
..... [2]

(ii) Give a reason why  $\frac{11}{18}$  is a valid estimate for this probability.

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

(b) Hilary says that the probability that the first vehicle past the gates after 0830 on Saturday will be a commercial vehicle is  $\frac{5}{18}$ .

Give a reason why  $\frac{5}{18}$  is **not** a valid estimate for this probability.

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

5 You are given that  $40 = 2^3 \times 5$  when expressed as a product of its prime factors.

(a) Express 60 and 72 as products of their prime factors.

(a)  $60 = \dots\dots\dots$

$72 = \dots\dots\dots$  [4]

(b) Find the least common multiple (LCM) of 40, 60 and 72.

Give your answer as a product of its prime factors.

(b)  $\dots\dots\dots$  [2]

(c) Which of these fractions is nearest to  $\frac{1}{2}$ ?

Show how you decided.

$$\frac{21}{40} \quad \frac{29}{60} \quad \frac{35}{72}$$

(c)  $\dots\dots\dots$  [2]

6 (a) Solve algebraically these simultaneous equations.

$$2x + 3y = 18$$

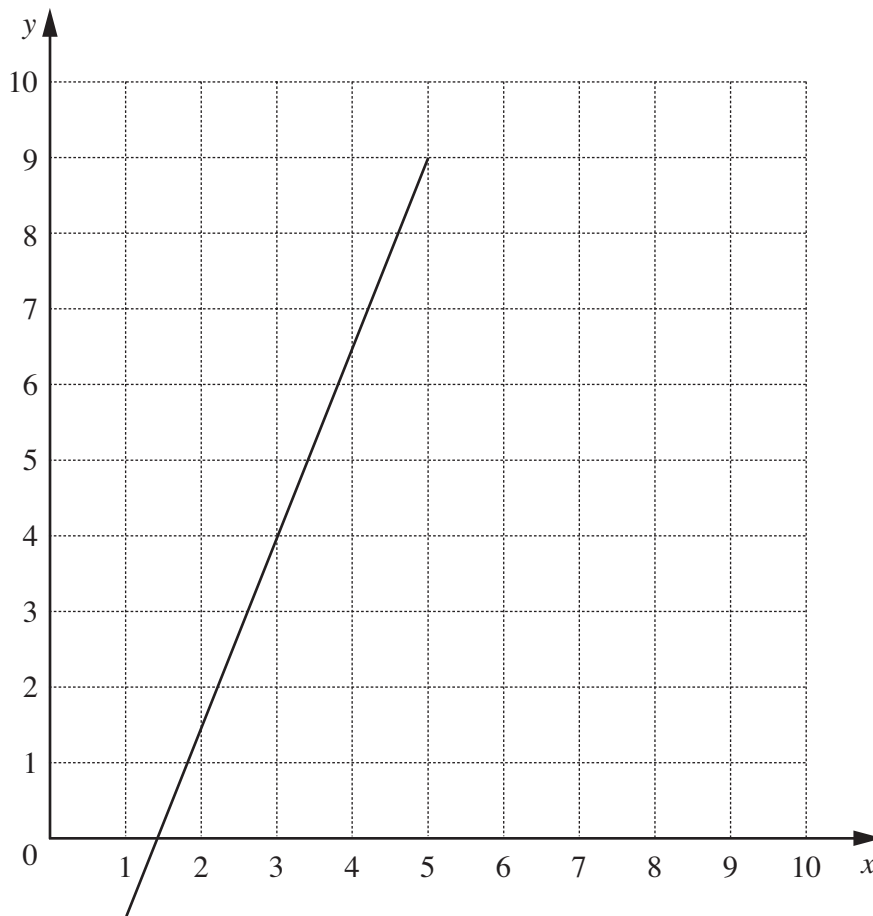
$$5x - 2y = 7$$

(a)  $x = \dots\dots\dots$

$y = \dots\dots\dots$  [4]



(b) The grid below shows the graph of  $5x - 2y = 7$ .



(i) On the same grid, draw the graph of  $2x + 3y = 18$ . [2]

(ii) Explain how you can use the graphs to solve the simultaneous equations in part (a).

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

7 Amit says that the surface area of a compound shape is given by this formula.

$$S = 2\pi r^2 + \pi r l^2$$

By considering dimensions, explain why Amit is incorrect.

.....  
 ..... [2]

8 You are given four equations and four graphs.

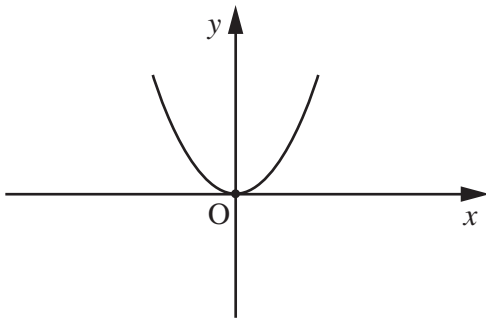
Match each equation to its graph. Write the appropriate letter in the space beneath each graph.

A  $y = \frac{1}{2}x^3$

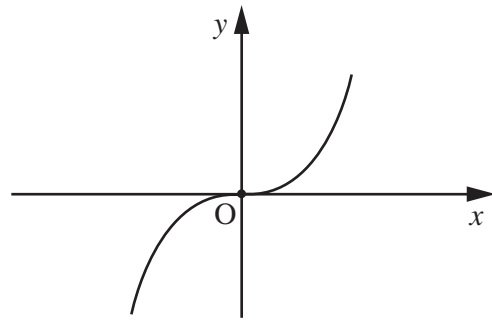
B  $y = 2x^2$

C  $y = 2 \times 3^x$

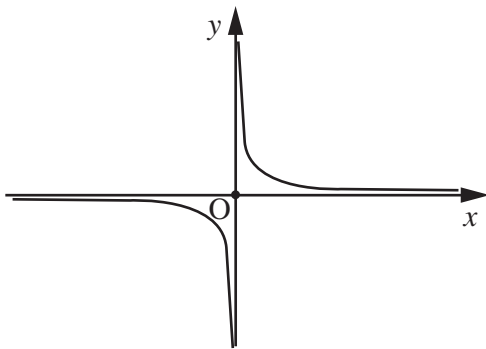
D  $y = \frac{2}{x}$



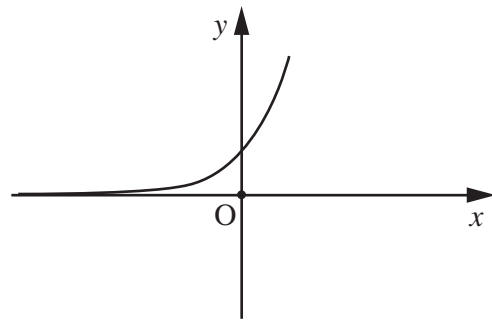
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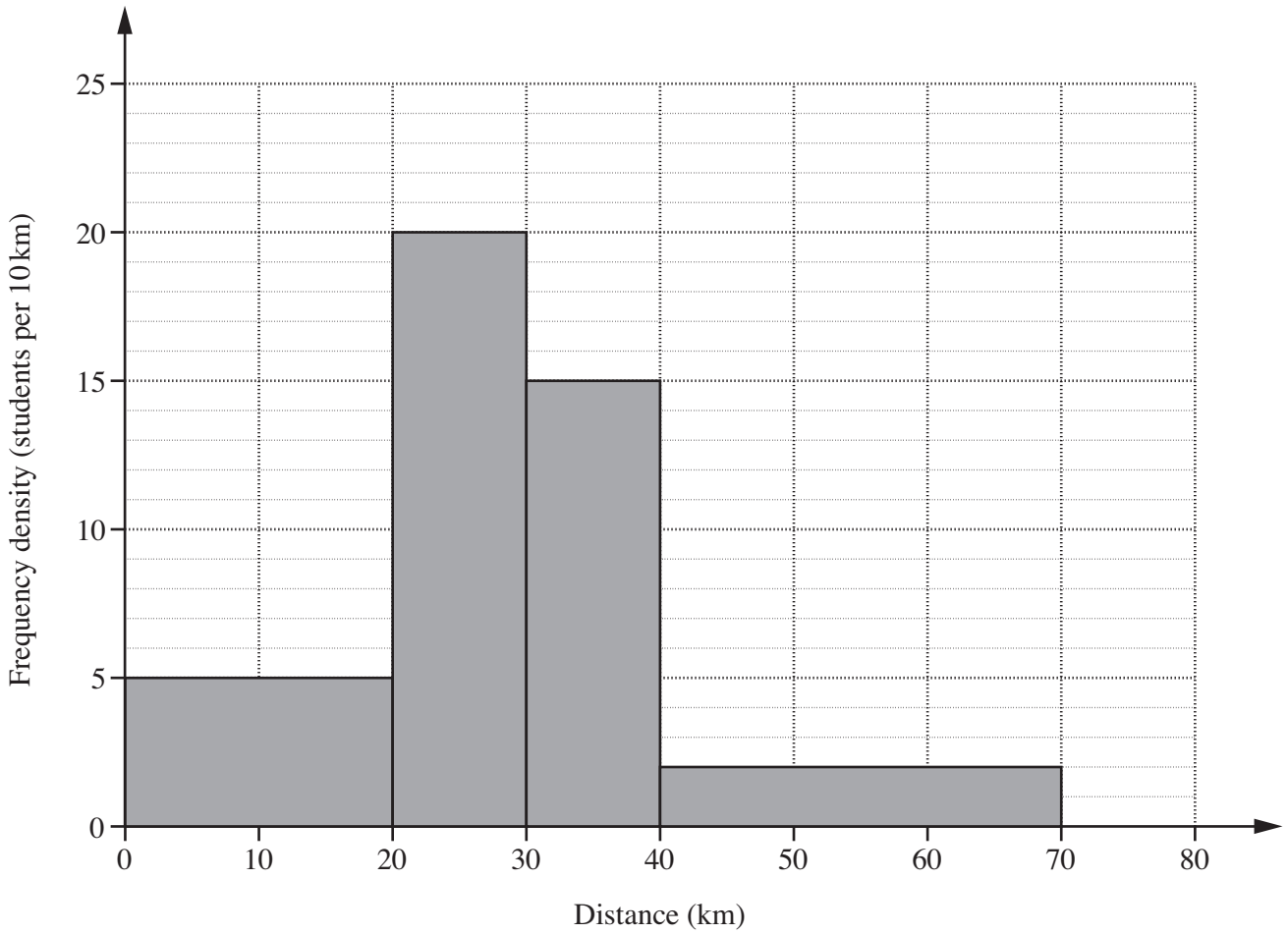
.....



.....

[3]

- 9 The students from Avonford Community High School took part in a sponsored cycle ride. The Head of Mathematics drew the following histogram to illustrate the distances the students rode.



How many students took part in the sponsored cycle ride?

..... [3]

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