

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

B293A

Paper 3 Section A
(Higher Tier)

**Monday 18 May 2009
Afternoon**

Duration: 45 minutes

Candidates answer on the question paper

OCR Supplied Materials:
None

Other Materials Required:

- Geometrical instruments
- Tracing paper (optional)



Candidate Forename		Candidate Surname	
--------------------	--	-------------------	--

Centre Number							Candidate Number				
---------------	--	--	--	--	--	--	------------------	--	--	--	--


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.

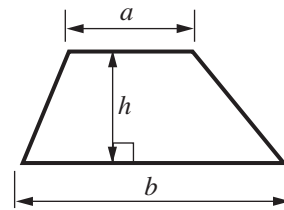
WARNING



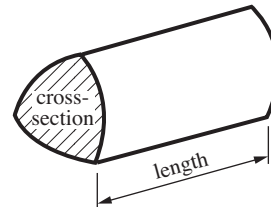
No calculator can be used for Section A of this paper

Formulae Sheet: Higher Tier

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



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

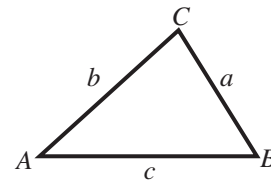


In any triangle ABC

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

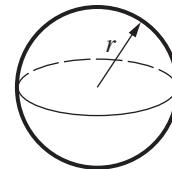
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

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



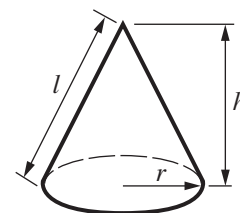
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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



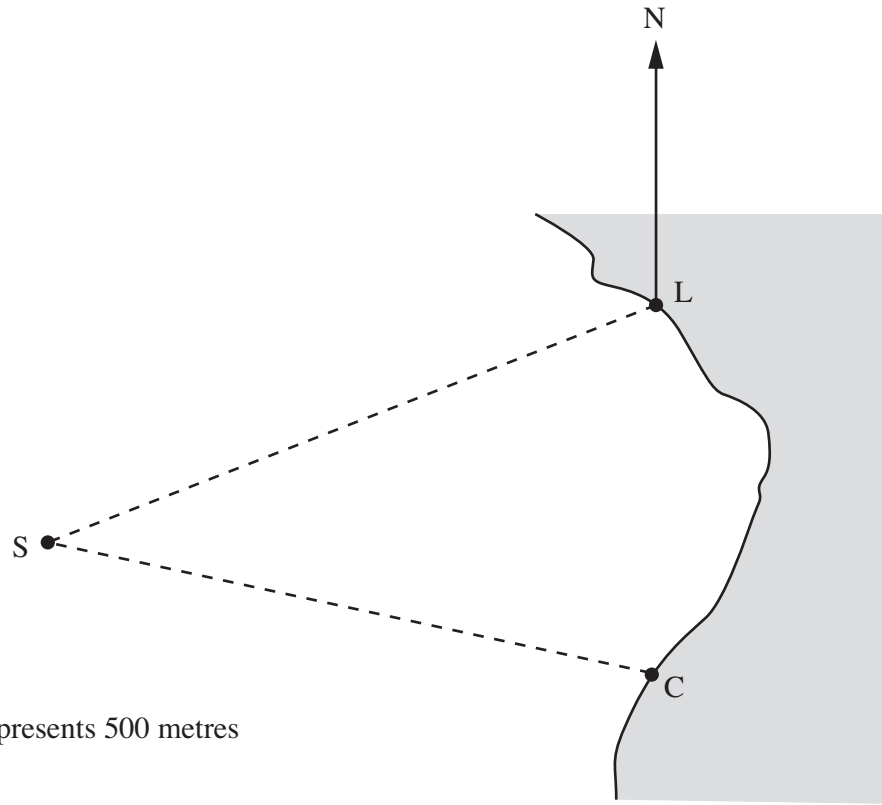
The Quadratic Equation

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 in distress 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.

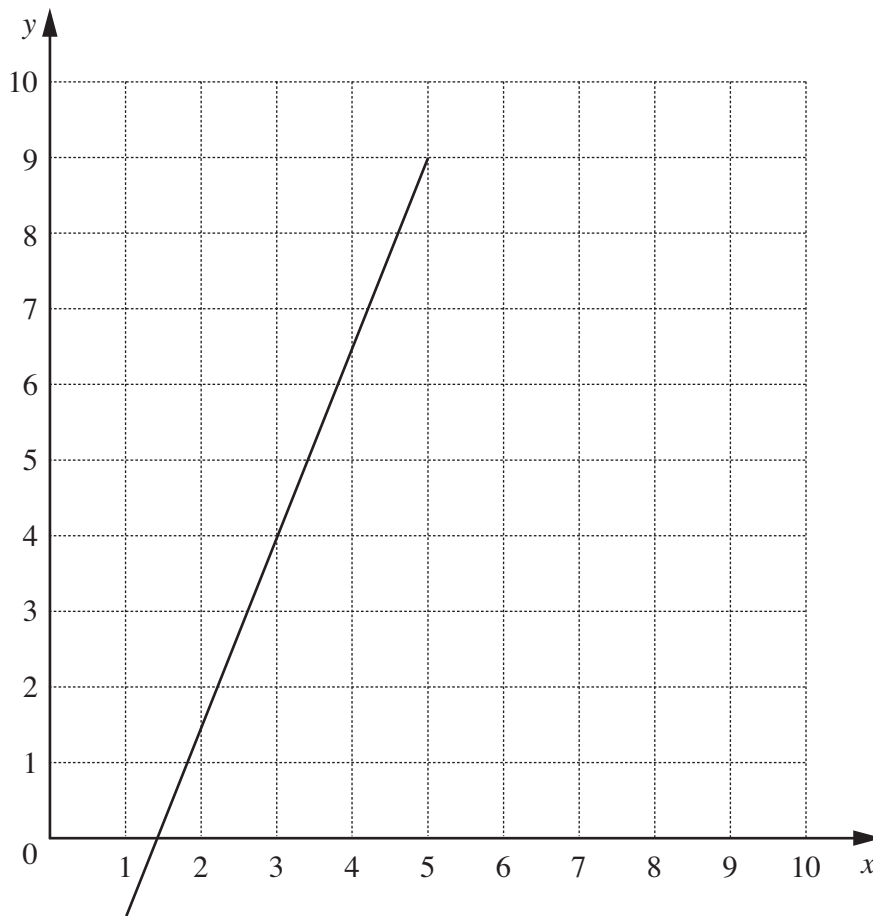
$$2x + 3y = 18$$

$$5x - 2y = 7$$

(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.

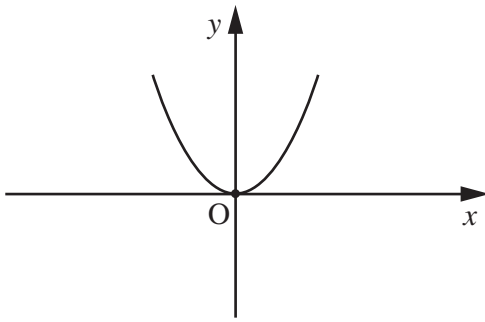
Match each equation to its graph. Write the appropriate letter in the space beneath each graph.

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

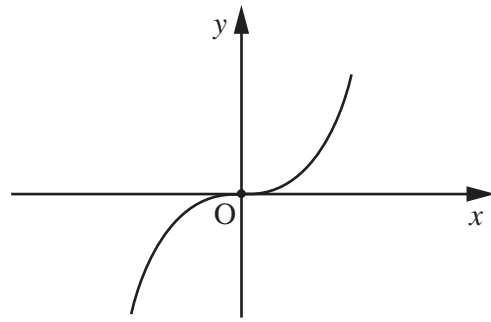
B $y = 2x^2$

C $y = 2 \times 3^x$

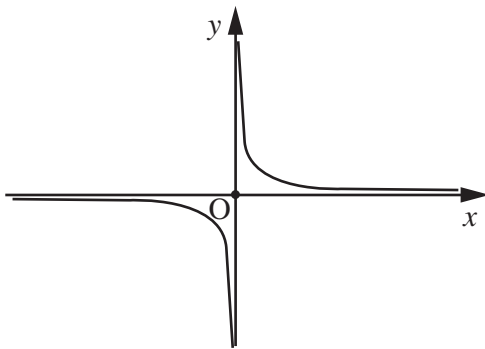
D $y = \frac{2}{x}$



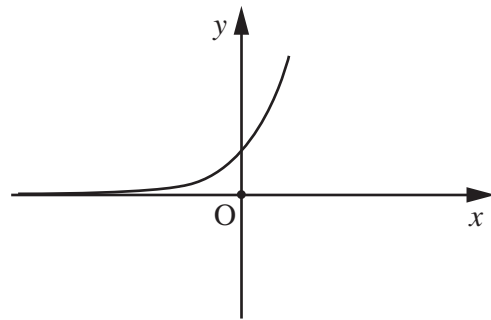
.....



.....



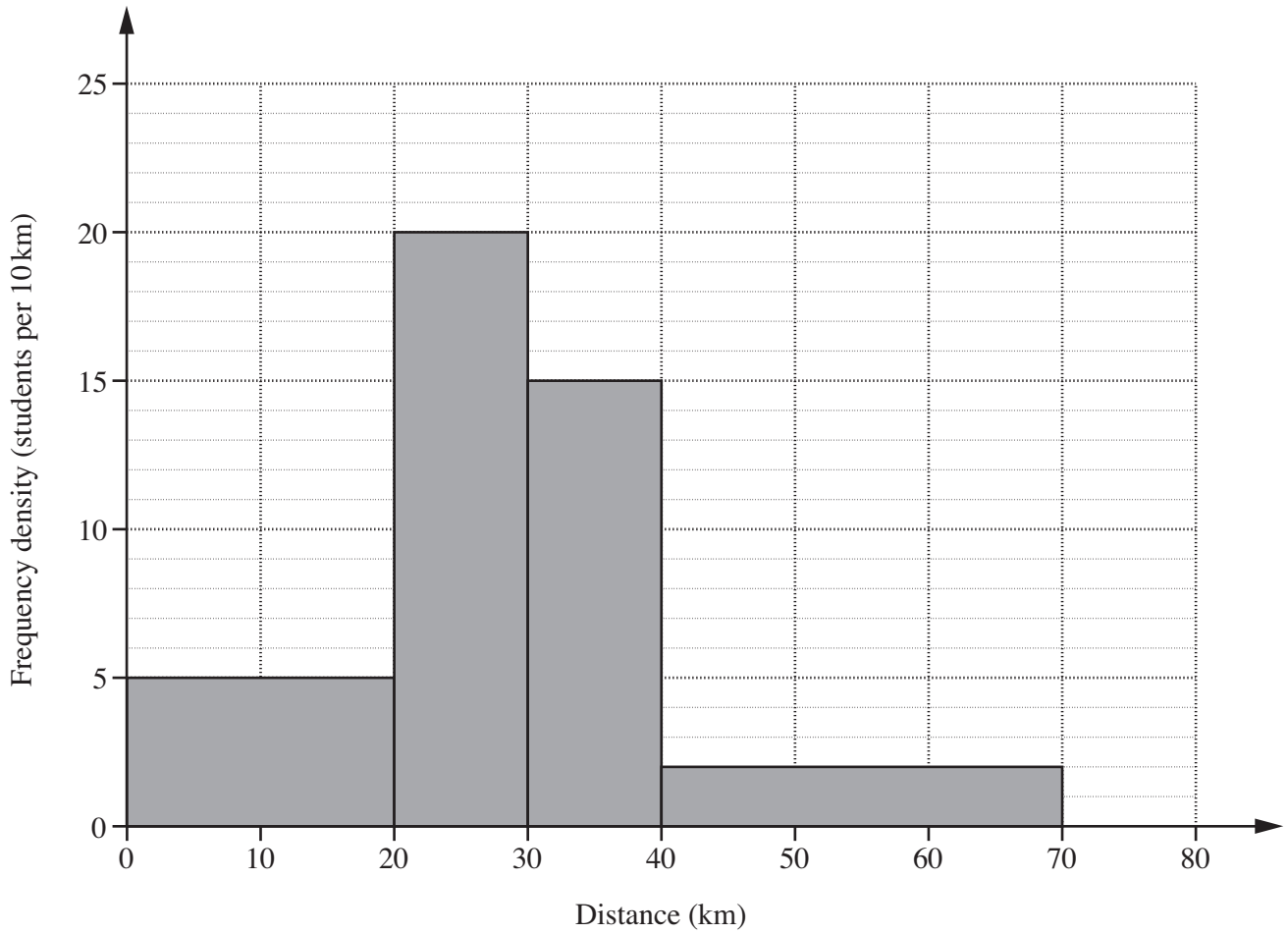
.....



.....

[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]

PLEASE DO NOT WRITE ON THIS PAGE



Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations, is given to all schools that receive assessment material and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1PB.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.