Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

B293A

MATHEMATICS B (MEI)

Paper 3 Section A
(Higher Tier)

MONDAY 18 MAY 2009: Afternoon
DURATION: 45 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the question paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Geometrical instruments
Tracing paper (optional)

READ INSTRUCTIONS OVERLEAF

DC (LEO/SW) OV90776 10808/1

INSTRUCTIONS TO CANDIDATES

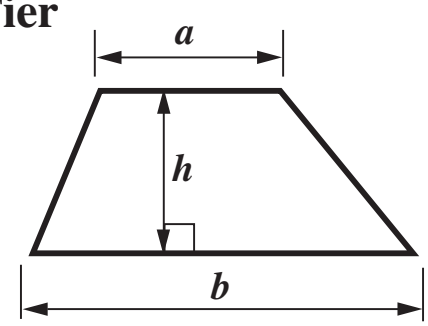
- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **Use black ink. Pencil may be used for graphs and diagrams only.**
- **Read each question carefully and make sure that you know what you have to do before starting your answer.**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

INFORMATION FOR CANDIDATES

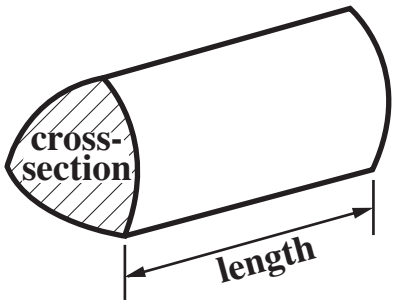
- **The number of marks is given in brackets [ ] at the end of each question or part question.**
- **The total number of marks for this Section is 36.**

Formulae Sheet: Higher Tier

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



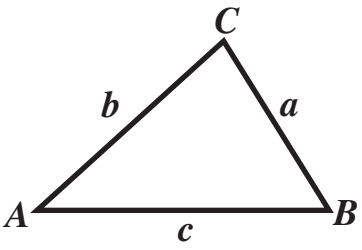
Volume of prism = (area of cross-section) × length



In any triangle ABC

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

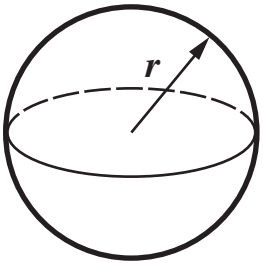
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$



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

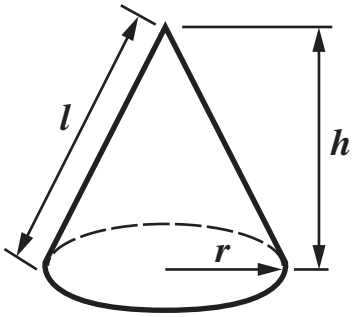
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

Curved surface area of cone $= \pi rl$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$**, where** $a \neq 0$**, are given by**

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

1 The diagram on a separate sheet 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.
The scale of the diagram is 1 cm to 500 metres.

(a) Find the actual distance of the ship from the coastguard station.
Give the units of your answer. [3 marks]

(a) _____

(b) Find the bearing of the ship from the lighthouse.
[1 mark]

(b) _____°

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

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

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 $r = 3$
[2 marks]

(a) _____

(b) If $r = 12$ explain why this formula will not work for large values of *m*. [1 mark]

_____

_____

3 Solve the equation below.

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

[2 marks]

_____

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 marks]**

_____

_____

(ii) **Give a reason why** $\frac{11}{18}$ **is a valid estimate for this probability. [1 mark]**

_____

_____

_____

(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 <u>NOT</u> a valid estimate for this probability. [1 mark]

_____

_____

_____

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.
[4 marks]

(a) 60 = _____

72 = _____

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

Give your answer as a product of its prime factors.
[2 marks]

(b) _____

(c) Write down which of these fractions is nearest to $\frac{1}{2}$

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

Show how you decided. [2 marks]

(c) _____

6 (a) Solve algebraically the simultaneous equations below.

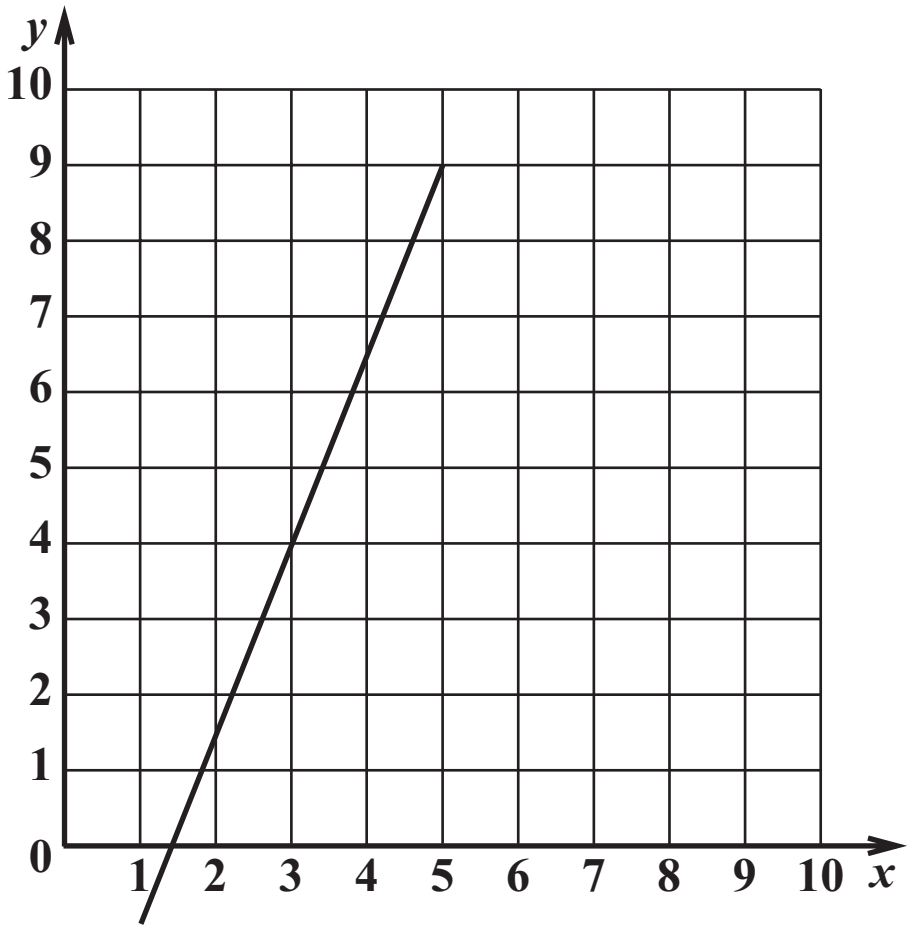
$2x + 3y = 18$
$5x - 2y = 7$
[4 marks]

(a) x = _____

y = _____

(b) The grid below shows the graph of

$5x - 2y = 7$



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

(ii) Explain how you can use the graphs to solve the simultaneous equations in part (a). [1 mark]

_____

_____

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

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

By considering dimensions, explain why Amit is incorrect. [2 marks]

_____

_____

8 **Four graphs are drawn on the oppposite page.**
Look at the four equations below. They are labelled A, B, C and D.

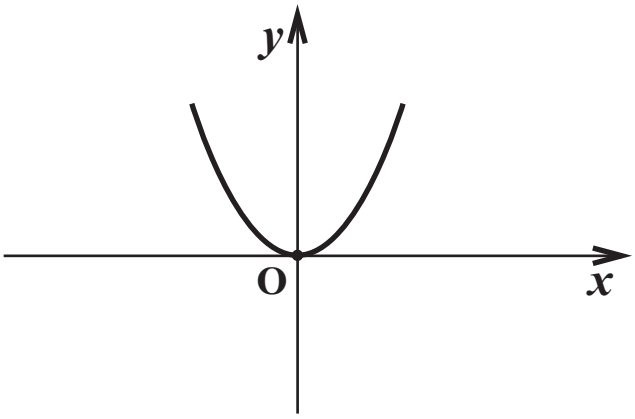
A $y = \frac{1}{2}\ x^3$

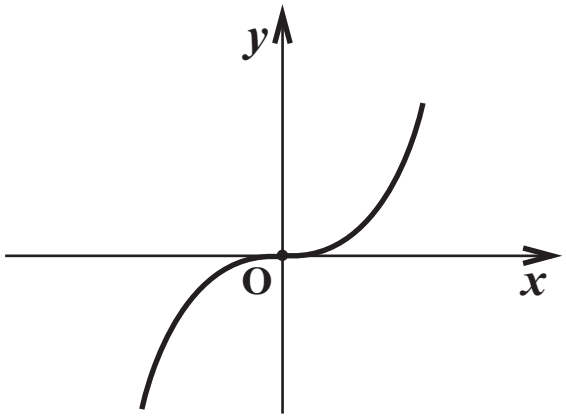
B $y = 2x^2$

C $y = 2 \times 3^x$

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

Match each equation to its graph.
Write the appropriate letter in the space beneath each graph. [3 marks]


y
O
x


y
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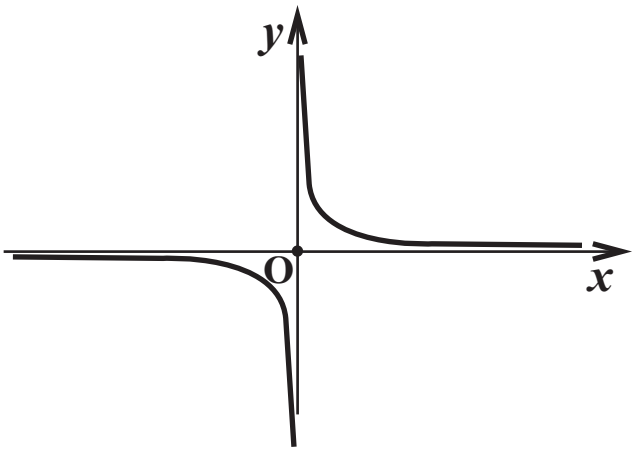
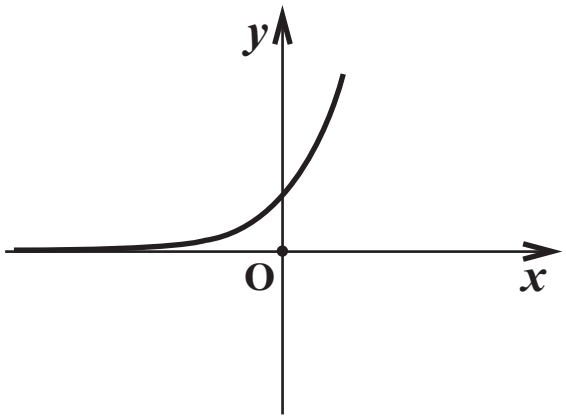
x

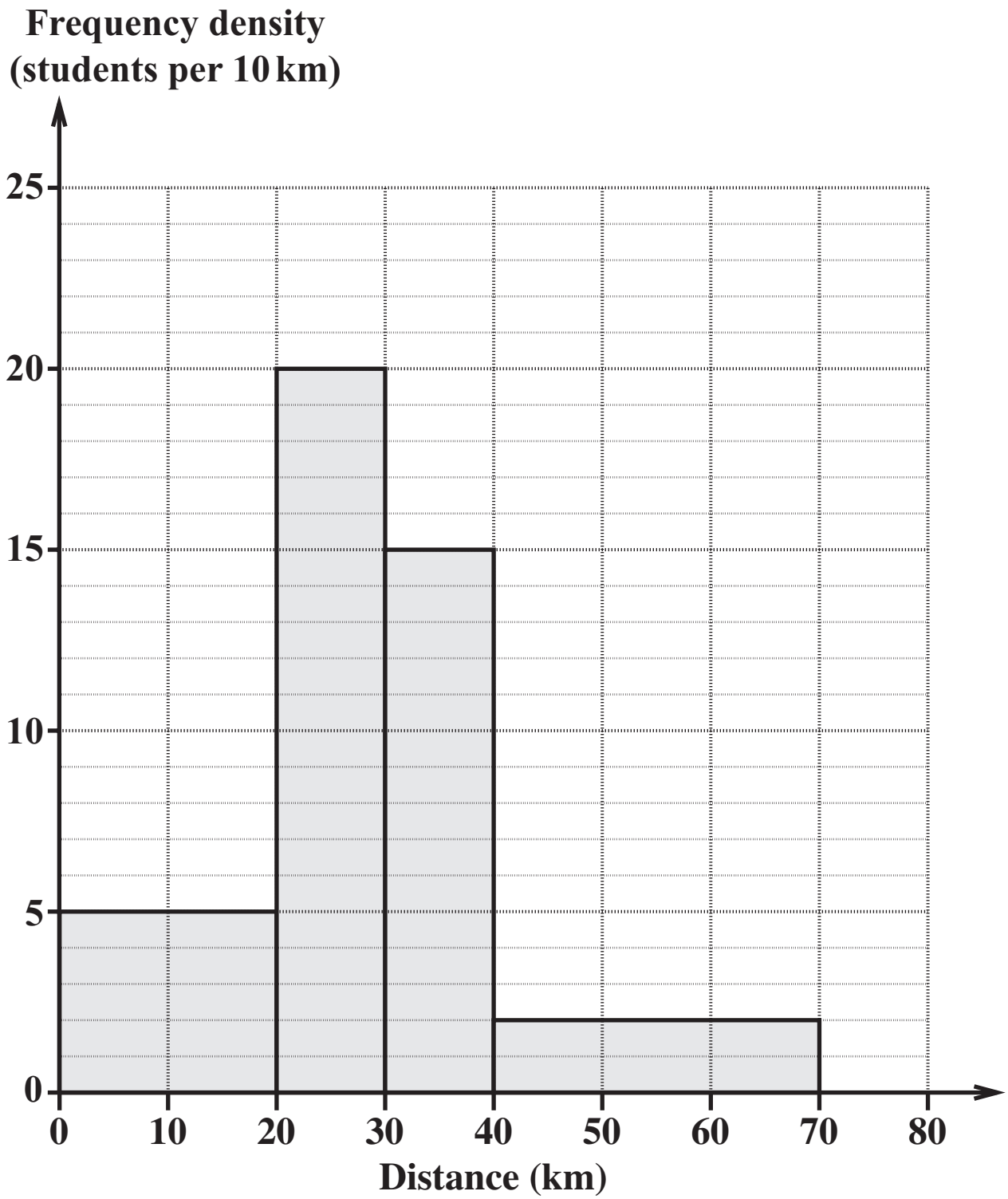

y
O
x


y
O
x

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

How many students took part in the sponsored cycle ride?
[3 marks]

_____


Frequency density
(students per 10 km)
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
Distance (km)