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Centre number						Candidate number				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

B293B

MATHEMATICS B (MEI)

Paper 3 Section B (Higher Tier)

TUESDAY 11 JANUARY 2011: Morning

DURATION: 45 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the question paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Geometrical instruments

Scientific or graphical calculator

Tracing paper (optional)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

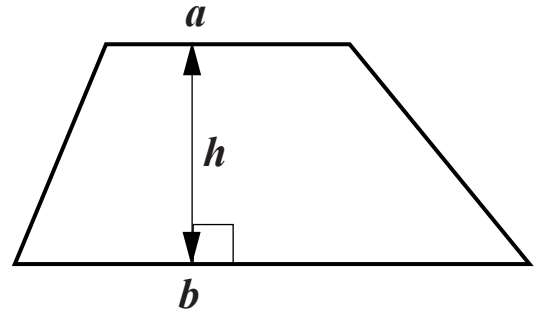
- **Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.**
- **Use black ink. Pencil may be used for graphs and diagrams only.**
- **Read each question carefully. Make sure you know what you have to do before starting your answer.**
- **Show your working. Marks may be given for a correct method even if the answer is incorrect.**
- **Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).**
- **Answer ALL the questions.**

INFORMATION FOR CANDIDATES

- **The number of marks is given in brackets [] at the end of each question or part question.**
- **Section B starts with question 10.**
- **You are expected to use a calculator in Section B of this paper.**
- **Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.**
- **The total number of marks for this Section is 36.**

FORMULAE SHEET: HIGHER TIER

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



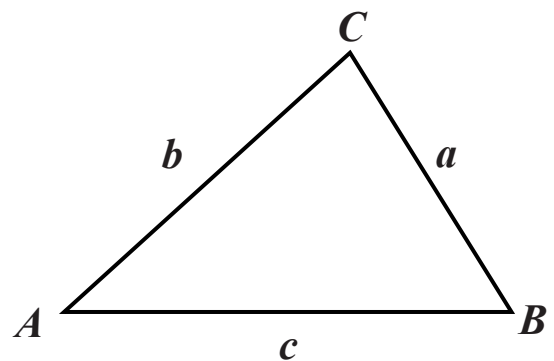
Volume of prism =
(area of cross-section) \times length

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 = $\frac{1}{2} ab \sin C$



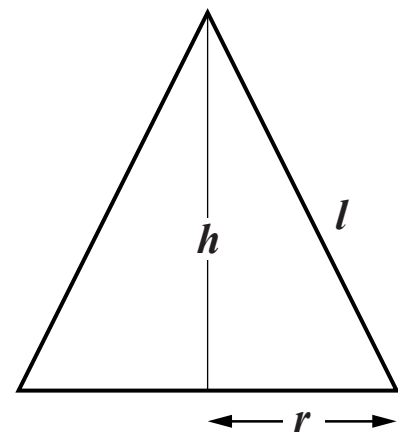
Volume of sphere = $\frac{4}{3} \pi r^3$

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

Where r is the radius.

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

Curved surface area of cone = πrl



The Quadratic Equation

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

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

- 10 Fred and Jo each own an orchard in which they have a number of apple trees. Last year they recorded the numbers of apples picked from each tree. The data are summarised in the stem and leaf diagrams below.**

Key 4 | 5 means 45

Fred

3	9
4	5
5	
6	6 7 7 8
7	2 3 4 6 8 8 9
8	7 8

Key 4 | 2 means 42

Jo

3	6
4	2 3 4
5	3 6 8
6	3 5 7
7	4 5
8	

**(a) Work out the median number of apples for each
[2 marks]**

Fred _____

Jo _____

**(b) Make two comparisons between the distributions.
[2 marks]**

1. _____

2. _____

11 The masses of 60 students are summarised in the table below.

MASS (x kg)	NUMBER OF STUDENTS
$50 < x \leq 55$	24
$55 < x \leq 60$	16
$60 < x \leq 65$	13
$65 < x \leq 70$	7

(a) One student is selected at random from this group of students.

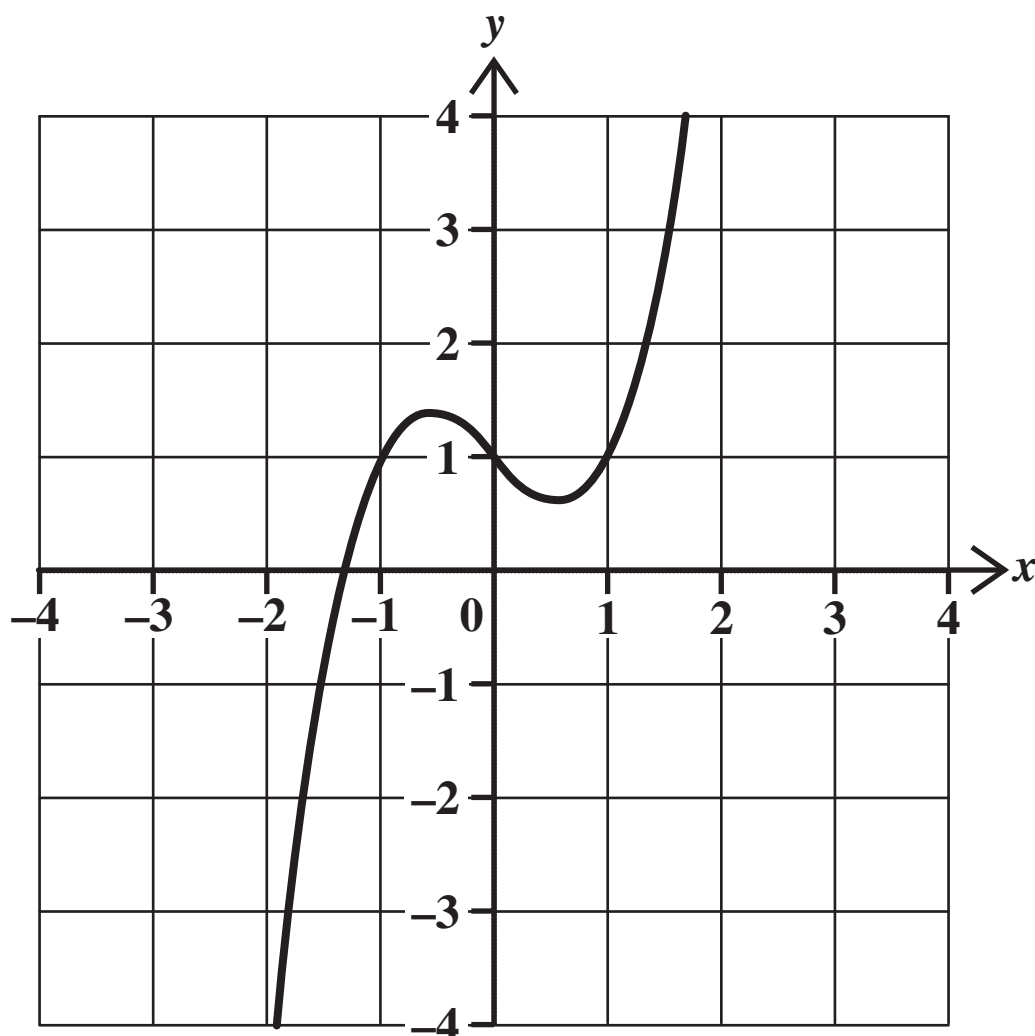
**Find the probability that the mass of the student selected is more than 55 kg
[2 marks]**

(b) Calculate an estimate of the mean mass of these students. [4 marks]

_____ kg

12 The graph below shows

$$y = x^3 - x + 1$$



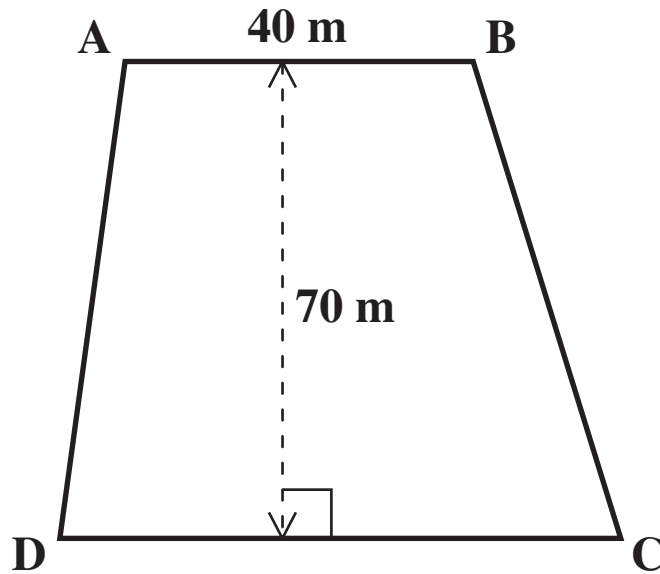
- (a) Mark a point on the curve that shows that the solution of the equation $x^3 - x + 1 = 2$ is approximately $x = 1.3$
[1 mark]

(b) Use trial and improvement to find a more accurate solution of the equation

$$x^3 - x + 1 = 2$$

**Give your answer correct to 2 decimal places.
Show all your trials. [3 marks]**

- 13** Look at the diagram below.
It is not to scale.



A field ABCD is in the shape of a trapezium as shown in the diagram.

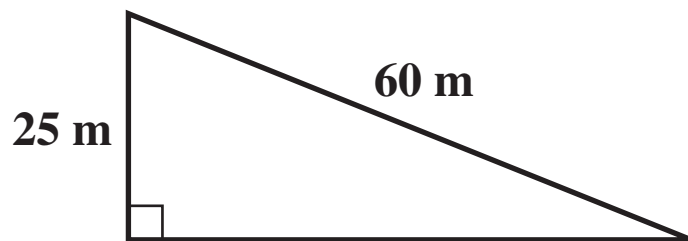
AB has length 40 m and is parallel to DC.

The area of the field is 3150 m^2 and the distance between the parallel sides is 70 m

Calculate the length of the side DC. [3 marks]

_____ m

14 Look at the diagram below.



**A straight path up a hillside has a constant angle of slope.
It rises vertically 25 m for 60 m along the path.**

Find the angle of slope. [3 marks]

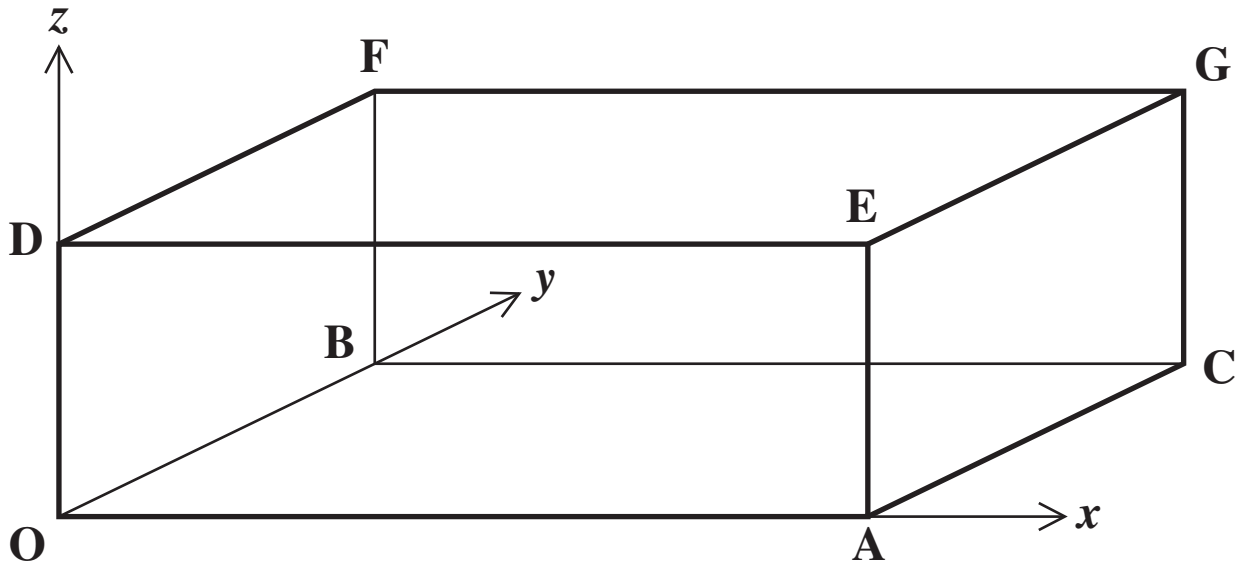
_____ °

15 A model may be provided for this question.

The diagram represents a section of air space in the shape of a cuboid.

$OA = 8$ $OB = 4$ and $OD = 2$

All lengths are in kilometres.



(a) An aircraft is at point G.

(i) Write down the coordinates of the point G. [1 mark]

(_____ , _____ , _____)

(ii) Find how far the aircraft is from O. [3 marks]

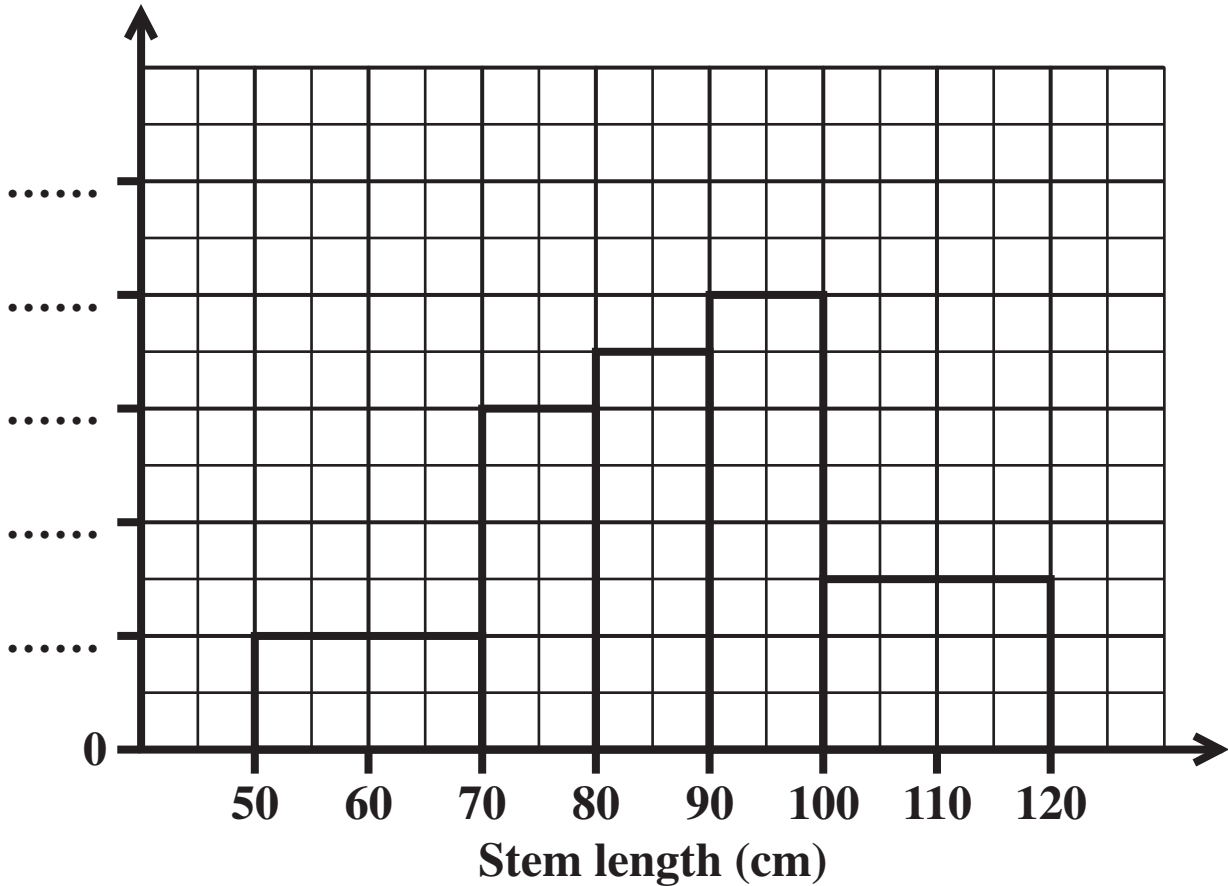
_____ km

(b) Another aircraft is at the point with coordinates (8, 0, 2).

Mark the position of this aircraft with an X. [1 mark]

16 A group of botanists visited a valley in Derbyshire in search of thistles and measured the stem lengths of a sample of these plants. Their results are shown in the histogram and partly completed table below.

Frequency density
plants per



Stem length, (x cm)	Number of plants
$50 \leq x < 70$	
$70 \leq x < 80$	6
$80 \leq x < 90$	
$90 \leq x < 100$	
$100 \leq x < 120$	

(a) Complete the table. [2 marks]

(b) Complete the labelling and scaling of the vertical axis. [2 marks]

17 You are given that
 $x^2 - 6x + 10 = (x - c)^2 + d$

(a) Find the values of c and d
[3 marks]

$c =$ _____

$d =$ _____

(b) Hence write down the minimum value of
 $x^2 - 6x + 10$
[1 mark]

18 A forklift truck is used to lift pallets of materials onto high shelves.

The truck can safely lift 1500 kg correct to 2 significant figures.

A loaded pallet weighs 120 kg correct to 2 significant figures.

What is the maximum number of loaded pallets that the forklift truck could safely lift to be sure of being within the stated limit? [3 marks]

END OF QUESTIONS

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