



H

GENERAL CERTIFICATE OF SECONDARY EDUCATION
MATHEMATICS B (MEI)
 Paper 3 Section B (Higher Tier)

B293B

Candidates answer on the question paper.

OCR supplied materials:
None

Other materials required:

- Geometrical instruments
- Scientific or graphical calculator
- Tracing paper (optional)

Tuesday 11 January 2011
Morning

Duration: 45 minutes



Candidate forename		Candidate surname	
-----------------------	--	----------------------	--

Centre number						Candidate number				
---------------	--	--	--	--	--	------------------	--	--	--	--

INSTRUCTIONS TO CANDIDATES

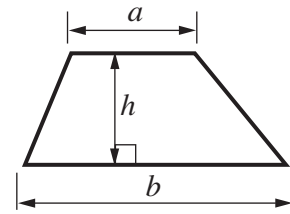
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Show all your 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.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

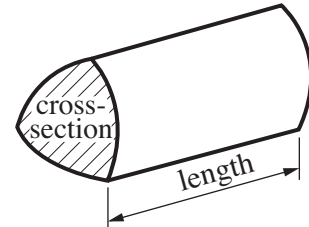
- The number of marks is given in brackets [] at the end of each question or part question.
- Section B starts with question 10.
- You are expected to use a calculator in Section B of this paper.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- The total number of marks for this Section is **36**.
- This document consists of **12** pages. Any blank pages are indicated.

Formulae Sheet: Higher Tier

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



$$\text{Volume of prism} = (\text{area of cross-section}) \times \text{length}$$

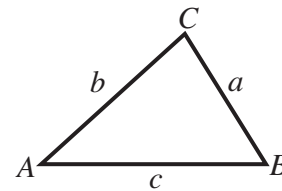


In any triangle ABC

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

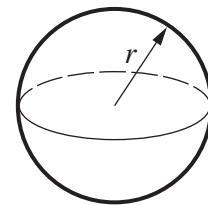
$$\text{Cosine rule} \quad a^2 = b^2 + c^2 - 2bc \cos A$$

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



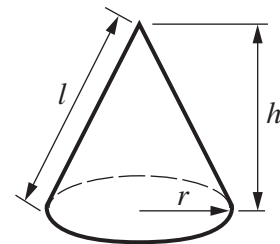
$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

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



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

$$\text{Curved surface area of cone} = \pi r l$$



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

- 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.

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

Key 4 | 5 means 45

Key 4 | 2 means 42

- (a) Work out the median number of apples for each.

(a) Fred

Jo [2]

- (b) Make two comparisons between the distributions.

1.

2. [2]

- 11 The masses of 60 students are summarised as follows.

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.

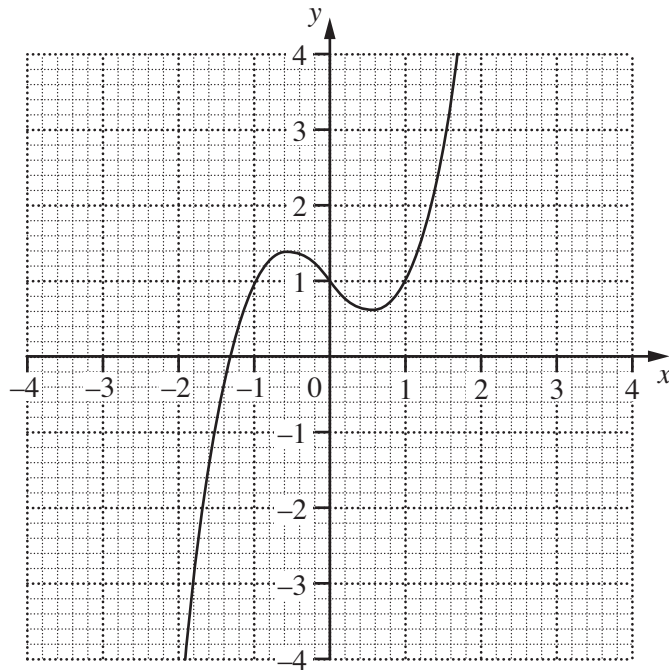
Find the probability that the mass of the student selected is more than 55 kg.

(a) [2]

- (b) Calculate an estimate of the mean mass of these students.

(b)kg [4]

- 12 The graph 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]

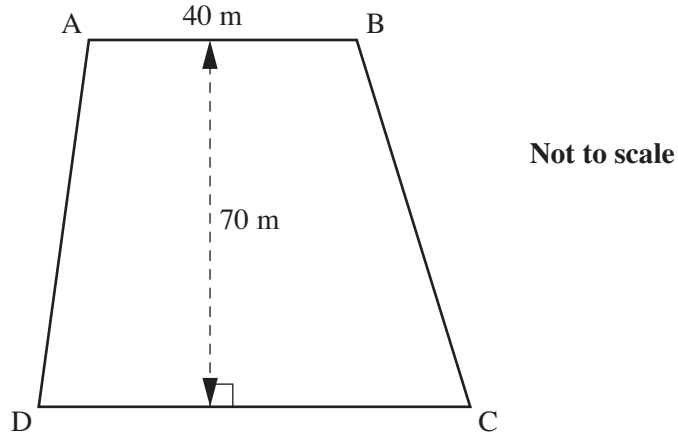
- (b) Use trial and improvement to find a more accurate solution of the equation

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

Give your answer correct to 2 decimal places.
Show all your trials.

(b) [3]

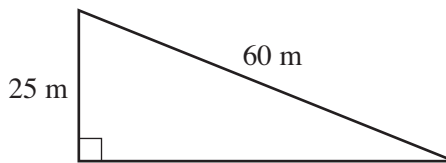
- 13 A field ABCD is in the shape of a trapezium as shown in the diagram.
 AB has length 40 m and is parallel to DC.
 The area of the field is 3150 m^2 and the distance between the parallel sides is 70 m.



Calculate the length of the side DC.

.....m [3]

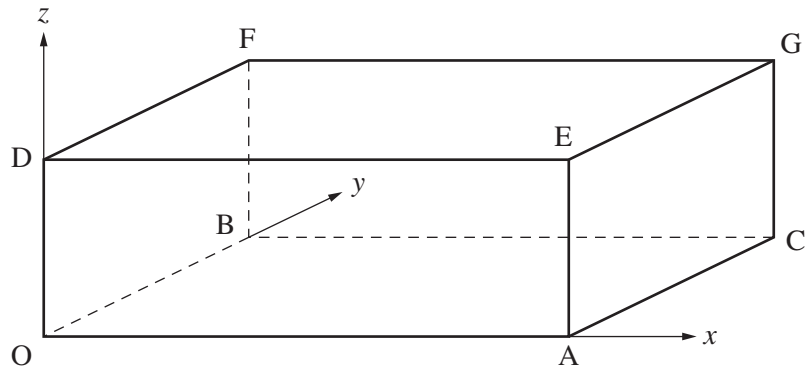
- 14 A straight path up a hillside has a constant angle of slope.
 It rises vertically 25 m for 60 m along the path.



Find the angle of slope.

.....° [3]

- 15** 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.

(a)(i) (..... , ,) [1]

(ii) Find how far the aircraft is from O.

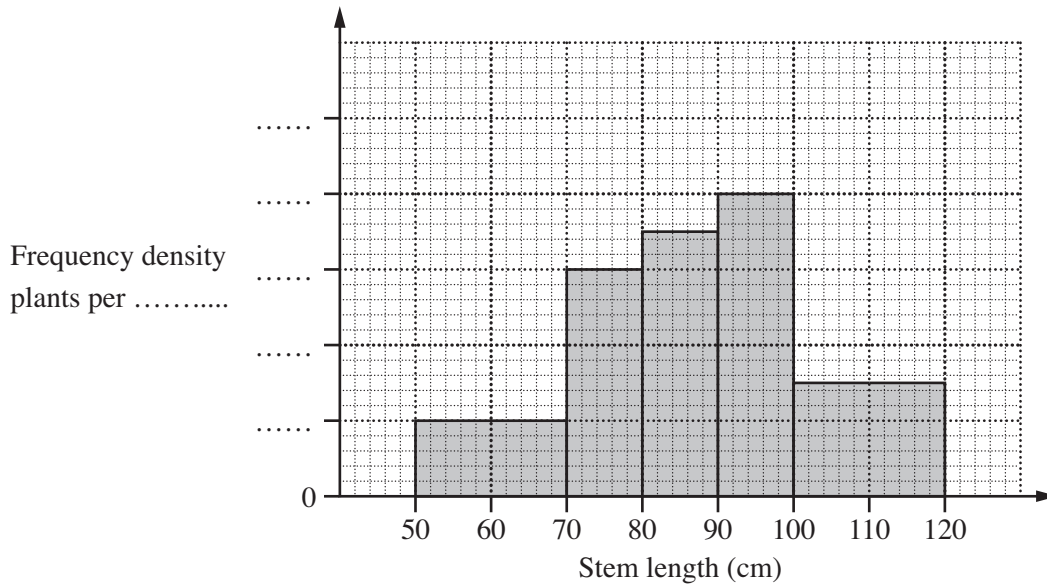
(ii) km [3]

- (b)** Another aircraft is at the point X with coordinates $(4, 0, 2)$.

Mark and label the point X on the diagram.

[1]

- 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.



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

(a) Complete the table. [2]

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

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

(a) Find the values of c and d .

(a) $c = \dots\dots\dots$

$d = \dots\dots\dots$ [3]

(b) Hence write down the minimum value of $x^2 - 6x + 10$.

(b) $\dots\dots\dots$ [1]

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?

$\dots\dots\dots$ [3]

PLEASE DO NOT WRITE ON THIS PAGE

PLEASE DO NOT WRITE ON THIS PAGE

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 1GE.

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.