OCR
RECOGNISING ACHIEVEMENT

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B264B

GENERAL CERTIFICATE OF SECONDARY EDUCATION
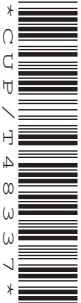
MATHEMATICS B (MEI)

Paper 4 Section B (Higher Tier)

MONDAY 2 JUNE 2008

Afternoon
Time: 1 hour

Candidates answer on the question paper
Additional materials (enclosed): None

Additional materials (required):
Geometrical instruments
Scientific or graphical calculator
Tracing paper (optional)

Candidate Forename		Candidate Surname	

Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

* Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
* Use blue or 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.
* Answer **all** the questions.
* Show your working. Marks may be given for a correct method even if the answer is incorrect.
* Do **not** write in the bar codes.
* Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

* The number of marks is given in brackets [ ] at the end of each question or part question.
* Unless otherwise instructed in the question, take π to be 3.142 or use the π button on your calculator.
* The total number of marks for this Section is **50**.
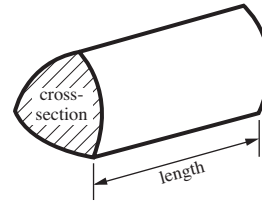* Section B starts with question 11.

FOR EXAMINER'S USE

SECTION B	

This document consists of **12** printed pages.

Formulae Sheet : Higher Tier

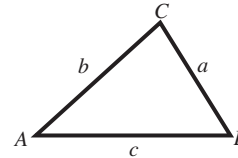**Volume of prism** = (area of cross-section) × length

In any triangle *ABC*

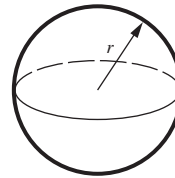**Sine rule** $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

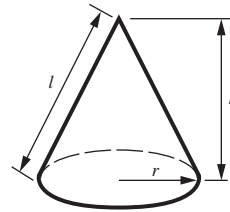**Area of triangle =** $\frac{1}{2} ab \sin C$

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 $= \pi r l$

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

11 Aisha is in the top mathematics set. She is carrying out a survey of mathematics and English
examination marks for her school.
For her sample she chooses students in her mathematics set.
She asks them what marks they scored in both examinations.

(a) Make one criticism of this method of obtaining her sample.

....

.... [1]

(b) The scatter diagram below shows the results of Aisha's survey for 24 of the students in her set.
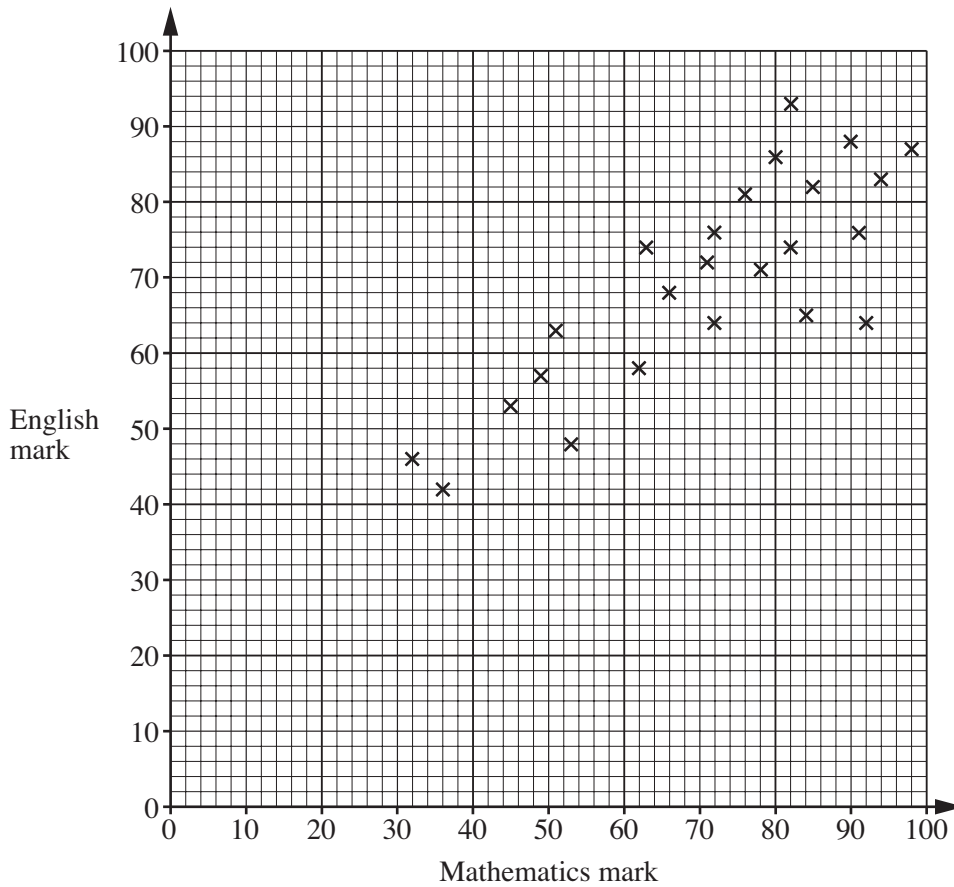
Mathematics mark

(i) Describe the relationship between the mathematics marks and the English marks
for Aisha's set.

.... [1]

(ii) Draw a line of best fit on the graph. [1]

(iii) Another student in Aisha's set took the mathematics examination but missed the
English examination.
Her mathematics mark was 58.

Use your line of best fit to estimate her English mark.

(b)(iii)...................................... [1]

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CARPET SALE
60% OFF!

(a) Abigail bought a carpet in this sale. The original price was £450.

Calculate the sale price of the carpet.

(a) £ .... [3]

(b) Yashim bought some carpet in the sale.
He paid £22 per square metre.

(i) Calculate the original price per square metre of the carpet.

(b)(i) £ .... [3]

In addition to the price of the carpet, Yashim paid £8 per square metre for underlay.
He also paid £120 for fitting.
Yashim bought x square metres of carpet and x square metres of underlay.

(ii) Write down an expression, in terms of x, for Yashim's total bill.

(ii) £ .... [2]

Yashim's total bill was £1425.

(iii) Write down an equation in x and solve it to find the area of carpet that Yashim bought.

(iii) ....m^2[3]

[Turn over

13
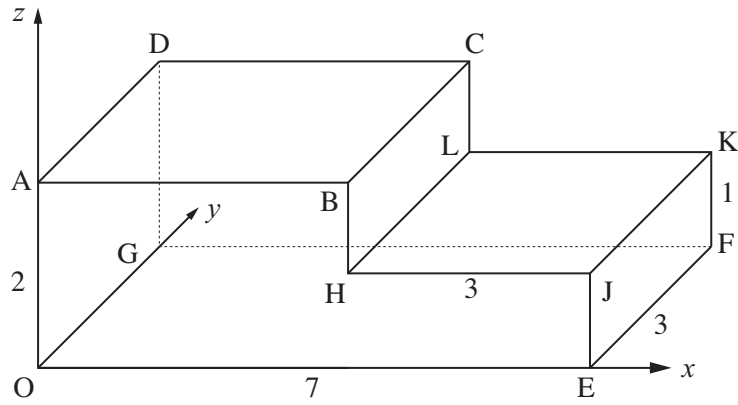
In the diagram each edge of the shape is parallel to one of the axes.

$$OE = 7 \qquad OA = 2 \qquad EF = 3 \qquad HJ = 3 \qquad FK = 1$$

Write down the coordinates of

(a) the point K,

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

(b) the point H,

(b) (.......... , ... , ...)[1]

(c) the midpoint of BC.

(c) (.......... , ... , ...)[1]
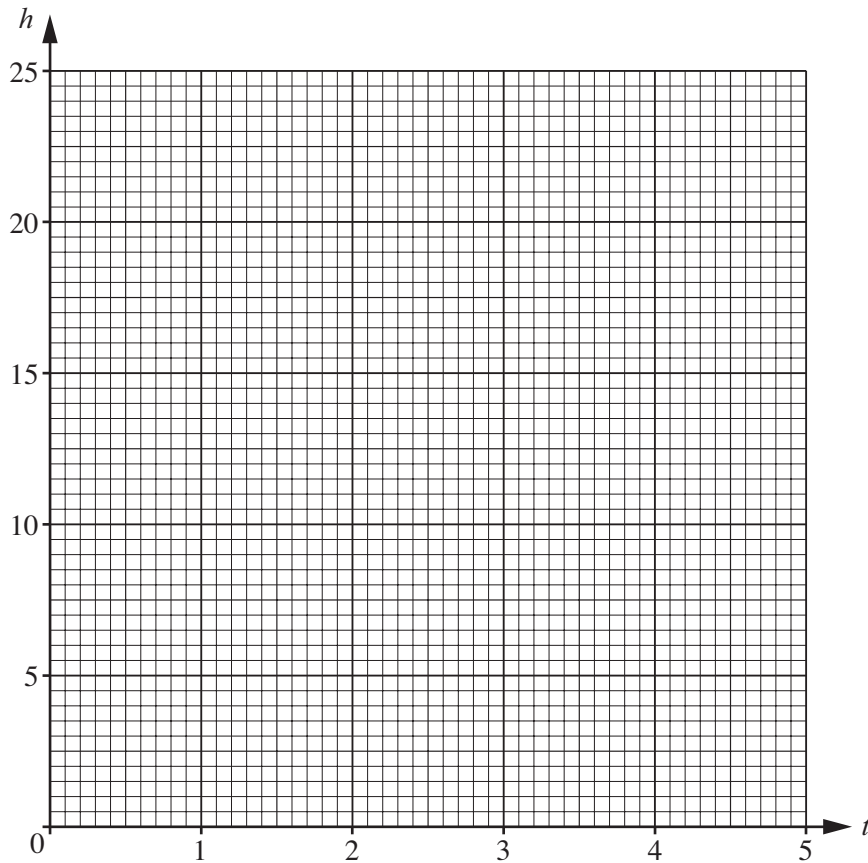
14 A stone is thrown into the air.
Its height, h metres, above the ground is given by the formula $h = 2 + 20t - 5t^2$,
where t is the time, in seconds, after it is thrown.

(a) Complete the table for $h = 2 + 20t - 5t^2$.

t	0	0.5	1	1.5	2	2.5	3	3.5	4
h	2		17	20.75		20.75	17		2

[2]

(b) On the grid below draw the graph of $h = 2 + 20t - 5t^2$ for $0 \le t \le 4$.

[2]

(c) **(i)** Use your graph to solve $2 + 20t - 5t^2 = 15$.

(c)(i) .... [1]

(ii) State what your answer to part **(c)(i)** tells you about the stone.

.... [1]

(d) By extending your graph, estimate the time when the stone hits the ground.

(d) ....s[1]

[Turn over

15 **(a)** Write as a single power of 2.

$$\frac{2^6 \times 2^3}{2^4}$$

(a)...................................... [2]

(b) The population of the UK in 2006 was 60 400 000.

    (i) Write 60 400 000 in standard form.

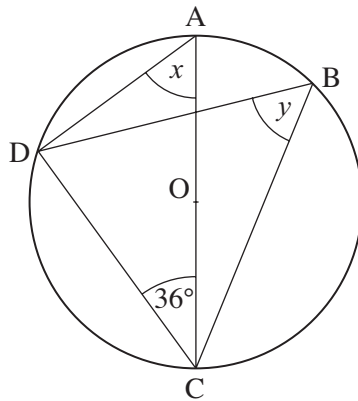**(b)(i)**...................................... [1]

    (ii) The area of the UK is 2.44×10^5 km^2.

        Calculate the average number of people per km^2 in the UK in 2006.
        Give your answer to a suitable degree of accuracy.

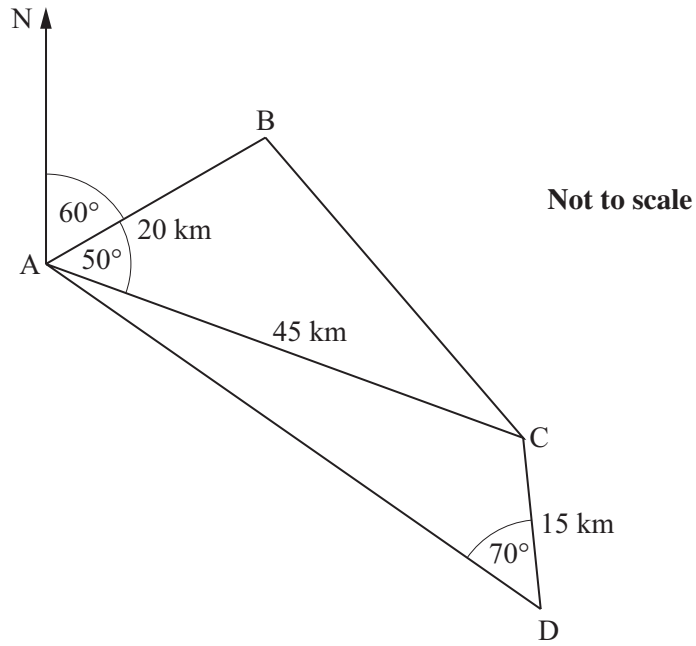**(ii)**...................................... [3]

16

Not to scale

In the diagram A, B, C and D are points on the circle, centre O.
AC is a diameter.

(a) Work out angle x.
Give your reasons.

$x = $ .... ° Reasons ....

....

.... [3]

(b) Find angle y.
Give your reason.

$y = $ .... ° Reason ....

....

.... [2]

[Turn over

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Not to scale

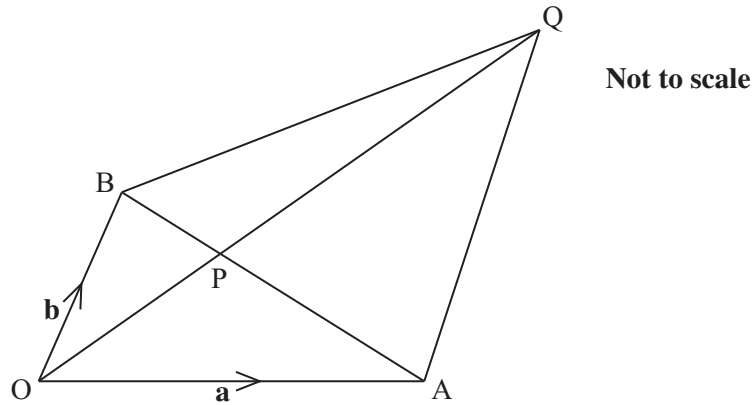The diagram shows the route, ABCD, taken by a ship.
The bearing of B from A is 060°.
Angle BAC = 50° and angle ADC = 70°.
AB = 20 km, AC = 45 km and CD = 15 km.

(a) Calculate the length BC.

(a) .... km[3]

(b) Calculate the bearing of D from A.

(b) .... °[4]

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Not to scale

In the diagram

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
AB and OQ intersect at P.

(a) P divides BA such that $\overrightarrow{BP} = \frac{2}{5} \overrightarrow{BA}$.

Find $\overrightarrow{OP}$ in terms of **a** and **b**.

(a)..................................... [3]

(b) P divides OQ in the ratio 2 : 3.

Find $\overrightarrow{AQ}$ in terms of **a** and **b**.
Simplify your answer.

(b)..................................... [2]

(c) What is the special name of quadrilateral OAQB?
Use your answer to part **(b)** to justify this.

OAQB is .... because ....

.... [2]

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