

GENERAL CERTIFICATE OF SECONDARY EDUCATION

MATHEMATICS B (MEI)

Paper 4 Section A (Higher Tier)

B294A

Candidates answer on the Question Paper

OCR Supplied Materials:

None

Other Materials Required:

- Geometrical instruments
- Tracing paper (optional)

**Friday 15 January 2010
Morning**

Duration: 1 hour



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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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

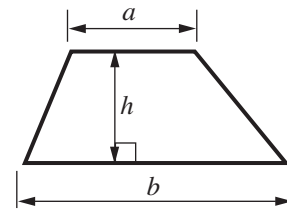
- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this Section is **50**.
- This document consists of **12** pages. Any blank pages are indicated.

WARNING

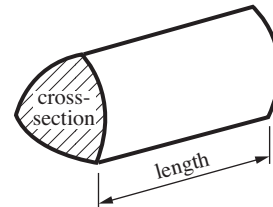
No calculator can be used for Section A of this paper

Formulae Sheet: Higher Tier

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



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

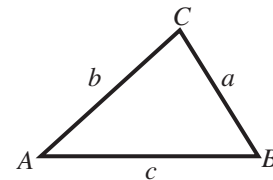


In any triangle ABC

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

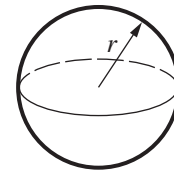
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

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



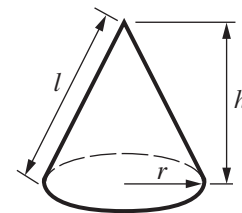
Volume of sphere = $\frac{4}{3}\pi r^3$

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

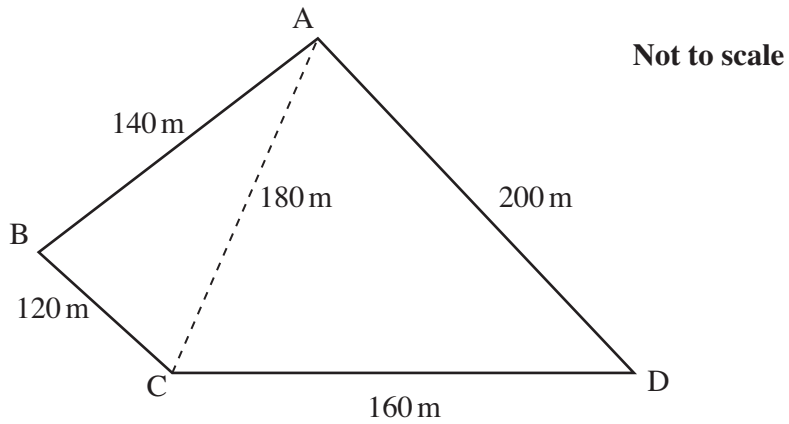
The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

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

PLEASE DO NOT WRITE ON THIS PAGE

1 In this question, use a ruler and compasses only.

The diagram shows a sketch of a field, ABCD.
There is a straight path in the field from A to C.



- (a) Make an accurate scale drawing of the field.
The line CD has been drawn for you.
Use a scale of 1 cm = 20 m.



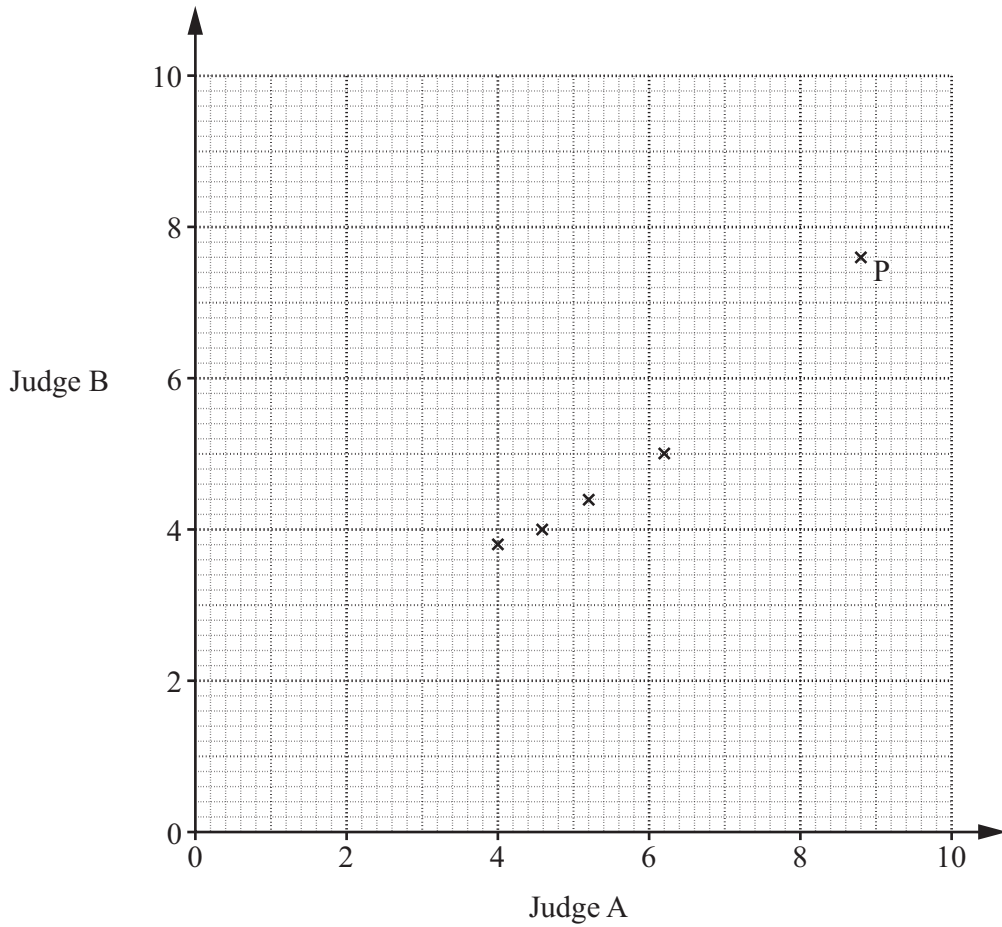
[4]

- (b) Another straight path crosses the field.
This path is equidistant from DA and DC.

Construct the line representing the path.

[2]

- 2 A school is holding a dance competition.
 Two judges each give a mark out of ten for each dancer.
 Their marks for five dancers are shown on the scatter diagram.



(a) What marks are represented by point P?

(a) Judge A gives a mark of

Judge B gives a mark of [1]

(b) Five more dancers are given the following marks.

Judge A	6.8	7.0	7.4	8.0	8.6
Judge B	5.2	5.6	6.8	6.6	7.0

Add this information to the scatter diagram.

[2]

(c) Describe the correlation shown in your scatter diagram.

..... [1]

(d) Draw a line of best fit for the data.

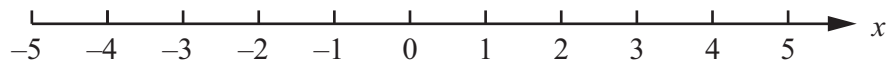
[1]

(e) Judge B gives another dancer a mark of 6.2.

Use your line of best fit to predict judge A's mark for this dancer.

(e) [1]

3 (a) Show the inequality $x \geq -2$ on the number line.



[1]

(b) Solve this inequality.

$$2x + 5 < 17$$

(b) [2]

4 Expressed as a product of their prime factors,

$$450 = 2 \times 3^2 \times 5^2, \quad 540 = 2^2 \times 3^3 \times 5 \quad \text{and} \quad 840 = 2^3 \times 3 \times 5 \times 7.$$

(a) Calculate the highest common factor (HCF) of 450, 540 and 840.

(a) [2]

(b) Calculate the least common multiple (LCM) of 450 and 540.

(b) [2]

5 Solve this equation.

$$5x + 3 = 4(x + 2)$$

..... [3]

6 The planet Neptune is 4.5×10^9 km from the Sun.
Light travels at 3×10^5 km/s.

(a) How many seconds does it take light to travel from the Sun to Neptune?
Give your answer in standard form.

(a) s [2]

(b) Earth is 1.5×10^8 kilometres from the Sun.

How much further from the Sun is Neptune than Earth?
Give your answer in standard form.

(b) km [2]

7 (a) (i) Which of these fractions are equivalent to recurring decimals?
Put an R under the ones which recur.

$$\frac{4}{9}$$

$$\frac{2}{5}$$

$$\frac{4}{35}$$

$$\frac{7}{72}$$

$$\frac{9}{20}$$

.....

.....

.....

.....

.....

[2]

(ii) Explain how you decided which were recurring decimals.

.....

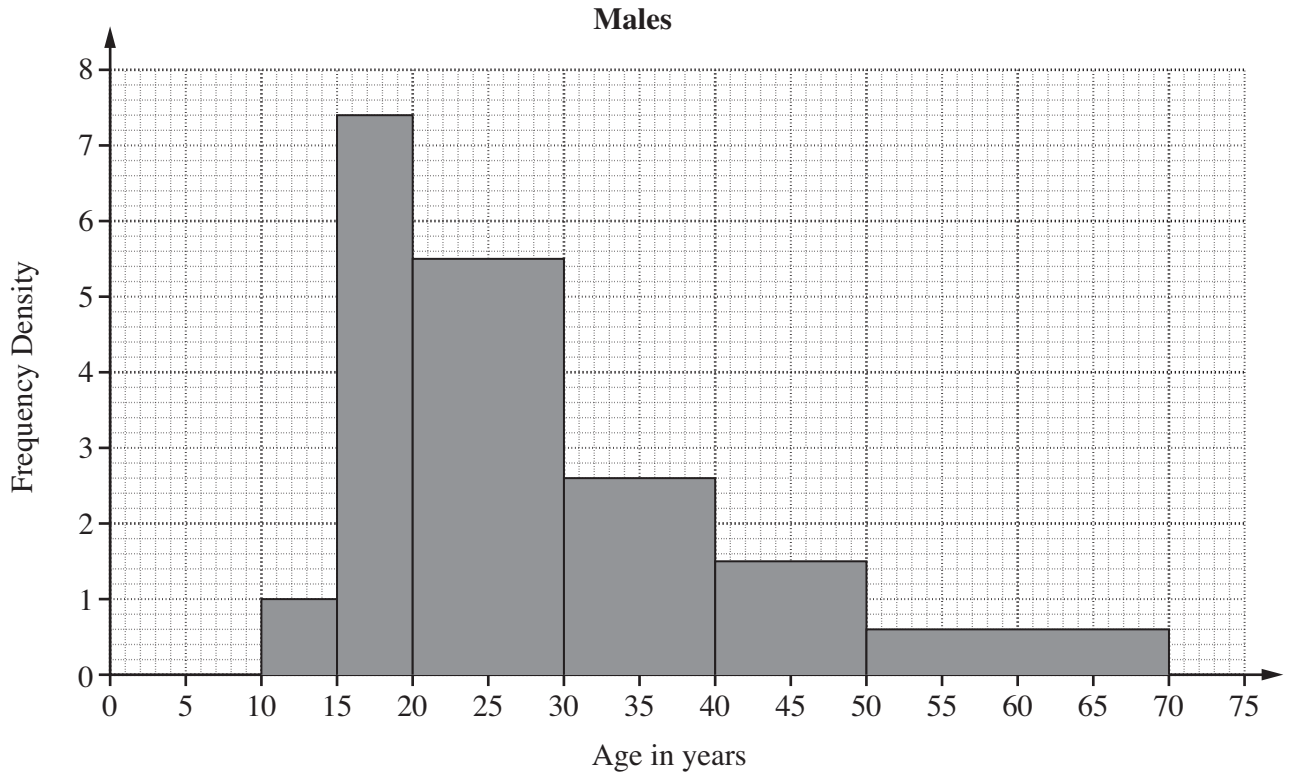
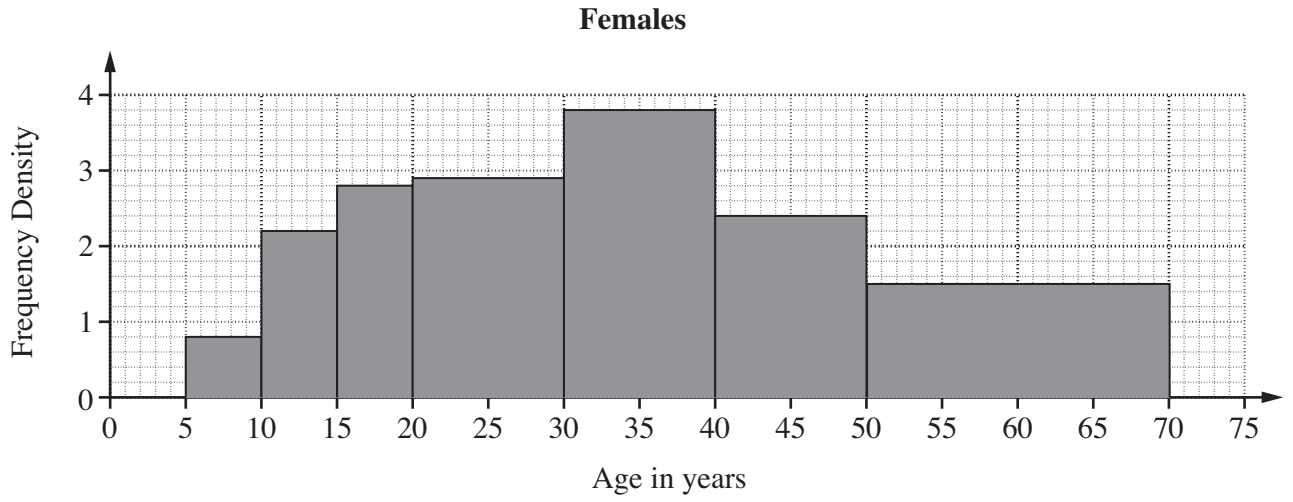
.....

..... [1]

(b) Change $0.\dot{7}\dot{2}$ to a fraction.

(b) [2]

- 8 150 females and 150 males took part in a charity fun run.
The histograms below show the distributions of the ages of the females and males.



(a) Make **two** comparisons between the distributions of ages of the females and males.

1

.....

2

..... [2]

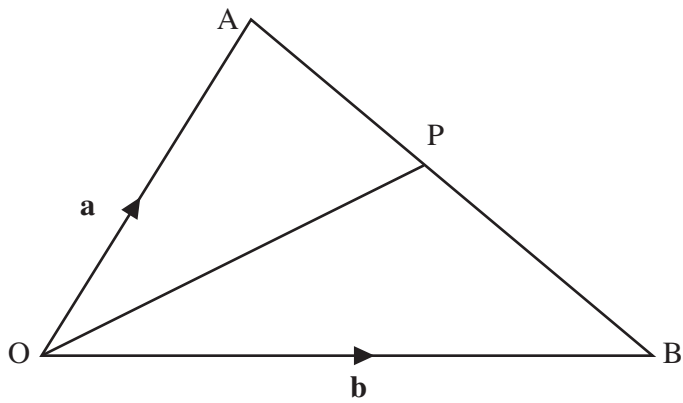
(b) Calculate how many more females aged 50 or over took part than males aged 50 or over.

(b) [3]

(c) Estimate the median age of the males.

(c) [2]

- 9 (a) In triangle OAB, $\vec{OA} = \mathbf{a}$ and $\vec{OB} = \mathbf{b}$.



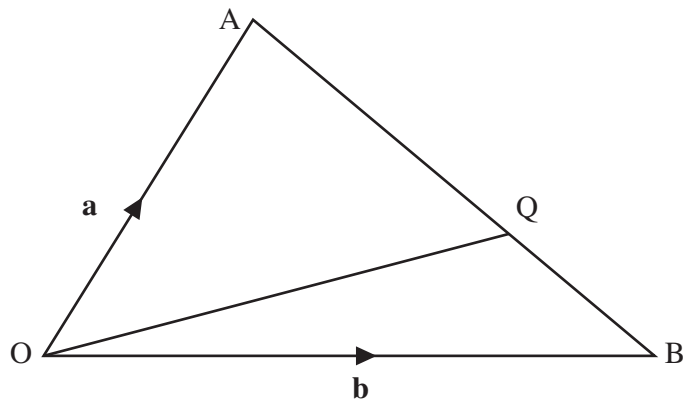
P divides AB in the ratio 3 : 4.

Find \vec{OP} in terms of \mathbf{a} and \mathbf{b} .

Write your answer in its simplest form.

(a) [3]

(b)



Q divides AB in the ratio $n : 1$.

Find \overrightarrow{OQ} in terms of \mathbf{a} , \mathbf{b} and n .

(b) [3]

TURN OVER FOR QUESTION 10

10 (a) Simplify.

$$\frac{(x^5)^{\frac{1}{2}}}{x^{-\frac{1}{2}}}$$

(a) [2]

(b) Make x the subject of this formula.

$$y = \frac{ax + b}{cx + d}$$

(b) $x =$ [4]



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