

GENERAL CERTIFICATE OF SECONDARY EDUCATION

MATHEMATICS B (MEI)

Paper 4 Section B (Higher Tier)

B294B

Candidates answer on the Question Paper

OCR Supplied Materials:

None

Other Materials Required:

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

Friday 15 January 2010

Morning

Duration: 1 hour



| | | | |
|--------------------|--|-------------------|--|
| Candidate Forename | | Candidate Surname | |
|--------------------|--|-------------------|--|

| | | | | | | | | | | |
|---------------|--|--|--|--|--|------------------|--|--|--|--|
| Centre Number | | | | | | Candidate Number | | | | |
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INSTRUCTIONS TO CANDIDATES

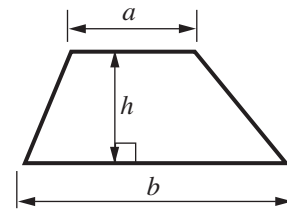
- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Show your working. 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

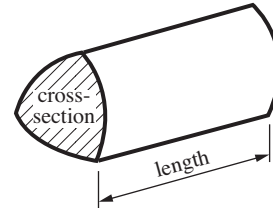
- The number of marks is given in brackets [] at the end of each question or part question.
- Section B starts with question 11.
- You are expected to use a calculator for this section of the paper.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- The total number of marks for this Section is **50**.
- This document consists of **12** pages. Any blank pages are indicated.

Formulae Sheet: Higher Tier

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



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

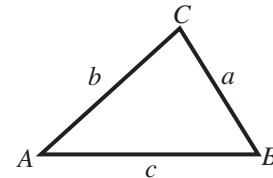


In any triangle ABC

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

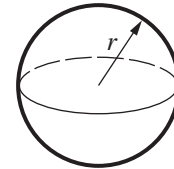
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

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



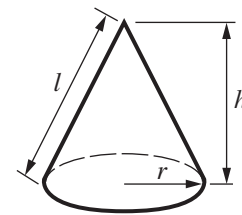
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

Curved surface area of cone = $\pi r l$

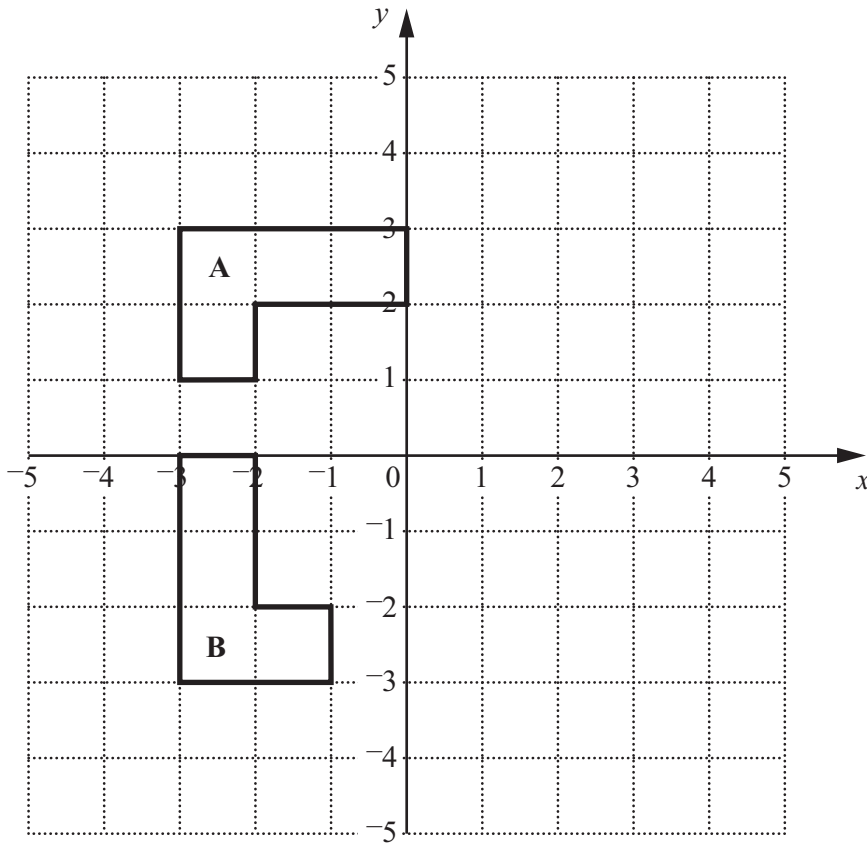


The Quadratic Equation

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

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

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(a) Describe fully the **single** transformation that will map shape **A** onto shape **B**.

.....
 [3]

(b) Translate shape **A**, 4 right and 5 down.
 Label the image **C**.

[2]

(c) Reflect shape **A** in the line $x = 1$.
 Label the image **D**.

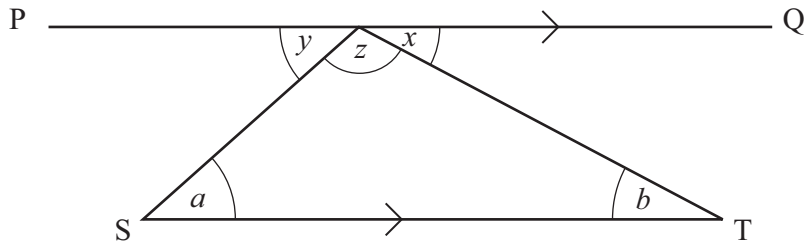
[2]

(d) Shape **C** can be mapped onto shape **D** by a translation followed by a reflection.
 Write the column vector of the translation and the equation of the mirror line.

Vector $\begin{pmatrix} \\ \end{pmatrix}$

Equation of mirror line[2]

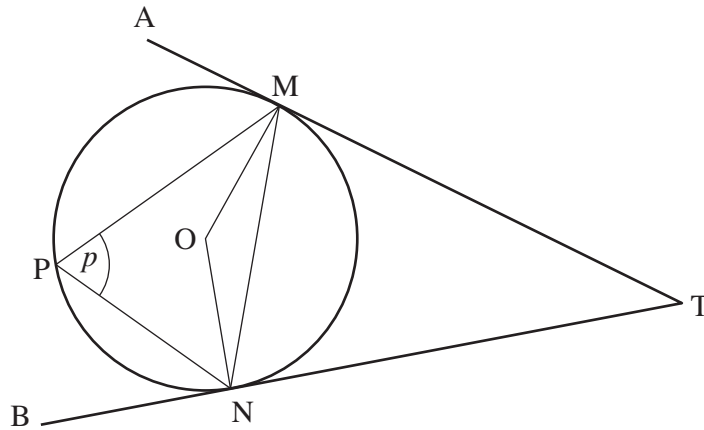
12 (a) In the diagram, line PQ is parallel to line ST.



Complete this proof that the angles in a triangle add up to 180° .

Angle x = Angle and Angle y = Angle
 because
 $x + y + z = 180^\circ$ because
 So the angles in a triangle add up to 180° . [3]

(b)



In the diagram M, N and P are points on the circle, centre O.
 TMA and TNB are tangents to the circle.
 Angle $MPN = p$.

Find the following in terms of p .

(i) Angle MON

(b)(i) [1]

(ii) Angle MTN

(ii) [1]

- 13 (a) A shopkeeper buys a television from a wholesaler for £522.
The shopkeeper sells the television for £700.

Calculate the percentage profit made by the shopkeeper.

(a)% [3]

- (b) The £522 was 45% more than the wholesaler paid the manufacturer.

Calculate the price that the wholesaler paid the manufacturer.

(b) £ [3]

14 (a) These are the first five terms of a sequence.

1 4 9 16 25

Write down the n th term of this sequence.

(a) [1]

(b) These are the first five terms of another sequence.

3 5 7 9 11

Find an expression for the n th term of this sequence.

(b) [2]

(c) Hence, or otherwise, find an expression for the n th term of this sequence.

4 9 16 25 36

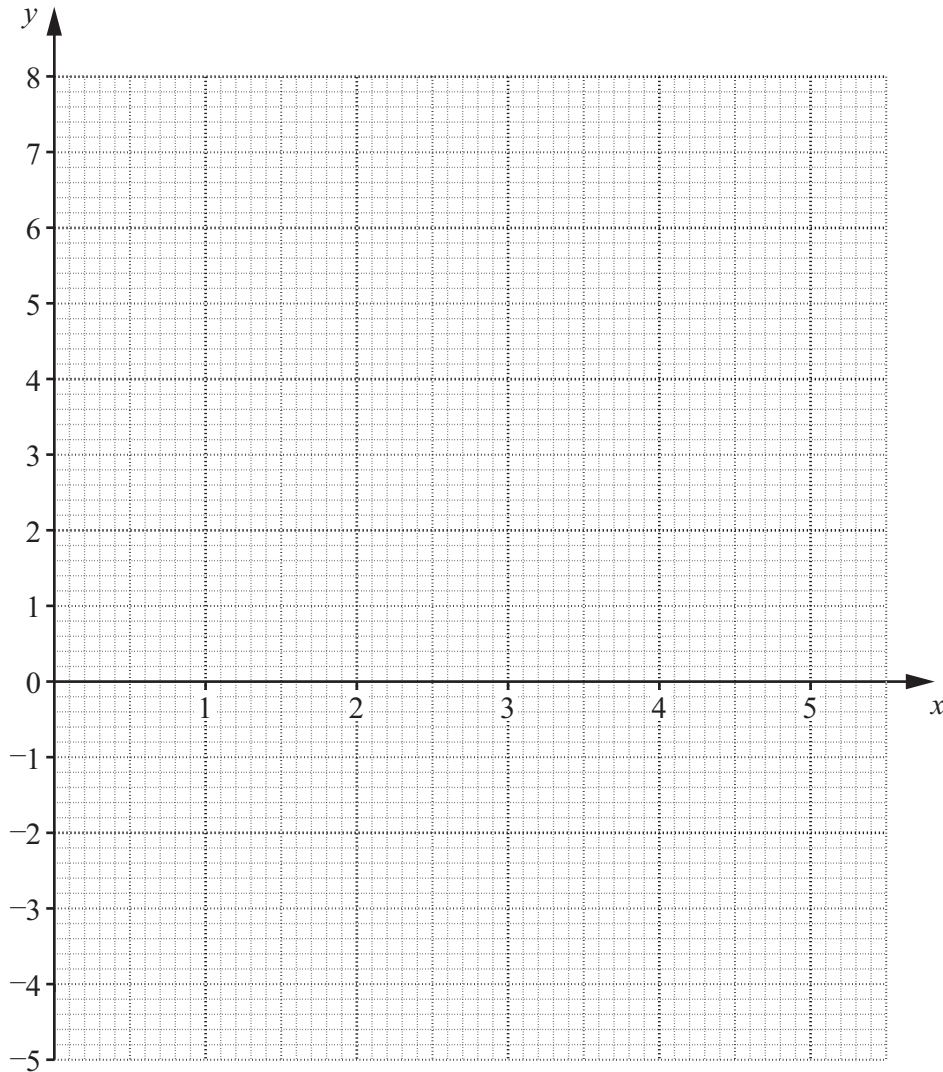
(c) [1]

15 (a) Complete the table for the equation $y = x^2 - 4x$.

| | | | | | | |
|-----|---|----|----|---|---|---|
| x | 0 | 1 | 2 | 3 | 4 | 5 |
| y | 0 | -3 | -4 | | 0 | |

[1]

(b) On the grid draw the graph of $y = x^2 - 4x$.



[2]

(c) By drawing a straight line on your graph, solve these simultaneous equations.

$$y = x^2 - 4x$$

$$y = x - 2$$

(c) $x = \dots\dots\dots$ $y = \dots\dots\dots$

$x = \dots\dots\dots$ $y = \dots\dots\dots$ [4]

16 On each turn of a game, a player throws two fair ordinary dice.

Bill is playing the game and is 'In Jail'.
To get out of jail he needs to throw a 6 on both dice.

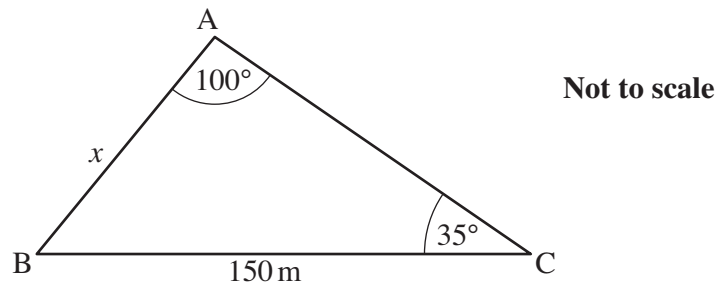
(a) Calculate the probability that Bill **does not** get out of jail on his first turn.
Give your answer as a fraction.

(a) [3]

(b) Calculate the probability that Bill gets out of jail on his 5th turn.
Give your answer as a decimal correct to 2 significant figures.

(b) [3]

17 The diagram represents a triangular field.



Calculate the length of x .
Give your answer to a suitable degree of accuracy.

..... m [4]

TURN OVER FOR QUESTION 18

18 (a) Describe fully the graph of $x^2 + y^2 = 40$.

.....
.....
..... [3]

(b) Find algebraically the coordinates of the points of intersection of the line $y = x - 4$ and the curve $x^2 + y^2 = 40$.

(b) (..... ,) and (..... ,) [6]

11
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