

**Thursday 21 June 2012 – Morning**

**GCSE METHODS IN MATHEMATICS**

**B392/02** Methods in Mathematics 2 (Higher Tier)

Candidates answer on the Question Paper.

**OCR supplied materials:**  
None

- Other materials required:**
- Scientific or graphical calculator
  - Geometrical instruments
  - Tracing paper (optional)

**Duration: 2 hours**



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|--------------------|--|-------------------|--|
| Candidate forename |  | Candidate surname |  |
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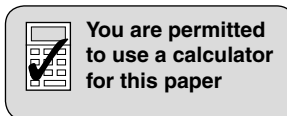
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| Centre number |  |  |  |  |  | Candidate number |  |  |  |  |
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**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Your answers should be supported with appropriate 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).
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

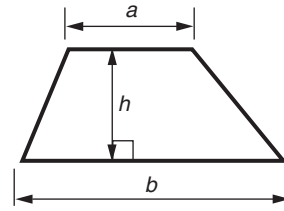
- The number of marks is given in brackets [ ] at the end of each question or part question.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (\*).
- The total number of marks for this paper is **90**.
- This document consists of **20** pages. Any blank pages are indicated.



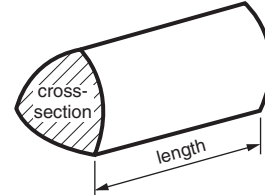
This paper has been pre modified for carrier language

## Formulae Sheet: Higher Tier

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



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

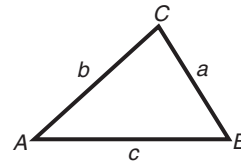


**In any triangle ABC**

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

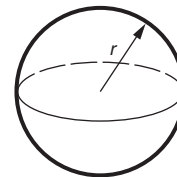
**Cosine rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

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



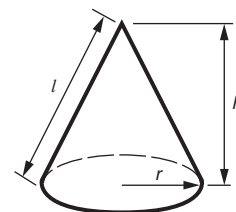
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

**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 Joel throws a dice four times.  
He gets the numbers 4, 2, 5 and 6.  
He puts the numbers in these boxes.  
He can put the numbers in the boxes in any order.

$$\square \times \square + \sqrt{\square \square}$$

- (a) Joel arranges the numbers like this.

$$\square \begin{array}{|c|} \hline 4 \\ \hline \end{array} \times \square \begin{array}{|c|} \hline 5 \\ \hline \end{array} + \sqrt{\square \begin{array}{|c|} \hline 2 \\ \hline \end{array} \square \begin{array}{|c|} \hline 6 \\ \hline \end{array}}$$

Use your calculator to work out  $4 \times 5 + \sqrt{26}$ .

(a) \_\_\_\_\_ [1]

- (b) Put the numbers 4, 2, 5 and 6 in the boxes below to show how the **biggest** answer can be made.

(b)  $\square \times \square + \sqrt{\square \square}$  [2]

2 (a)  $y = \frac{a+b}{c}$

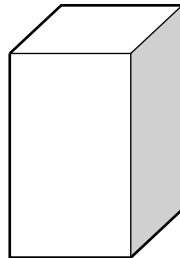
(i) Calculate the value of  $y$  when  $a = 3$ ,  $b = -4$  and  $c = 2$ .

(a)(i) \_\_\_\_\_ [2]

(ii) Rearrange  $y = \frac{a+b}{c}$  to make  $a$  the subject.

(ii) \_\_\_\_\_ [2]

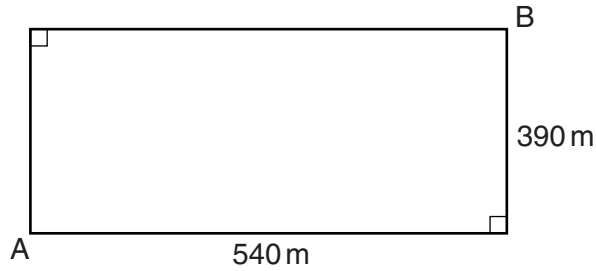
(b) The cuboid shown below has a square base of side  $b$  cm.  
The height of the cuboid is double the side of the base.



Find a formula, in terms of  $b$ , for the volume of the cuboid,  $V \text{ cm}^3$ .

(b)  $V =$  \_\_\_\_\_ [2]

- 3 (a) A recreation ground is 540 m by 390 m.  
There are gates at A and B.



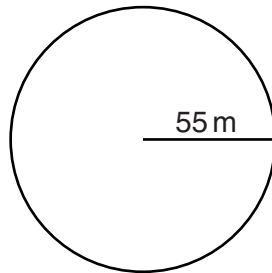
Not to scale

Dave walks around the edge of the ground from A to B.  
Ewan walks diagonally across the ground from A to B.

Work out how much further Dave walks than Ewan.  
Give your answer to a sensible degree of accuracy.

(a) \_\_\_\_\_ m [4]

- (b) A cricket pitch is a circle with radius 55 m.



Work out the circumference of the circle.

(b) \_\_\_\_\_ m [2]

- 4 The prices of some attractions are reduced for holders of a City Pass.

Complete this table.

|                   | Normal price | Reduced price | Percentage saving |
|-------------------|--------------|---------------|-------------------|
| Waterways cruise  | £11          | £9.35         | 15%               |
| Millennium tower  | £12          |               | 22½%              |
| Open top bus tour | £8.80        | £5.72         |                   |

[3]

[3]

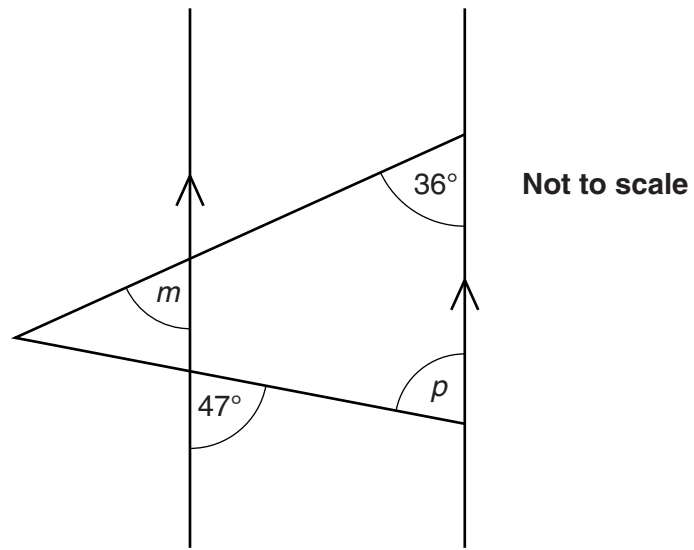
- 5 (a) Write the ratio 36 : 54 in its simplest form.

(a) \_\_\_\_\_ [2]

- (b) Divide £45 in the ratio 1 : 2.

(b) £ \_\_\_\_\_ : £ \_\_\_\_\_ [2]

- 6 The diagram consists of four straight lines. Two of them are parallel.



Find the size of angle  $m$  and angle  $p$ .

$$m = \text{_____}^\circ$$

$$p = \text{_____}^\circ \text{ [2]}$$

7 (a) Solve.

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

(a) \_\_\_\_\_ [2]

(b) Solve.

$$3x - 4 < 11$$

(b) \_\_\_\_\_ [2]

8 Work out the **exact** value of the following.

(a)  $(\sqrt{5})^6$

(a) \_\_\_\_\_ [1]

(b)  $\frac{1}{0.3}$

(b) \_\_\_\_\_ [2]

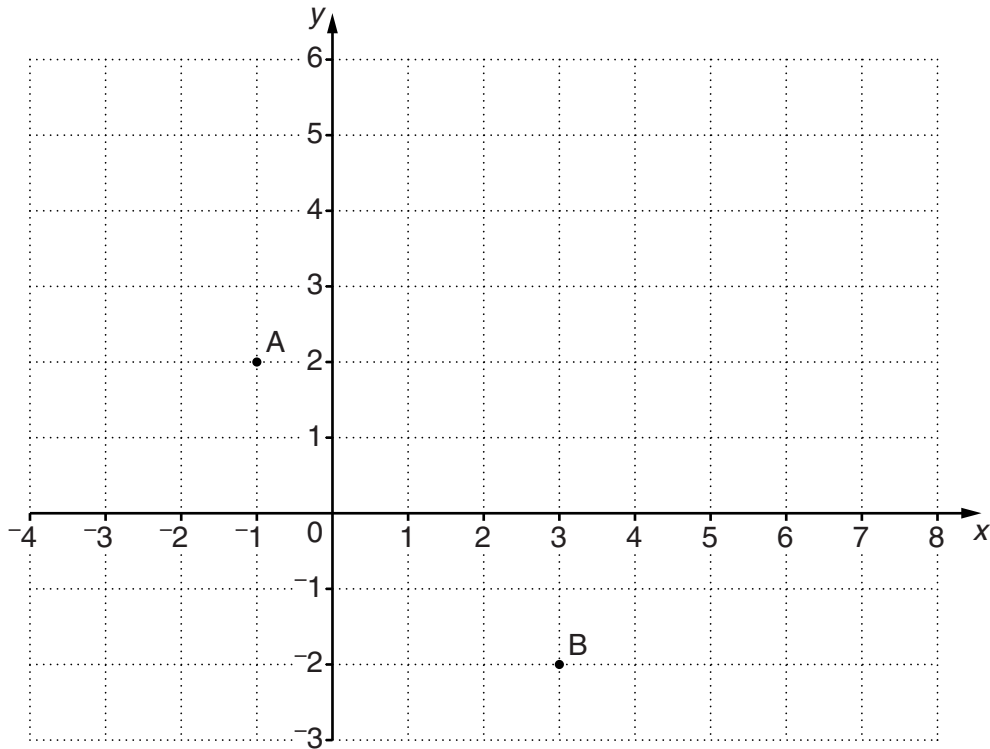


9 A is the point  $(-1, 2)$ ; B is the point  $(3, -2)$ .

(a) Find the coordinates of the midpoint of AB.

(a) ( \_\_\_\_\_ , \_\_\_\_\_ ) [2]

(b) (i) Draw the locus of all points which are equidistant from points A and B.



[2]

(ii) Write down the equation of the locus of all points which are equidistant from A and B.

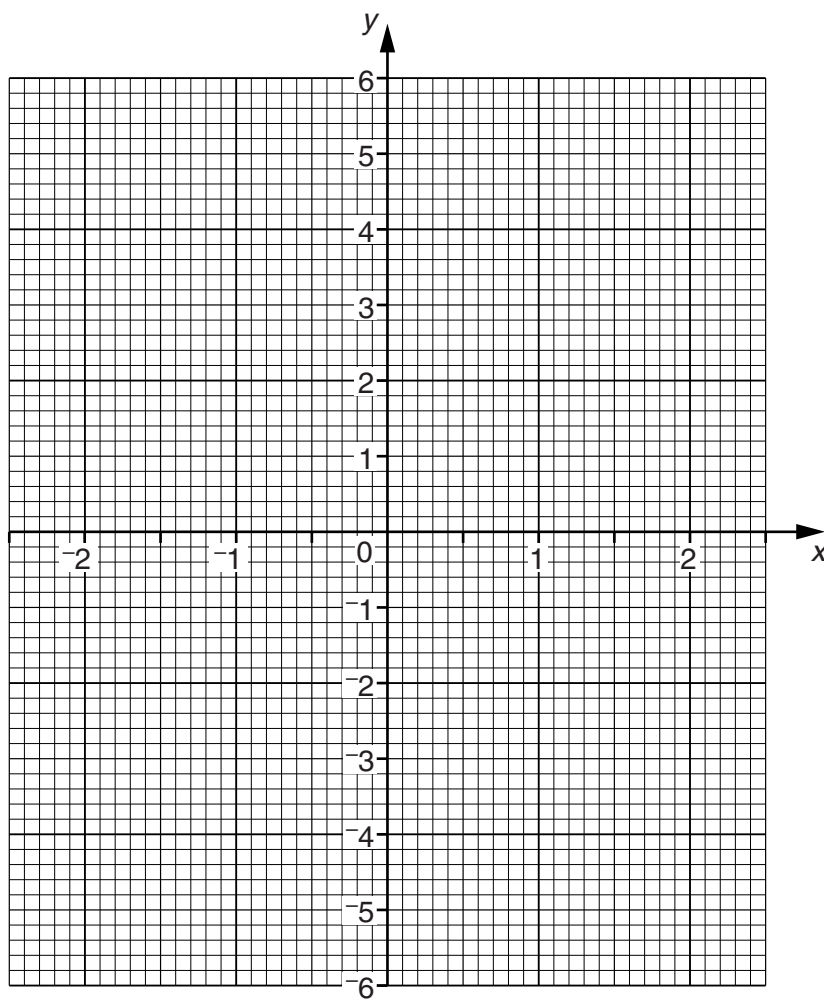
(b)(ii) \_\_\_\_\_ [2]

10 (a) Complete the table for  $y = x^3 - x$ .

|     |    |        |    |       |   |     |   |       |   |
|-----|----|--------|----|-------|---|-----|---|-------|---|
| $x$ | -2 | -1.5   | -1 | -0.5  | 0 | 0.5 | 1 | 1.5   | 2 |
| $y$ |    | -1.875 |    | 0.375 | 0 |     | 0 | 1.875 |   |

[2]

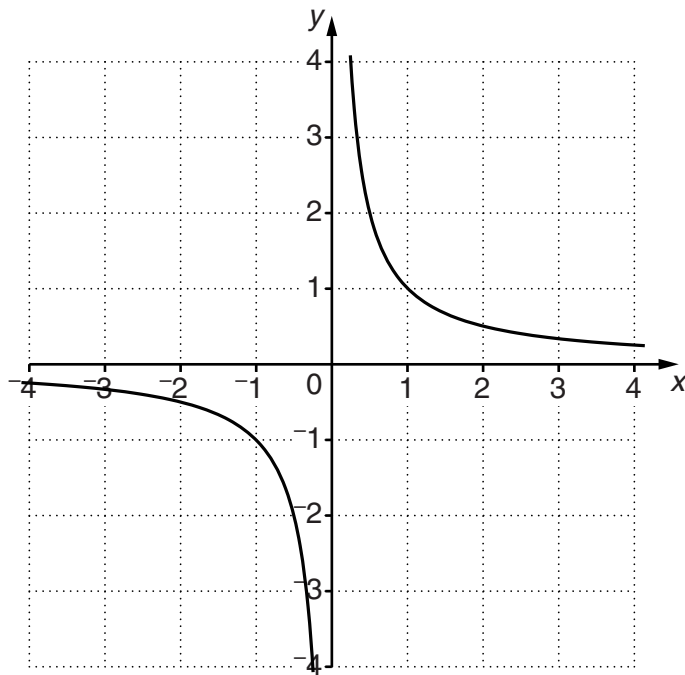
(b) Draw the graph of  $y = x^3 - x$ .



[2]

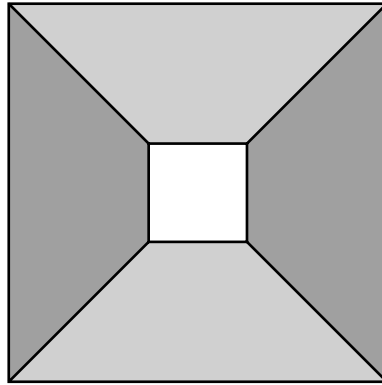
(c) The graph of  $y = \frac{1}{x}$  is shown below.

On the same axes, sketch the graph of  $y = \frac{1}{x} - 1$ .



[2]

- 11 The design below is made from 4 congruent trapeziums and a small square. They fit together to make a larger square. Each trapezium has a line of symmetry.



Not to scale

- (a)\* Calculate the angles of one trapezium, giving reasons for your answers.

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[3]

(b) The square hole in the design is  $\frac{1}{9}$  of the area of the larger square.

The longer parallel side of each trapezium is 5.4 cm.

Calculate the lengths of the other sides of the trapezium.

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[5]

12 (a) Factorise.

$$x^2 - y^2$$

(a) \_\_\_\_\_ [1]

(b)\* 24 can be written as the difference of two square numbers in two different ways.

$$24 = 25 - 1 = 5^2 - 1^2$$

$$24 = 49 - 25 = 7^2 - 5^2$$

Show that 15 can be written as the difference of two square numbers in two different ways **and** that no other ways are possible.

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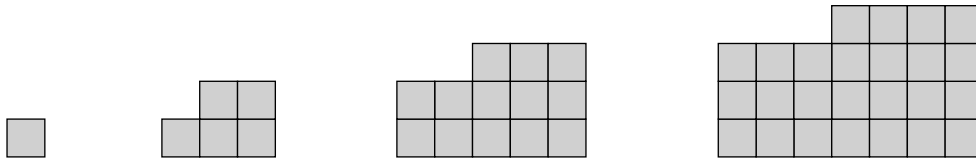
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[4]

13 The first four patterns in a sequence are shown below.



(a) Show that the number of small squares in the  $n^{\text{th}}$  pattern is  $2n^2 - 2n + 1$ .

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[3]

(b) Will there be a pattern with exactly 500 small squares in it?

**Either** find which pattern it will be **or** prove that there is no such pattern.

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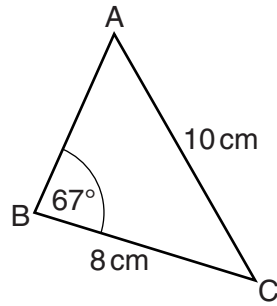
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[3]

14



Not to scale

(a) Calculate the size of angle A.

(a) \_\_\_\_\_ ° [3]

(b) Sally says that there are two possible answers for A: one obtuse and one acute.

Explain how you know Sally is wrong.

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[1]

(c) Calculate the area of triangle ABC.

(c) \_\_\_\_\_ cm<sup>2</sup> [3]



15 (a) Expand.

$$(7x + 2)(3x - 1)$$

(a) \_\_\_\_\_ [3]

(b) (i) Factorise.

$$2x^2 - x - 3$$

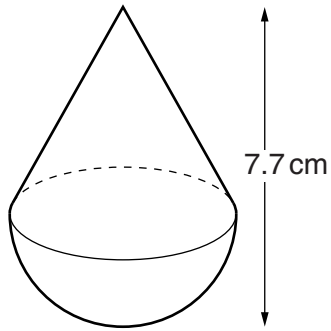
(b)(i) \_\_\_\_\_ [2]

(ii) Hence simplify.

$$\frac{2x^2 - x - 3}{2x^2 - 7x + 6}$$

(ii) \_\_\_\_\_ [3]

- 16 A solid shape is made of a cone attached to a hemisphere.  
The radius of the hemisphere is 3.2 cm. The total height of the shape is 7.7 cm.

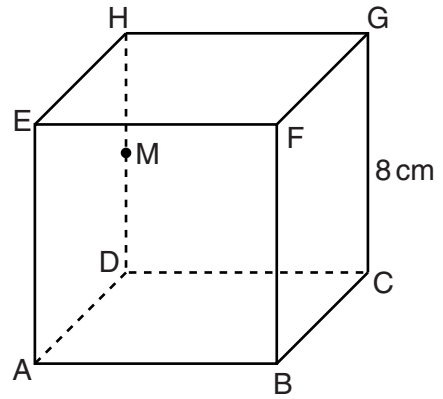


Find the volume of the shape. Give the units of your answer.

\_\_\_\_\_ [6]

- 17 ABCDEFGH is a cube.  
Each edge of the cube is 8 cm.  
M is the midpoint of HD.

Calculate angle MBD.



\_\_\_\_\_ ° [4]

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