

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



Candidate forename		Candidate surname	
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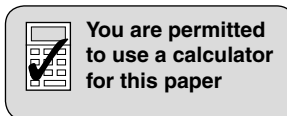
Centre number							Candidate number				
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INSTRUCTIONS TO CANDIDATES

- 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

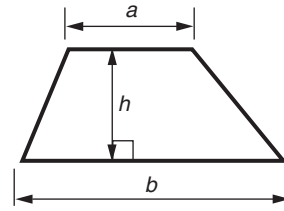
- The number of marks is given in brackets [] at the end of each question or part question.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **90**.
- This document consists of **20** pages. Any blank pages are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



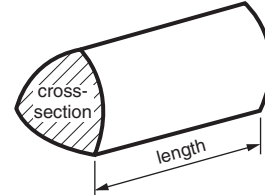
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Formulae Sheet: Higher Tier

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



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

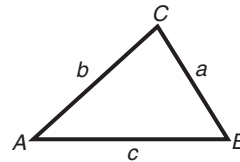


In any triangle ABC

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

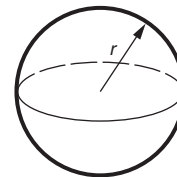
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

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



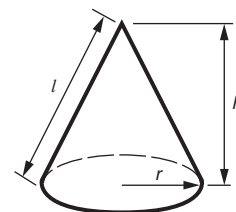
Volume of sphere = $\frac{4}{3}\pi r^3$

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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- 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.

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

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

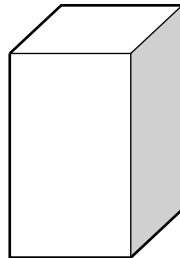
(i) Calculate the value of y when $a = 3$, $b = -4$ and $c = 2$.

(a)(i) _____ [2]

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

(ii) _____ [2]

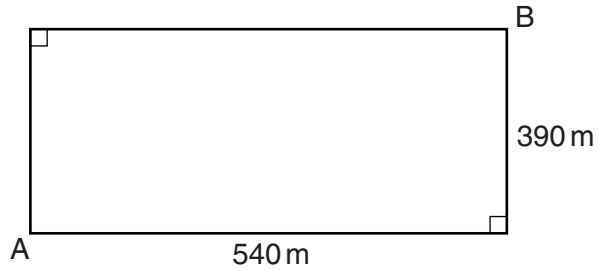
(b) The cuboid shown below has a square base of side b cm.
The height of the cuboid is double the side of the base.



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.



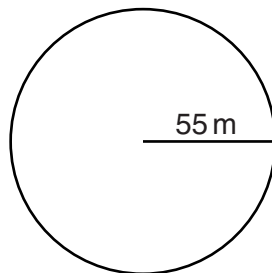
Not to scale

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]

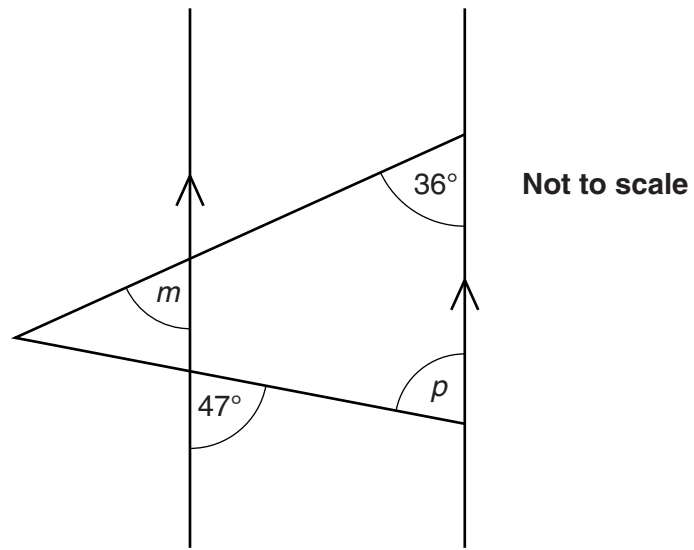
- 5 (a) Write the ratio 36 : 54 in its simplest form.

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

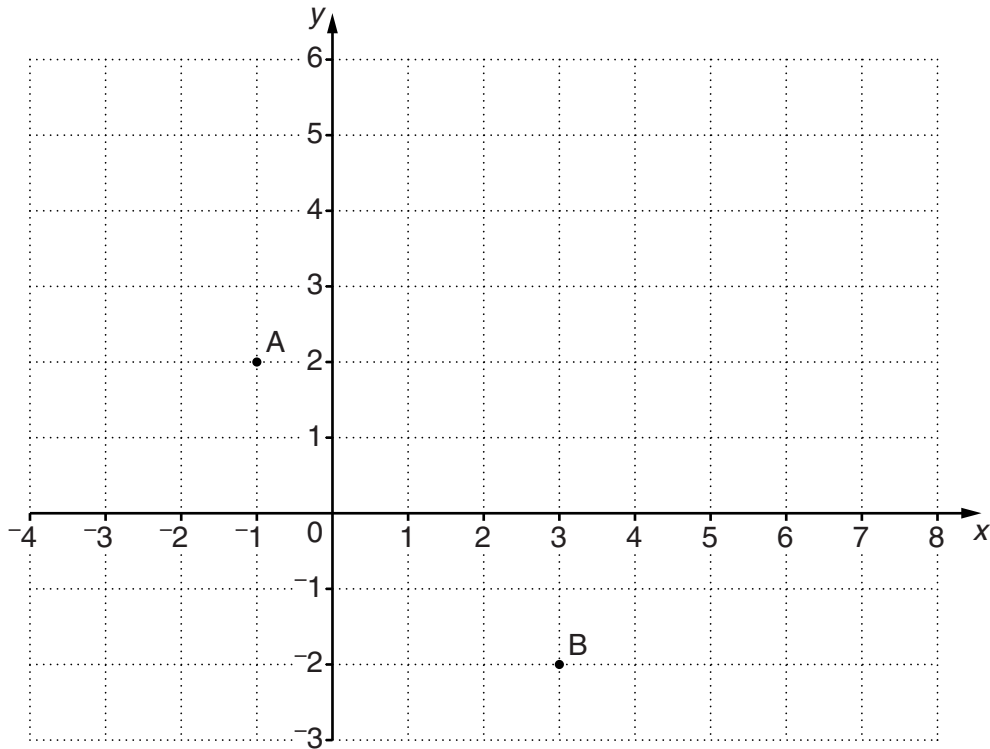
(b) _____ [2]

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.

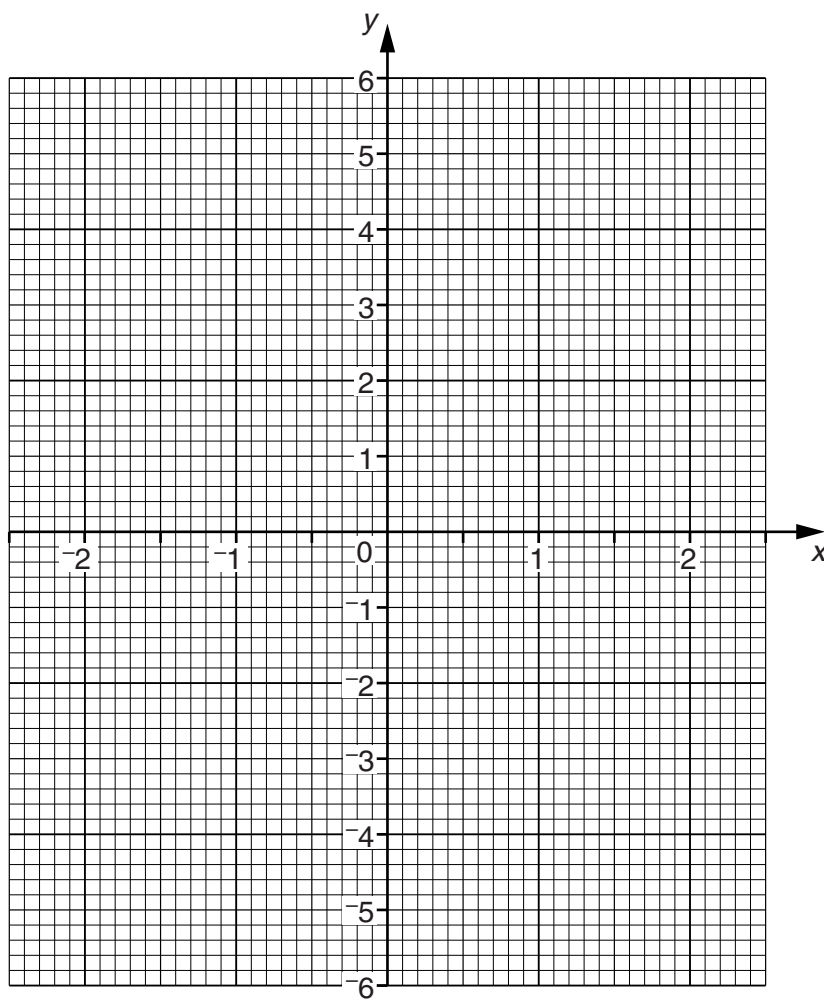
(b)(ii) _____ [2]

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]

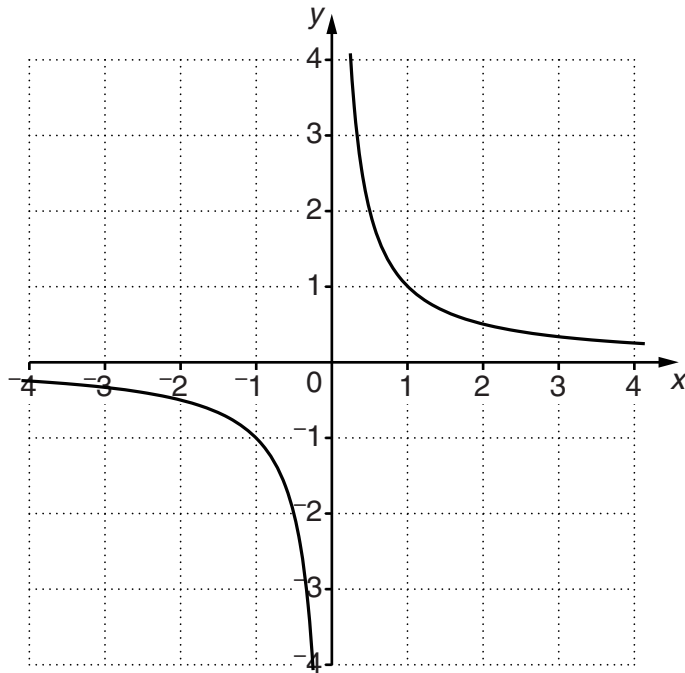
(b) Draw the graph of $y = x^3 - x$.



[2]

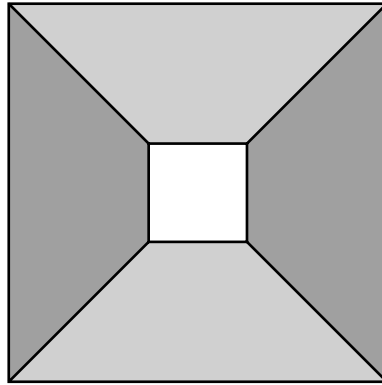
(c) The graph of $y = \frac{1}{x}$ is shown below.

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.

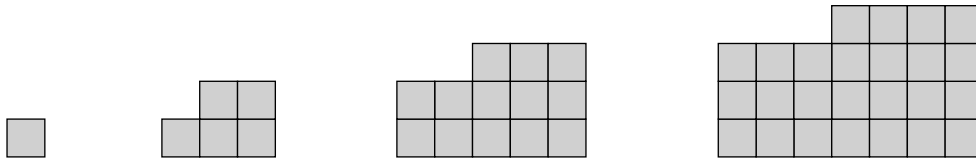


Not to scale

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

[3]

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



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

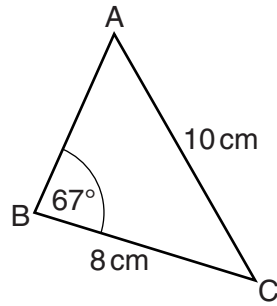
[3]

(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.

[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.

[1]

- (c) Calculate the area of triangle ABC.

(c) _____ cm² [3]

15 (a) Expand.

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

(a) _____ [3]

(b) (i) Factorise.

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

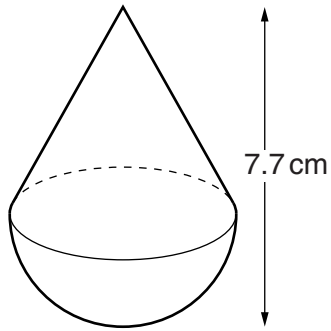
(b)(i) _____ [2]

(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.

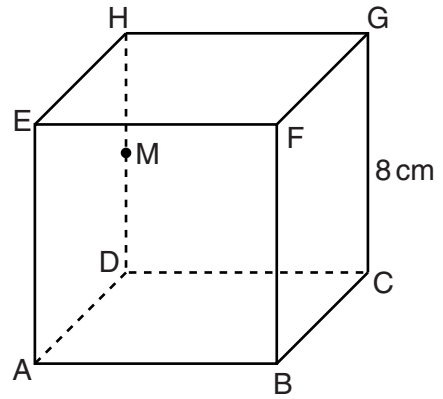


Find the volume of the shape. Give the units of your answer.

_____ [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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