

**Thursday 11 June 2015 – Afternoon**

**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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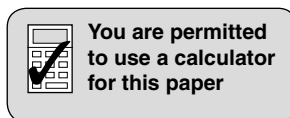
Centre number						Candidate number				
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**INSTRUCTIONS TO CANDIDATES**

- 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.

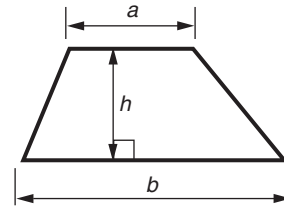
**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- Quality of written communication will be 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.

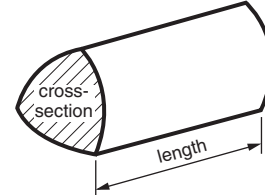


## Formulae Sheet: Higher Tier

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



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

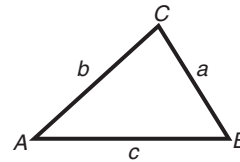


**In any triangle ABC**

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

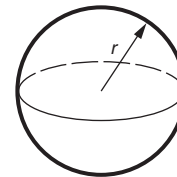
**Cosine rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

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



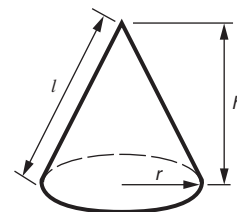
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

**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**

Answer **all** the questions.

1 (a) Use your calculator to work out the following.

(i)  $4.1 \times \sqrt{8^3}$

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

(ii)  $\frac{(1.6 \times 10^2) \times (9.7 \times 10^8)}{1.25}$

(ii) ..... [2]

(b) Andrea is working without a calculator.  
She does  $1215 \div 6$  and gets the answer 22.5.

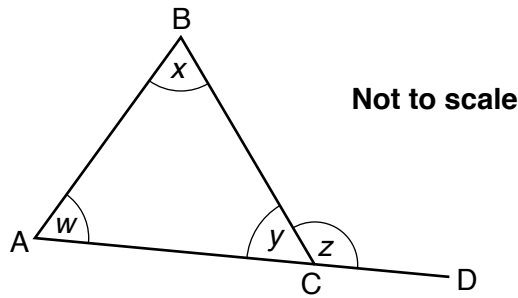
Show the working for one way that Andrea could check her answer without using a calculator.

.....  
.....  
..... [1]

(c) Write  $1.\dot{3}$  as a fraction.

(c) ..... [2]

2 (a) In the diagram below, triangle ABC has side AC continued to D.



There are errors in the following proof.

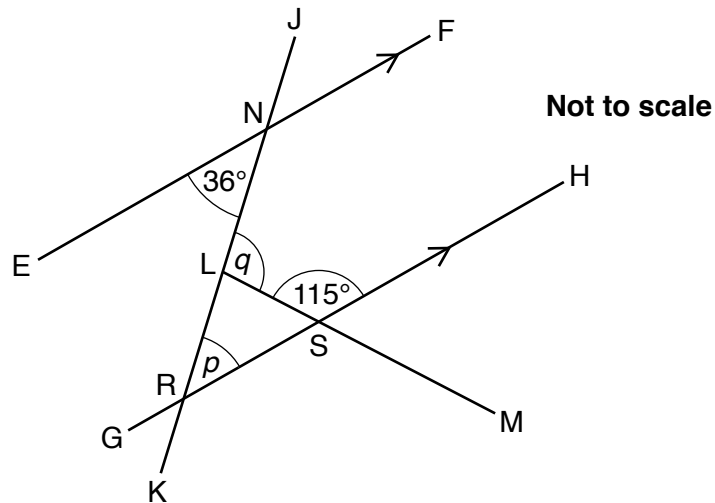
$w + x + y = 180^\circ$  (angle sum of a triangle is  $180^\circ$ )  
 $w + y + z = 180^\circ$  (angles on a straight line add up to  $180^\circ$ )  
 So  $w + x = z$   
 Exterior angle of a triangle is equal to the sum of the opposite interior angles.

Tick the box to show which line contains the **first** error.

- |                          |                |                          |                 |
|--------------------------|----------------|--------------------------|-----------------|
| <input type="checkbox"/> | The first line | <input type="checkbox"/> | The second line |
| <input type="checkbox"/> | The third line | <input type="checkbox"/> | The fourth line |

[1]

(b)\* The diagram below consists of four straight lines. EF and GH are parallel.



Calculate angles  $p$  and  $q$ , giving a geometrical reason for each step in your working.

.....

.....

.....

.....

.....

[4]

3 (a) Divide £54 in the ratio 2:7.

(a) £ ....., £ ..... [3]

(b) (i) Calculate  $\frac{3}{4} \times 7$ . Give your answer as a mixed number.

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

(ii) What exact number does  $\frac{3}{4} \times 7$  need to be multiplied by to give  $\frac{3}{4}$ ?

(ii) ..... [1]

(c) Bernard's wage is 10% more than Carlotta's wage.

Work out the ratio of Bernard's wage to Carlotta's wage. Write the ratio in its simplest form using whole numbers.

(c) ..... [2]

4 The first five terms of a sequence are shown below.

3, 5, 7, 9, 11

(a) Write an expression for the  $n$ th term of the sequence.

(a) ..... [2]

(b)\* 3 and 7 are both terms in the sequence.

The product of 3 and 7 is  $3 \times 7 = 21$ . 21 is also a term in the sequence.

Show that the product of **any** two terms in the sequence will also be a term in the sequence.

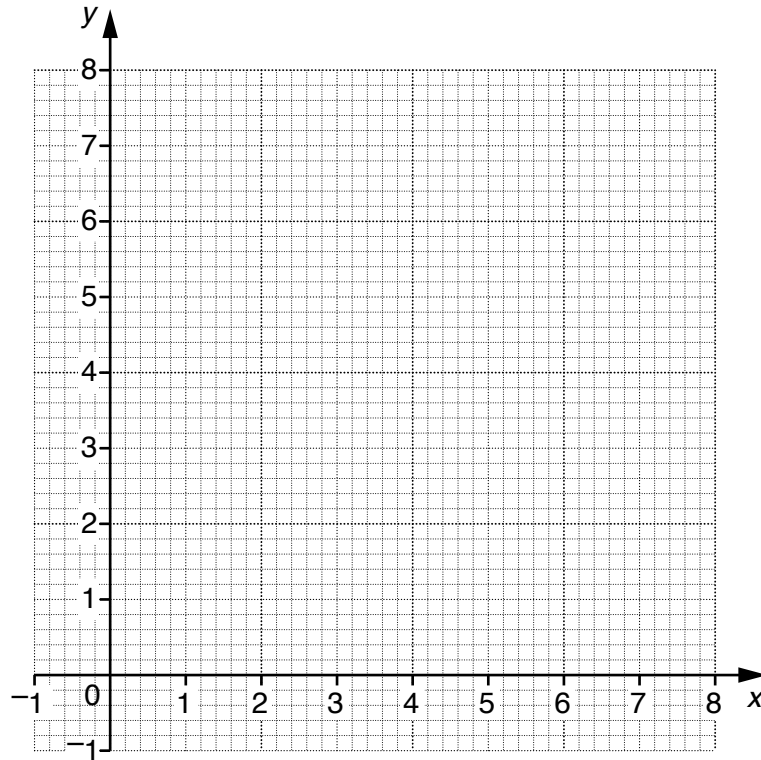
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.....  
..... [2]

5 Two positive numbers,  $x$  and  $y$ , add up to make 8.

(a) Write an equation to show this relationship between  $x$  and  $y$ .

(a) ..... [1]

(b) On the grid below, draw a graph which shows all possible pairs of values of  $x$  and  $y$ .



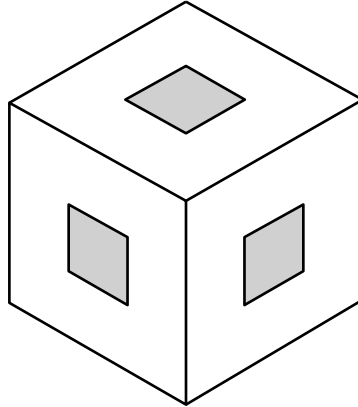
[2]

(c) It is also known that  $y$  is three times  $x$ .

By drawing a suitable additional line on the grid, find the values of  $x$  and  $y$ .

(c)  $x$  .....,  $y$  ..... [4]

- 6 The diagram below shows a cube of side 6 cm.  
Square holes, of side 2 cm, have been drilled through the cube, between the middles of pairs of opposite sides.



Find the volume of the shape that is left.

..... cm<sup>3</sup> [4]



7 (a) Solve.

$$4(x - 6) = x$$

(a) ..... [3]

(b) It is given that  $R = \frac{P}{A^2}$ .

(i) Calculate the value of  $R$  when  $P = 36$  and  $A = 4$ .

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

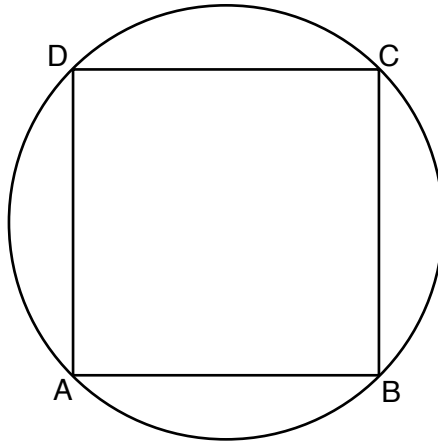
(ii) Make  $A$  the subject of the formula.

(ii) ..... [2]

(iii) Write down a possible pair of values of  $P$  and  $A$  so that  $R = 3.4 \times 10^8$ .

(iii)  $P$  .....  $A$  ..... [2]

- 8 ABCD is a square.  
A circle passes through all the points A, B, C and D.  
The centre of the circle is at the centre of the square.

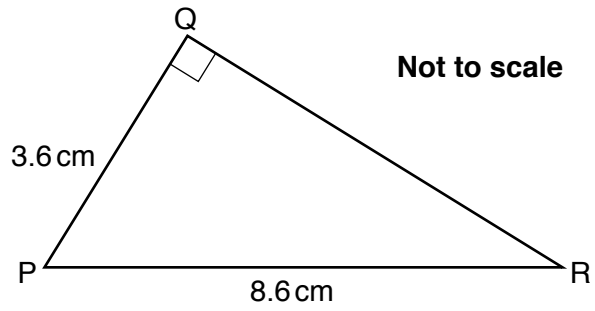


The area of square ABCD is  $36 \text{ cm}^2$ .

Work out the radius of the circle.

..... cm [4]

- 9 Triangle PQR is right-angled at Q.  
 PQ = 3.6 cm. PR = 8.6 cm.



- (a) Calculate the size of angle P.

(a) .....° [3]

- (b) Calculate the area of triangle PQR.

(b) ..... cm<sup>2</sup> [2]

10 (a) Solve.

$$2x^2 + 5x - 3 = 0$$

(a) ..... [4]

(b) Write  $\frac{1}{x-2} - \frac{1}{x+2}$  as a single fraction. Give your answer in its simplest form.

(b) ..... [2]

- (c) (i) An identity in  $x$  is given below. Find the values of  $u$  and  $v$ .

$$x^2 + 4x + 8 = (x + u)^2 + v$$

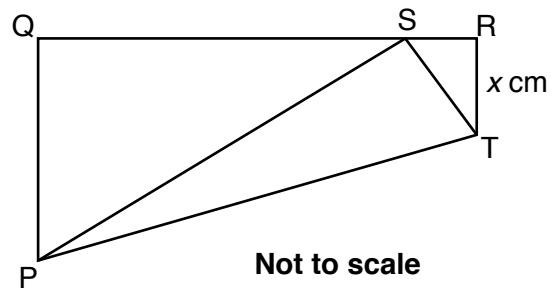
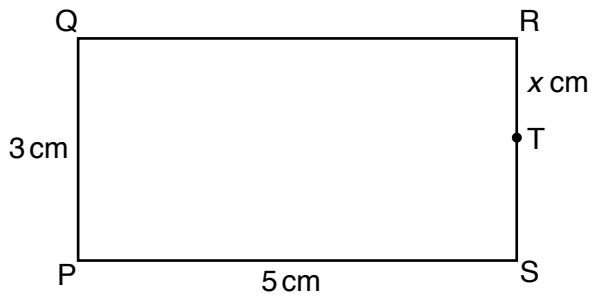
(c)(i)  $u = \dots\dots\dots$ ,  $v = \dots\dots\dots$  [3]

- (ii) Carlos thinks that  $x^2 + 4x + 8$  is always bigger than 8.

Find a value of  $x$  which makes  $x^2 + 4x + 8$  smaller than 8.

(ii)  $\dots\dots\dots$  [1]

11 PQRS is a rectangle. PQ = 3 cm; QR = 5 cm.



T is a point on RS with  $RT = x$  cm.  
 The rectangle is folded along PT. S then lies on RQ.

Show that  $x^2 - 6x + 9 = x^2 + 1$  and hence find the value of  $x$ .

..... [6]

12  $y$  is inversely proportional to the square root of  $x$ .  
When  $x = 4$ ,  $y = 8$ .

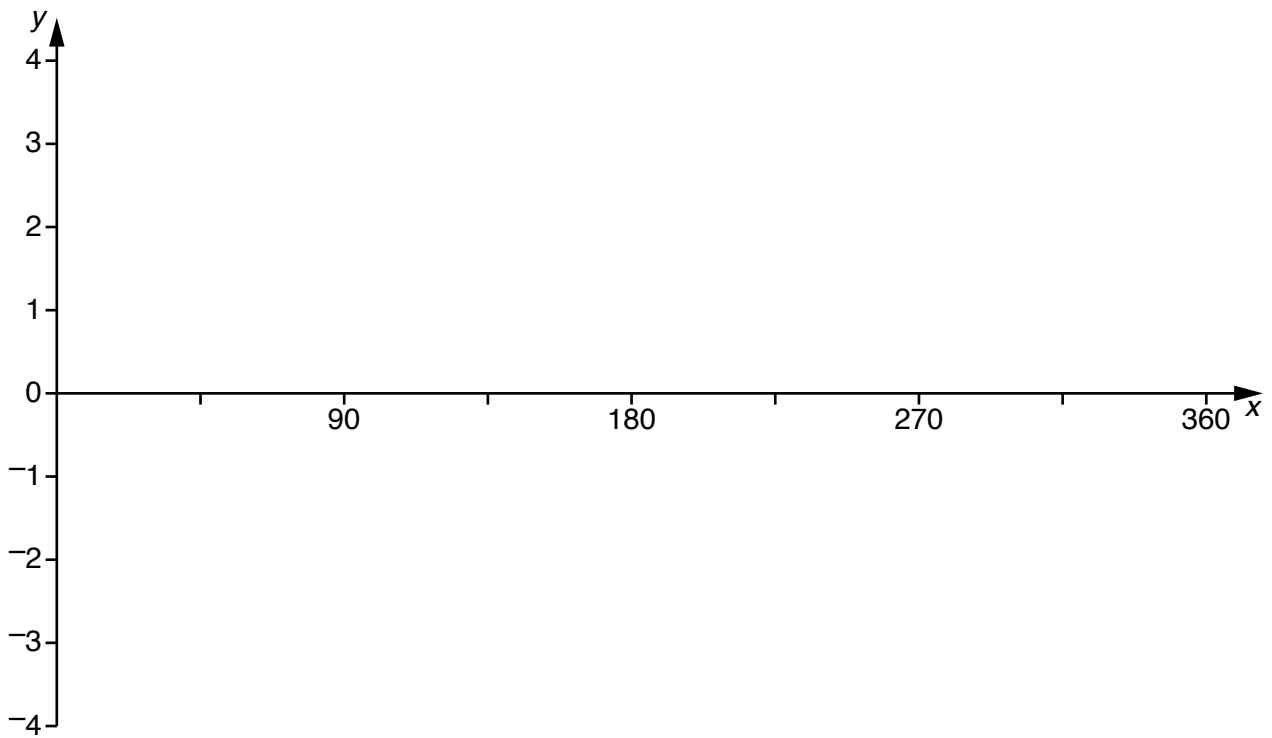
(a) Find  $y$  when  $x = 25$ .

(a) ..... [3]

(b) Find  $x$  when  $y = 2$ .

(b) ..... [2]

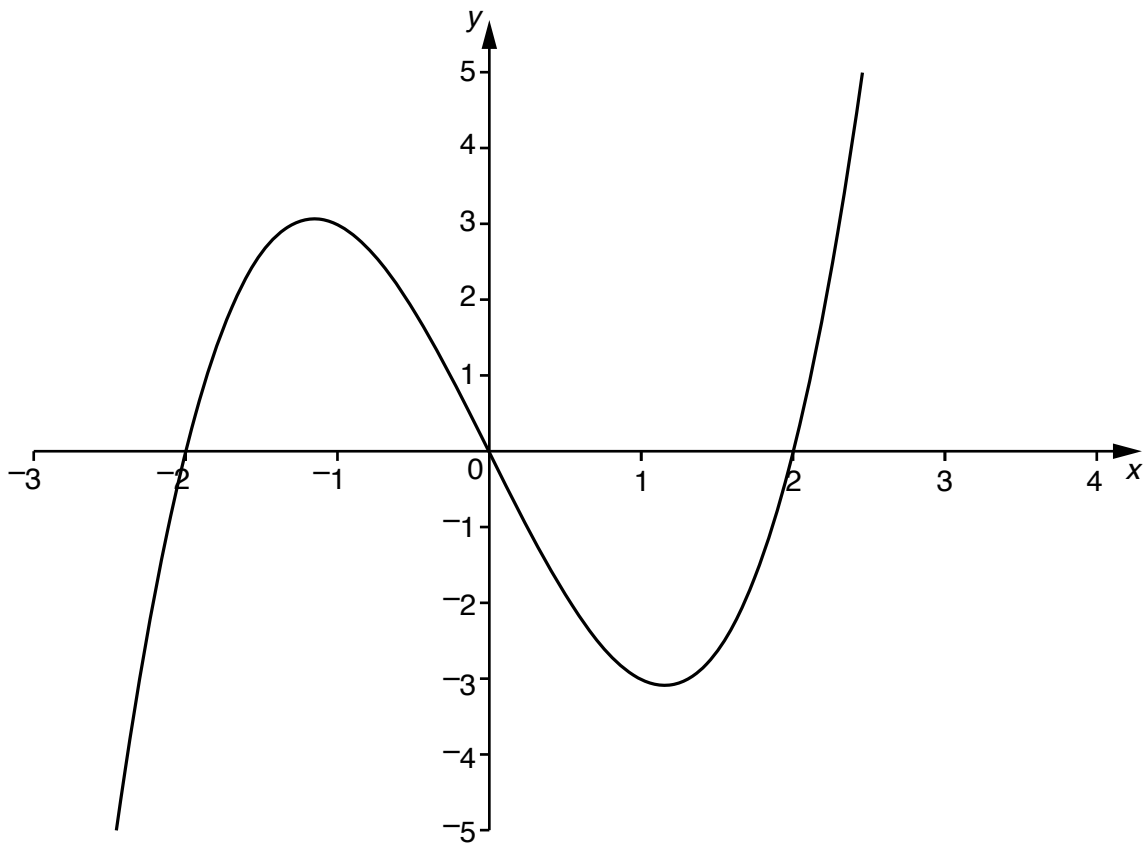
- 13 (a) Use the axes below to sketch the graph of  $y = 3 \cos x$ .



[3]

- (b) The graph of  $y = x^3 - 4x$  is shown below.

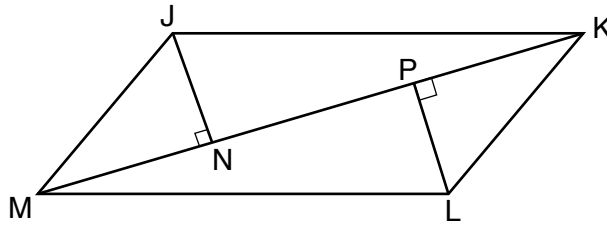
On the same axes, sketch the graph of  $y = x^3 - 4x + 1$ .



[2]



- 14 (a) JKLM is a parallelogram. MK is a diagonal of the parallelogram. N and P are points on MK such that angle JNM = angle LPK = 90°.



Not to scale

Prove that triangles JNM and LPK are congruent.

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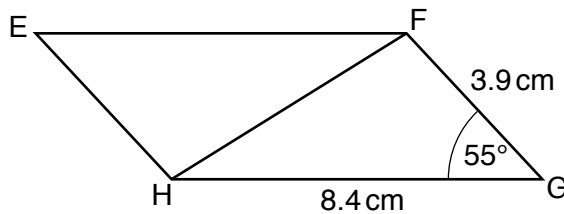
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..... [3]

- (b) EFGH is a parallelogram. HG = 8.4 cm, FG = 3.9 cm and angle FGH = 55°.



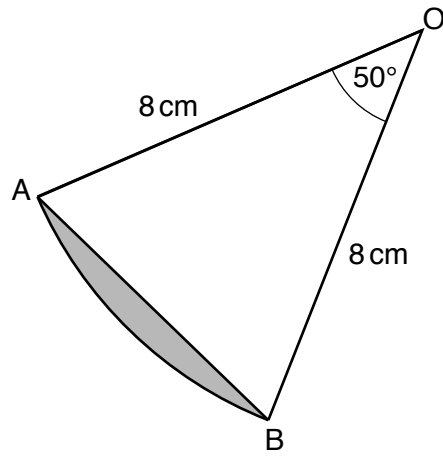
Not to scale

Calculate the length of the diagonal FH.

(b) ..... cm [3]

- 15 O is the centre of a circle with radius 8 cm.  
A and B are points on the circle.  
Angle AOB is  $50^\circ$ .

Calculate the **perimeter** of the shaded segment.



**Not to scale**

..... cm [5]

**END OF QUESTION PAPER**

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