

**Thursday 16 June 2016 – 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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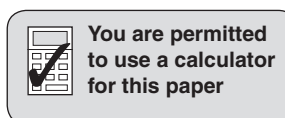
Centre number						Candidate number				
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**INSTRUCTIONS TO CANDIDATES**

- 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.

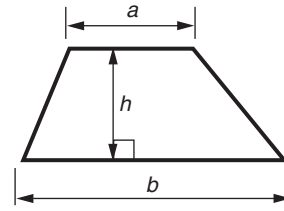
**INFORMATION FOR CANDIDATES**

- 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 **16** pages. Any blank pages are indicated.

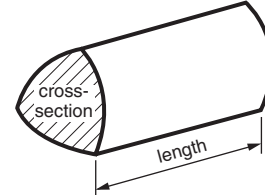


## Formulae Sheet: Higher Tier

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



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

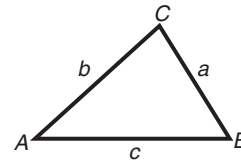


**In any triangle ABC**

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

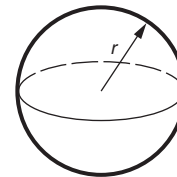
**Cosine rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

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



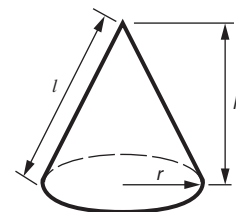
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

**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) Fill in the missing fractions, decimals and percentages in the table below.  
Give answers in their simplest forms.  
The top row has been done for you.

Fraction	Decimal	Percentage
$\frac{1}{4}$	0.25	25%
$\frac{7}{20}$		
	0.64	
		44%

[4]

- (b) Find the missing number.

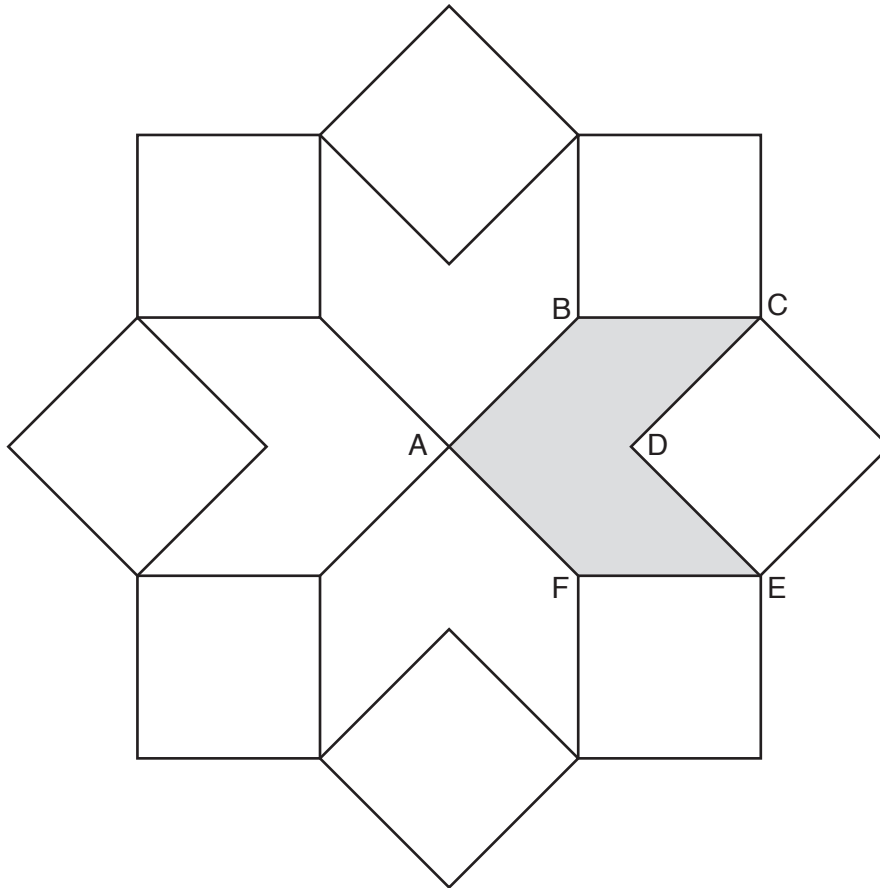
$$14 \times \boxed{\phantom{000}} = 1$$

[1]

- (c) Find a number that is bigger than  $\frac{1}{3}$  but smaller than  $\frac{1}{2}$ .

(c) ..... [2]

2\* The tiling pattern below is made from eight congruent squares and four congruent hexagons. Each hexagon has one line of symmetry.



**Calculate** all six angles of hexagon ABCDEF. Give a geometrical reason for each step in your working.

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[5]

- 3 (a) Find the missing numbers in this sequence.

1, 3, 6, ....., 15, .....

[2]

- (b) Show that  $2n - 1$  is **not** an expression for the  $n$ th term of the sequence in part (a).

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

- (c) The  $n$ th term of another sequence is  $4n - 2$ .

How many terms of this sequence are smaller than 200?

(c) ..... [4]

4 (a) Share £60 in the ratio 8:7.

(a) £....., £..... [2]

(b) The ratio of red sweets to black sweets in a bag is 3:2.  
There are only red sweets and black sweets in the bag.

(i) What fraction of the sweets in the bag are red?

(b)(i) ..... [1]

(ii) Kirsty opens the bag of sweets and eats 5 black sweets.  
This leaves only one black sweet in the bag.

What is the ratio of red sweets to black sweets now?

(ii) ..... : ..... [3]

5 (a) Solve.

$$7(x + 2) = 9x - 1$$

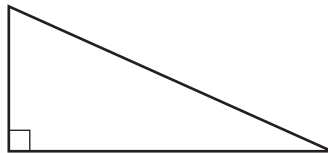
(a) ..... [3]

(b) Make  $t$  the subject of the following formula.

$$v = u + at$$

(b) ..... [2]

6 The lengths of the sides in a right angled triangle are in the ratio 3:4:5.

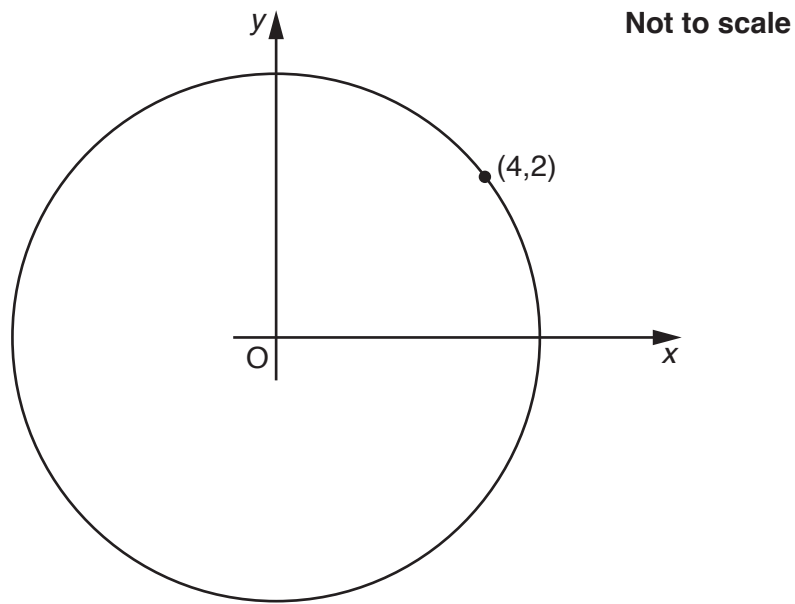


**Not to scale**

Calculate the size of the smallest angle in the triangle.

.....° [3]

- 7 The point  $(4, 2)$  lies on the circumference of a circle centre the origin.



- (a) Find the coordinates of the other end of the diameter that passes through  $(4, 2)$ .

(a) (..... , ..... ) [2]

- (b) Calculate the radius of the circle.

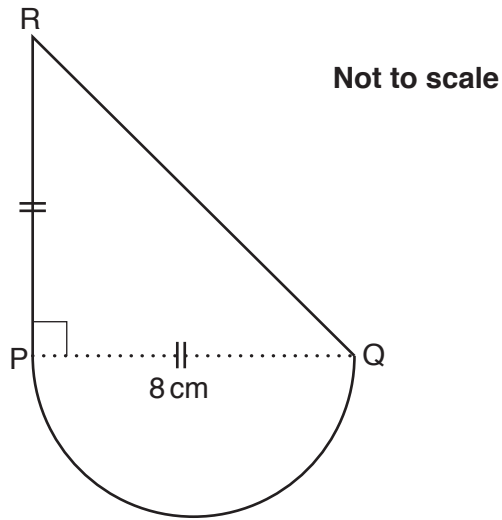
(b) ..... units [3]

- (c) Write down the equation of the circle.

(c) ..... [2]



- 8 (a) The shape below is made from a semicircle and a triangle PQR. The triangle is isosceles and right-angled. PQ is the diameter of the semicircle. PQ = 8 cm.



Calculate the area of the shape.

(a) ..... cm<sup>2</sup> [5]

- (b) The cross-section of a prism has area 81 cm<sup>2</sup>. The volume of the prism is 350 cm<sup>3</sup>.

Calculate the length of the prism.

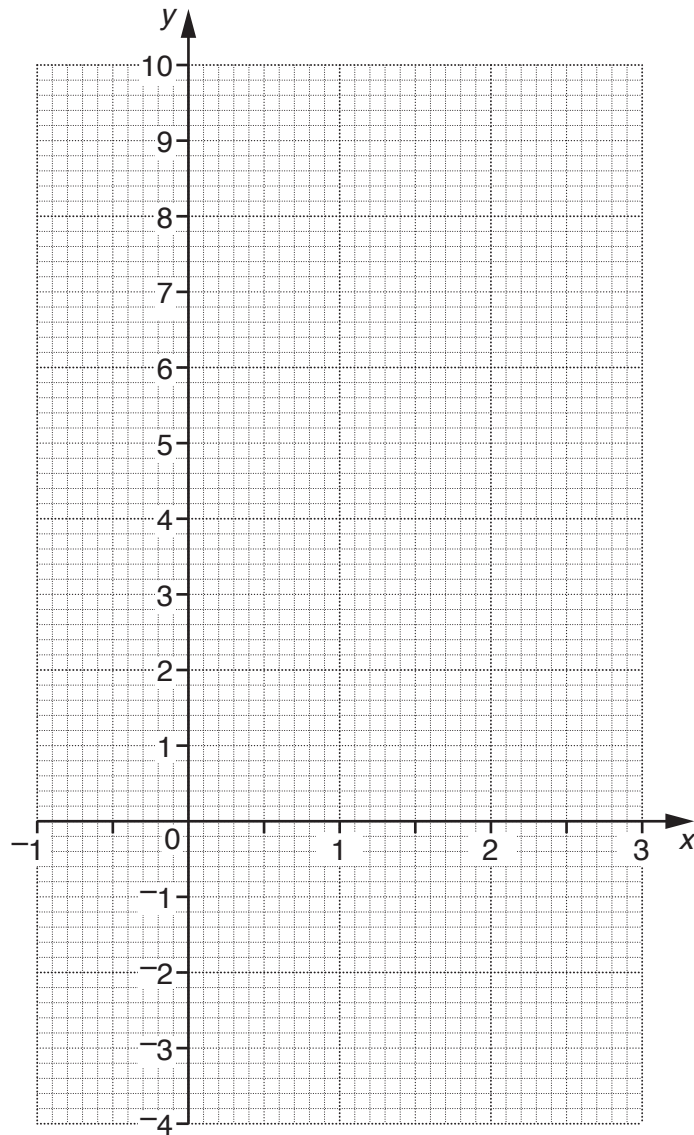
(b) ..... cm [2]

- 9 (a) Complete the table for  $y = x^3 - 2x^2$ .

$x$	-1	-0.5	0	0.5	1	1.5	2	2.5	3
$y$		-0.625		-0.375		-1.125			9

[2]

- (b) Draw the graph of  $y = x^3 - 2x^2$  for  $x$  between -1 and 3.



[2]

10 (a) Expand and simplify.

$$(6x - 1)(x + 3)$$

(a) ..... [3]

(b) Solve.

$$2x^2 - x - 6 = 0$$

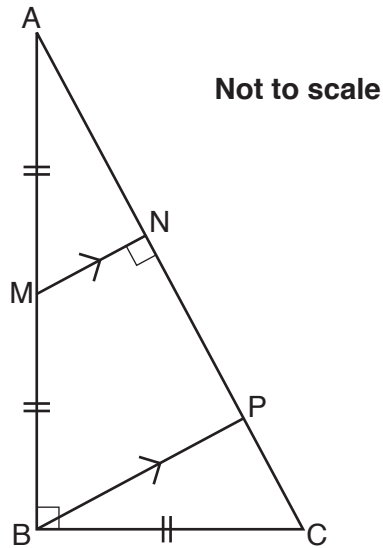
(b) ..... [4]

11 A pair of shoes costs £69. This includes VAT at 20%.

What was the cost of the shoes before VAT was added on?

£ ..... [2]

- 12 The diagram below shows triangle ABC, which is right-angled at B.  
 $AB = 2 BC$ .  
 M is the midpoint of AB.  
 N is on AC such that MN is perpendicular to AC.  
 P is on AC such that BP is parallel to MN.



- (a)\* Prove that triangles AMN and BPC are congruent.

.....

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..... [4]

- (b) Find the ratio of the area of triangle AMN to the area of triangle ABP.

(b) ..... : ..... [2]

- (c) What is the ratio of the area of triangle AMN to the area of triangle ABC?

(c) ..... : ..... [1]

**13**  $y$  is directly proportional to the square of  $h$ .  
When  $h = 2$ ,  $y = 12$ .

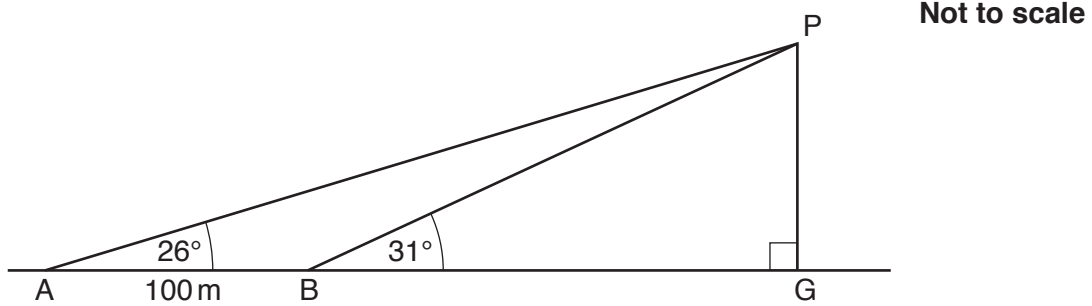
**(a)** Find  $y$  when  $h = 4$ .

**(a)** ..... [3]

**(b)** Find  $h$  when  $y = 75$ .

**(b)** ..... [2]

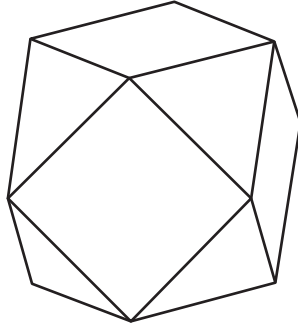
- 14 Point P is at the top of a hill.  
 Points A and B lie on horizontal ground.  
 ABG is a straight line, with G vertically below P.  
 P is observed from points A and B.  
 AB = 100 m. Angle PAB =  $26^\circ$ ; angle PBG =  $31^\circ$ .



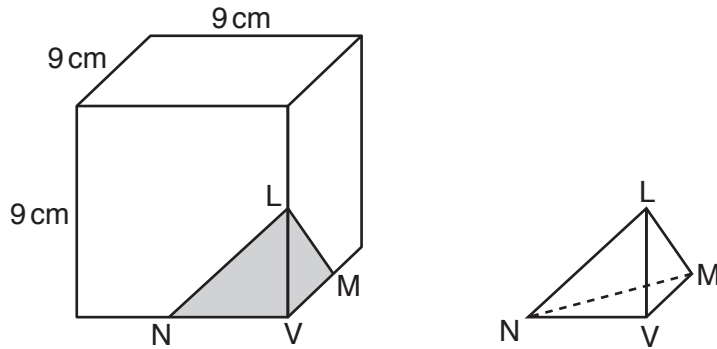
Calculate the height of the hill, PG.

..... m [6]

- 15 A cube has sides 9 cm long.  
A pyramid at **each** vertex of the cube is removed to make a new solid.



The diagrams below show how a pyramid is removed from the cube.  
L, M and N are midpoints of edges of the cube. V is a vertex of the cube.  
All the pyramids removed are congruent.



Find the volume of the new solid.

..... cm<sup>3</sup> [6]

16 Solve these simultaneous equations.

$$y = x^2 - 9x + 7$$

$$y = 3 - 5x$$

$x = \dots\dots\dots$ ,  $y = \dots\dots\dots$  [5]

**END OF QUESTION PAPER**

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