OCR
Oxford Cambridge and RSA

H

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	

Centre number						Candidate number				

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.

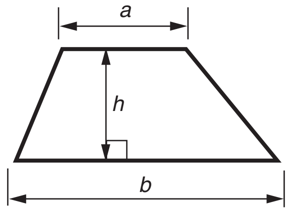
INFORMATION FOR CANDIDATES

- 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.

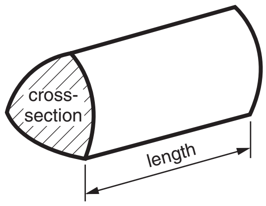
You are permitted to use a calculator for this paper

Formulae Sheet: Higher Tier

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



Volume of prism = (area of cross-section) × length

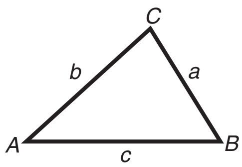


In any triangle *ABC*

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

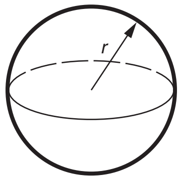
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

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



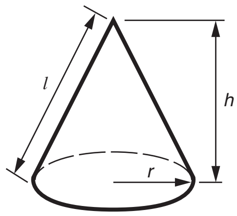
Volume of sphere = $\frac{4}{3}\pi r^3$

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.

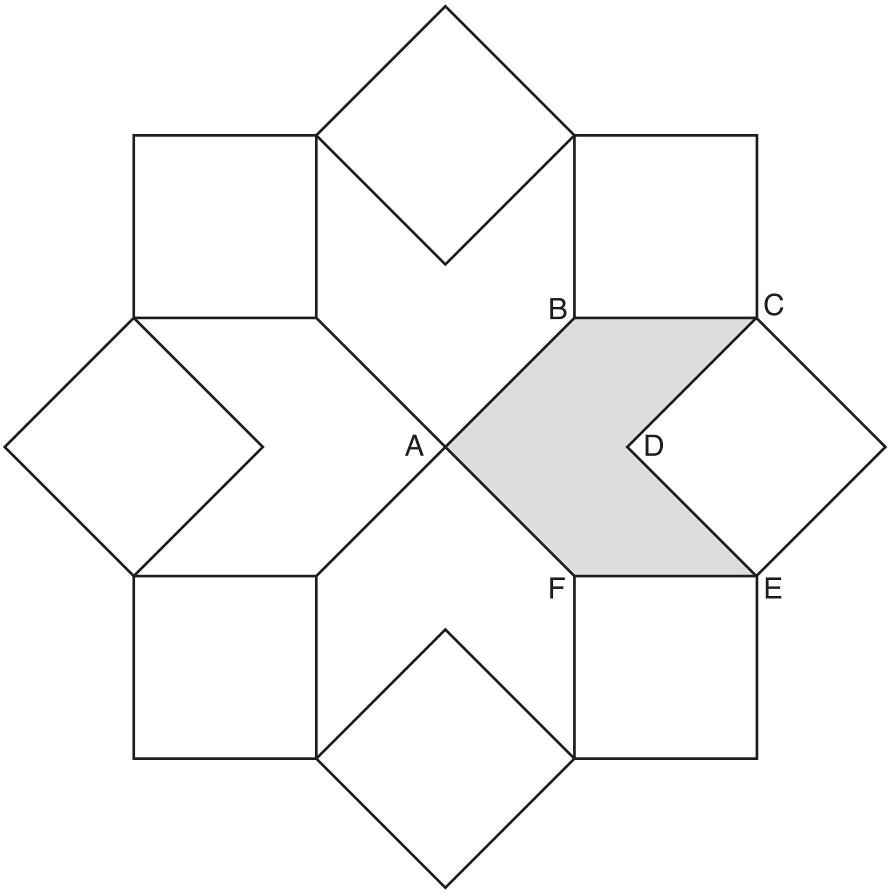
$14 \times \boxed{} = 1$

[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 nth term of the sequence in part **(a)**.

....

....

.... **[2]**

(c) The nth 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.

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

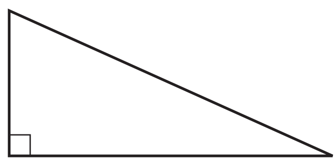
(a) .... **[3]**

(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 $3:4:5$.

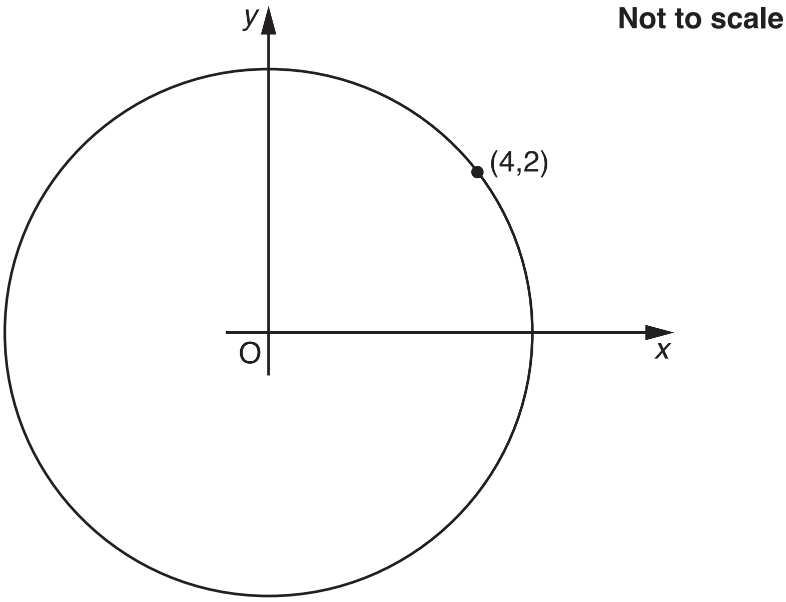


Not to scale

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]**

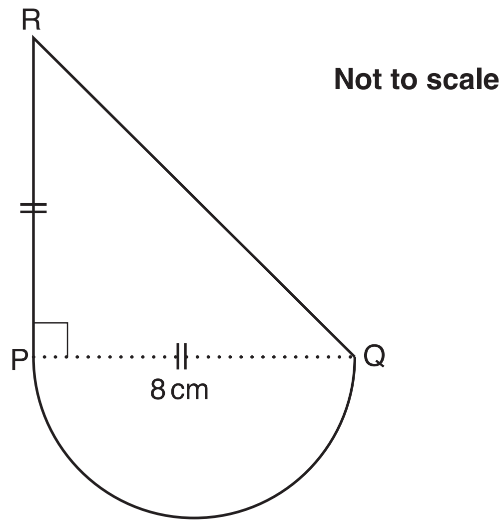
(b) Calculate the radius of the circle.

(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^2 **[5]**

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

Calculate the length of the prism.

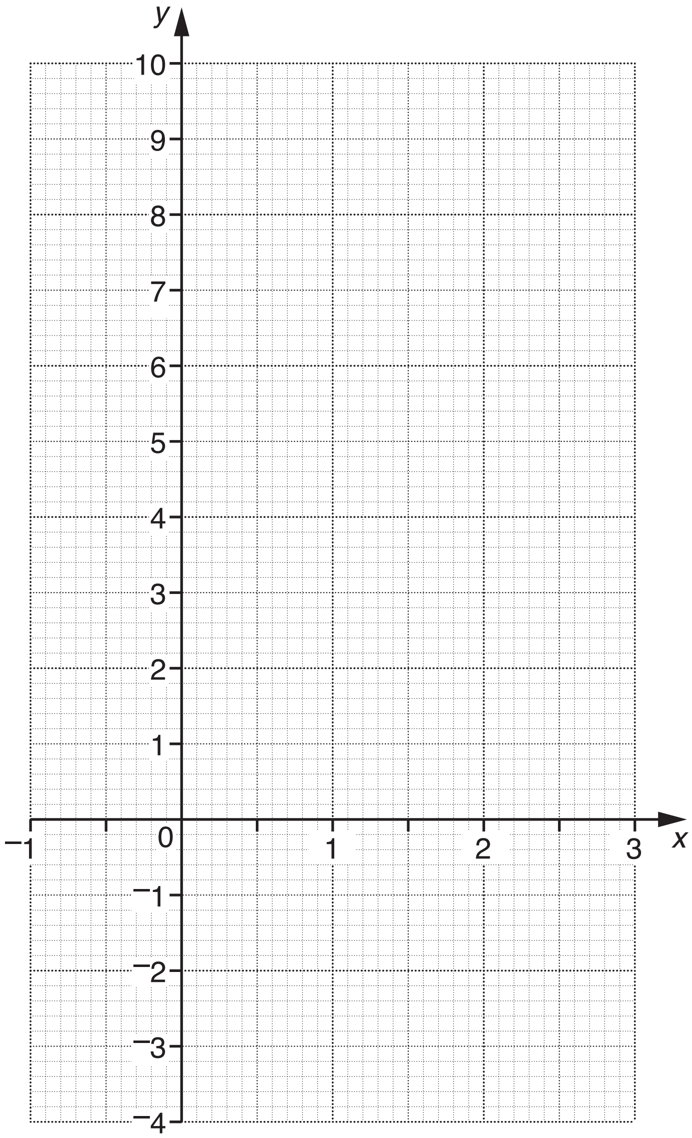
(b) .... cm **[2]**

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.

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

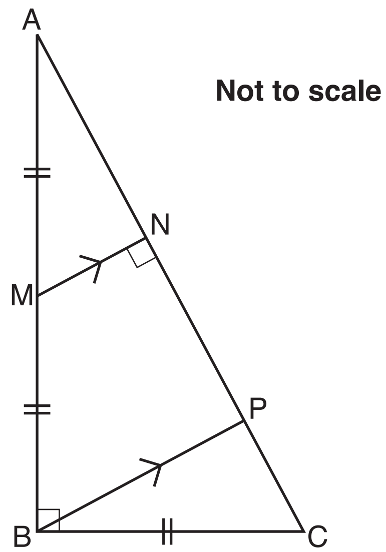
(b) .... **[4]**

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 $h = 4$.

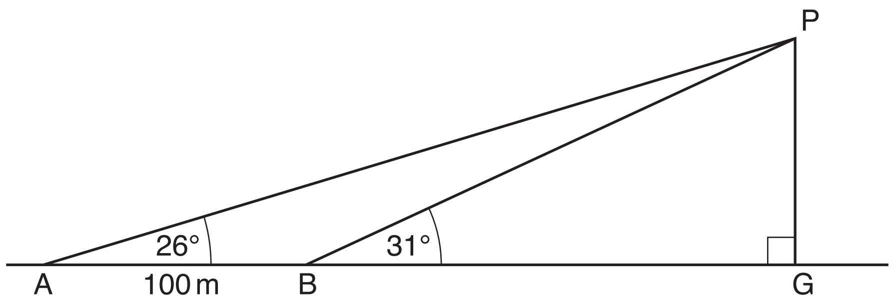
(a) .... **[3]**

(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°; angle PBG = 31°.

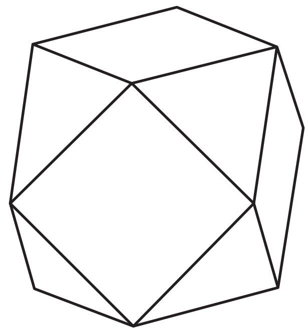
Not to scale



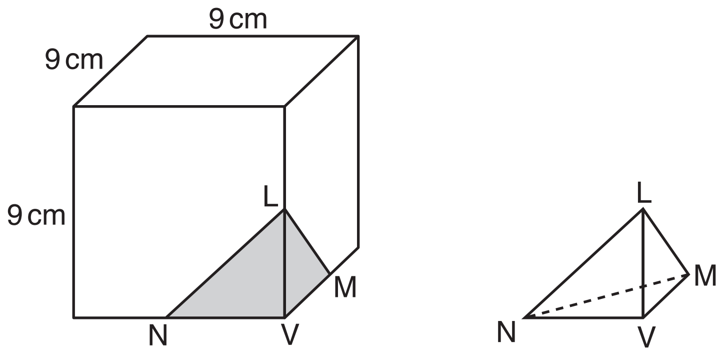
Calculate the height of the hill, PG.

.... 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^3 **[6]**

16 Solve these simultaneous equations.

$y = x^2 - 9x + 7$
$y = 3 - 5x$

x = ..., y = ... **[5]**

END OF QUESTION PAPER