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**Wednesday 12 November 2014 – 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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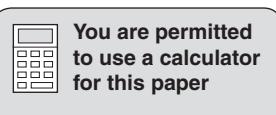
Centre number						Candidate number			
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**INSTRUCTIONS TO CANDIDATES**

- 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.

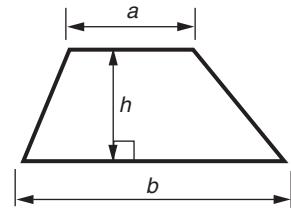
**INFORMATION FOR CANDIDATES**

- 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.

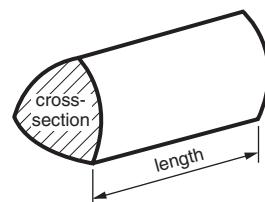


## Formulae Sheet: Higher Tier

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



$$\text{Volume of prism} = (\text{area of cross-section}) \times \text{length}$$

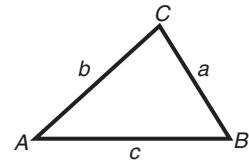


In any triangle  $ABC$

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

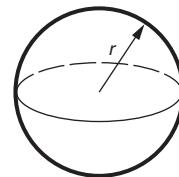
$$\text{Cosine rule} \quad a^2 = b^2 + c^2 - 2bc \cos A$$

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



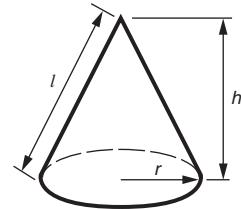
$$\text{Volume of sphere} = \frac{4}{3} \pi r^3$$

$$\text{Surface area of sphere} = 4\pi r^2$$



$$\text{Volume of cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Curved surface area of cone} = \pi r l$$



### 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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Answer **all** the questions.

1 (a) Convert  $\frac{2}{15}$  to a decimal.

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

(b) Write 0.175 as a fraction in its lowest terms.

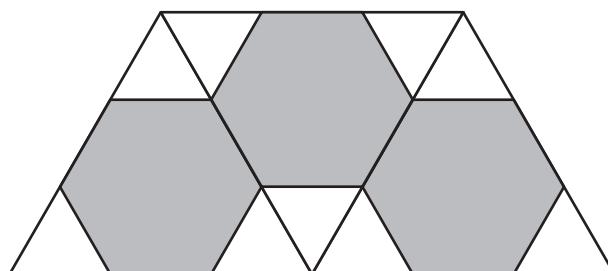
(b) \_\_\_\_\_ [2]

(c) Use your calculator to work out the following. Give your answer correct to three significant figures.

$$\frac{\sqrt{4.1^2 - 2.4^2}}{3.6 \times 5.1}$$

(c) \_\_\_\_\_ [3]

2 The tiling pattern below is made of regular hexagons and equilateral triangles.



(a) Find exactly the proportion of the area of the pattern taken up by the regular hexagons.

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

(b) The ratio of the number of hexagon tiles to the number of triangle tiles is 3 : 9.

Write this ratio in its simplest form.

(b) \_\_\_\_\_ [1]

(c)\* Emily has 50 of the equilateral triangle tiles and 15 of the hexagon tiles. She uses them to continue the tiling pattern shown above.

Which does she run out of first, the triangles or the hexagons? Explain how you know.

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[2]

3 (a) A shop employs 15 women and 8 men.

(i) What percentage of the employees are men?  
Give your answer to an appropriate degree of accuracy.

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

(ii) Some of the employees from the shop go out for a meal.  
20% of the people at the meal are men.

How many women and how many men are at the meal? Give one possible answer.

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

(b) A coat in the shop is priced at £64 on Thursday.

On Friday, the price of the coat goes down by 10%.

On Saturday, the price of the coat goes up by 5% of the price on Friday.

What is the price of the coat on Saturday?

(b) £\_\_\_\_\_ [3]

4 (a) Ahmed thinks of a number. He adds 3 to the number and then multiplies the result by 2 to get his final number.

Let the number which Ahmed thinks of be  $x$ .

(i) Write an expression, in terms of  $x$ , for Ahmed's final number.

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

(ii) Ahmed's final number is the same as the number he first thought of.

What number did Ahmed think of?

(ii)  $x =$  \_\_\_\_\_ [4]

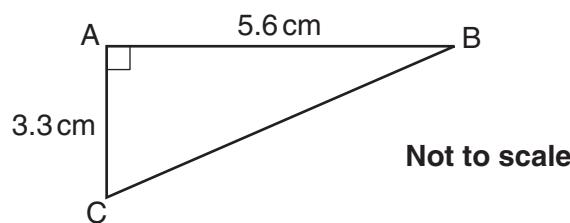
(b) The first six terms of a sequence are given below.

0, 2, 6, 12, 20, 30

Find an expression for the  $n$ th term of the sequence.

(b) \_\_\_\_\_ [3]

5 Triangle ABC is right-angled at A. AB = 5.6 cm. AC = 3.3 cm.



(a) Calculate the length of BC.

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

(b) Sketch an isosceles triangle which has an area double the area of triangle ABC.  
Write the length of **each side** of your triangle on your diagram.

[3]

6 It costs £10 to buy a one-year discount card for the cinema. People with a discount card pay £4 to see a film. People without a discount card pay £6 to see a film.

**(a)\*** Nicole sees  $x$  films in a year. This works out cheaper with a discount card.

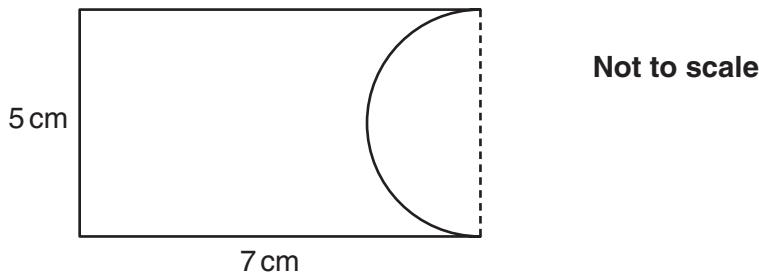
Show that  $6x > 10 + 4x$ .

(b) Solve the inequality  $6x > 10 + 4x$ .

[3]

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

7 (a) The shape below is made by removing a semicircle from a rectangle. The rectangle had length 7 cm and width 5 cm. The diameter of the semicircle is 5 cm.

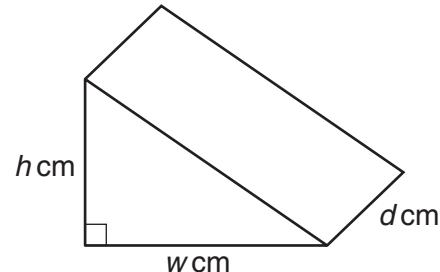


Find the area of the shape. Give the units of your answer.

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

(b) The diagram shows a prism. The cross-section of the prism is a right-angled triangle. The lengths of the two shorter sides of the triangle are  $w$  cm and  $h$  cm. The length of the prism is  $d$  cm. The volume of the prism is  $30 \text{ cm}^3$ .

Find possible values of  $w$ ,  $h$  and  $d$ .



(b)  $w$  \_\_\_\_\_

$h$  \_\_\_\_\_

$d$  \_\_\_\_\_ [3]

10

8 (a) Solve the simultaneous equations.

$$x - 2y = 5$$

$$2x + y = -5$$

(a)  $x = \underline{\hspace{2cm}}$ ,  $y = \underline{\hspace{2cm}}$  [3]

(b) Expand and simplify.

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

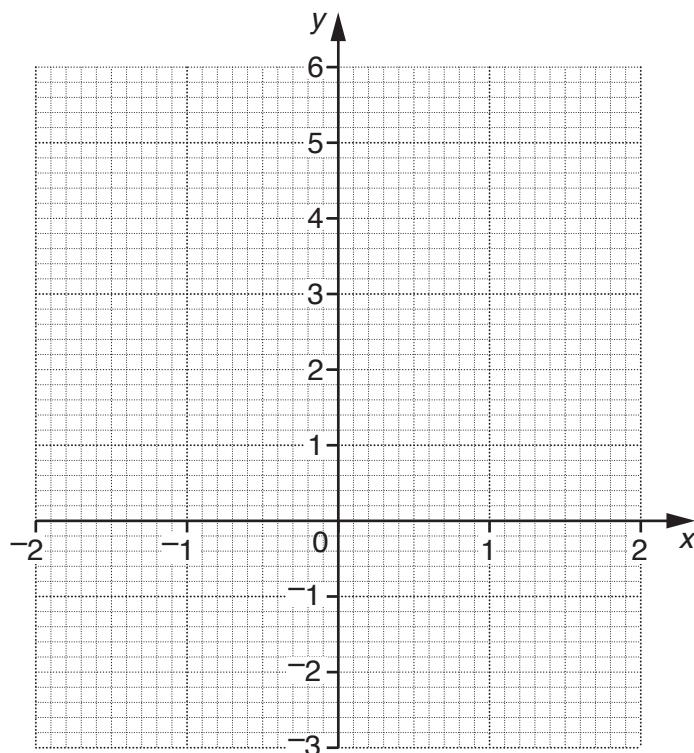
(b)  $\underline{\hspace{2cm}}$  [3]

9 (a) Complete the table for  $y = x^3 - 4x + 1$ .

$x$	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2
$y$	1			2.875		-0.875	-2		

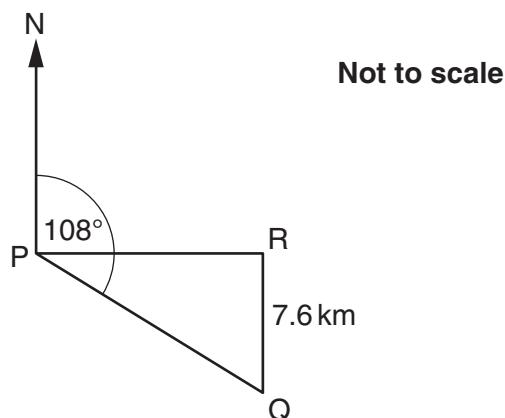
[2]

(b) Draw the graph of  $y = x^3 - 4x + 1$ .



[2]

10 (a) R is due east of P.  
Q is 7.6 km due south of R.  
The bearing of Q from P is  $108^\circ$ .

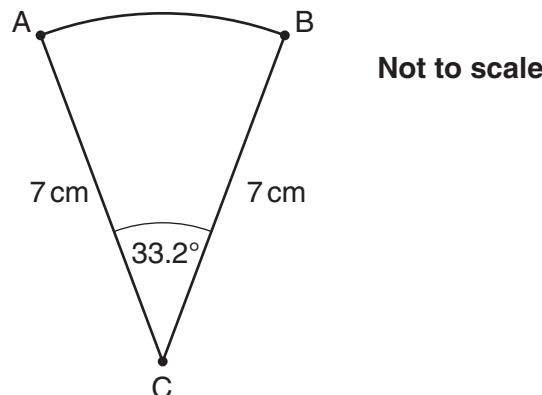


Calculate the distance PQ.

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

13

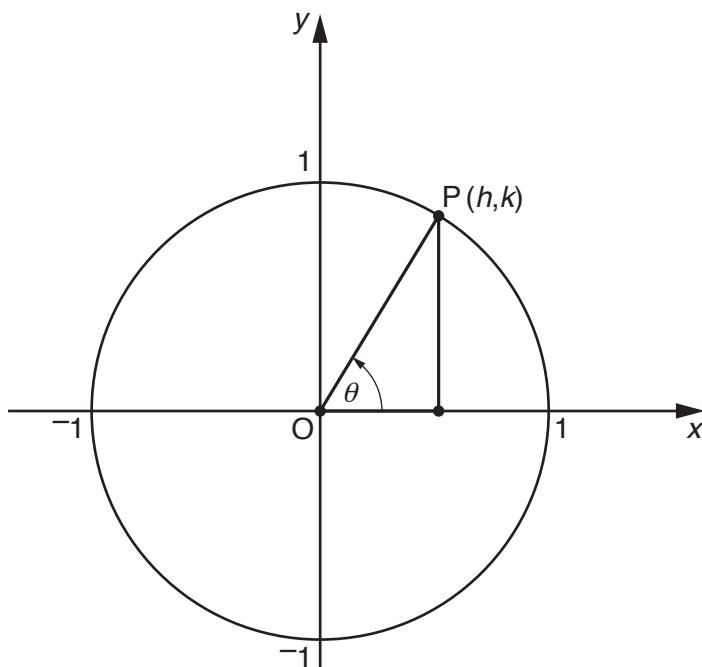
(b) The diagram shows a sector of a circle. C is the centre of the circle.  
The radius of the circle is 7 cm.  
Angle ACB is  $33.2^\circ$ .



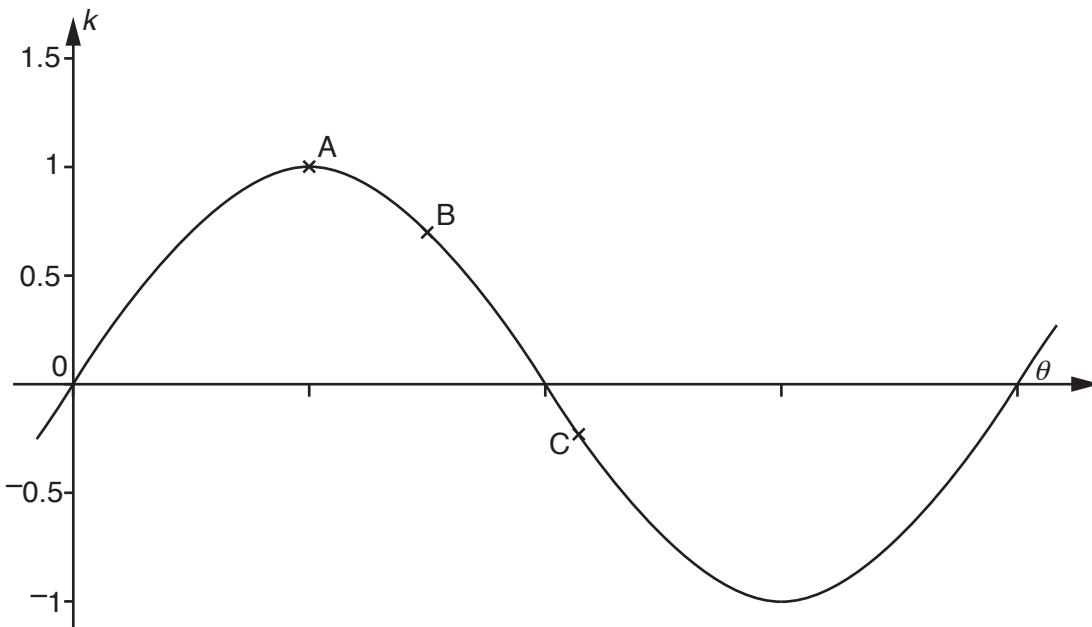
Calculate the area of the sector.

(b) \_\_\_\_\_  $\text{cm}^2$  [3]

11 This circle has radius 1 and centre the origin, O. P is a point which moves round the circle. It has coordinates  $(h, k)$ .  $\theta$  is the anticlockwise angle from the positive  $x$ -axis to OP.



The graph below shows how  $k$  changes as  $\theta$  increases.



On the circle above, mark the different positions of point P which correspond to points A, B and C on the graph. Label these positions  $P_A$ ,  $P_B$  and  $P_C$  respectively. [3]

15

12 (a) A hemisphere has radius 4.2 cm.

Calculate the volume of the hemisphere, giving your answer in terms of  $\pi$ .

(a) \_\_\_\_\_  $\text{cm}^3$  [2]

(b) A similar, larger hemisphere has a surface area 10 times as big as the hemisphere of radius 4.2 cm.

What is the radius of the larger hemisphere?

(b) \_\_\_\_\_  $\text{cm}$  [3]

16

13 (a) Solve this equation. Give your answers correct to one decimal place.

$$x^2 - 3x - 1 = 0$$

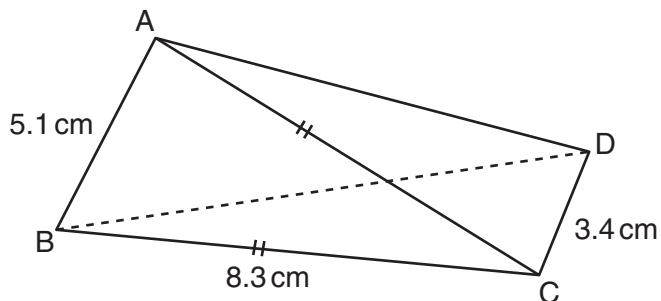
(a) \_\_\_\_\_ [4]

(b) Simplify.

$$\frac{x^2 - 4}{x^2 + x - 6}$$

(b) \_\_\_\_\_ [4]

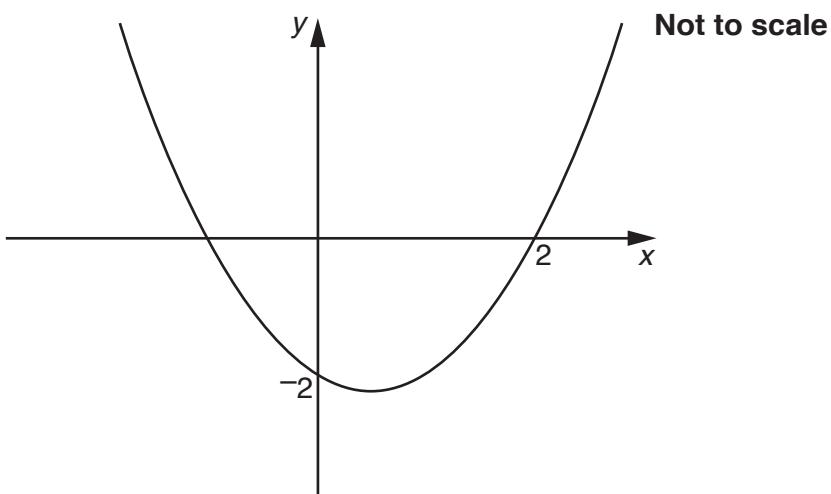
14 The diagram below shows a 3D solid with four triangular faces.  
 $AB = 5.1\text{ cm}$ ;  $DC = 3.4\text{ cm}$ .  
 $BC = AC = 8.3\text{ cm}$ .  
 $\text{Angle } ACD = 52^\circ$ .  
 $\text{Angle } BAD = 96^\circ$ .



Calculate the length of  $BD$ .

\_\_\_\_\_ cm [5]

15 The diagram below shows the graph of a quadratic function. The graph passes through the points  $(0, -2)$  and  $(2, 0)$ .



Find a possible equation for the graph.

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[3]

**END OF QUESTION PAPER**

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