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**International GCSE**

Centre Number

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Candidate Number

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# Mathematics B

## Paper 1R



Thursday 25 May 2017 – Morning  
**Time: 1 hour 30 minutes**

Paper Reference

**4MB0/01R**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- **Calculators may be used.**

### Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*

### Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.
- Without sufficient working, correct answers may be awarded no marks.

Turn over ►

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**Answer ALL TWENTY EIGHT questions.**

**Write your answers in the spaces provided.**

**You must write down all the stages in your working.**

**1** (a) Write the number 57 864 correct to 3 significant figures.

.....  
(1)

(b) Write the number 0.047 49 correct to 2 decimal places.

.....  
(1)

**(Total for Question 1 is 2 marks)**

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**2** Find the value of  $20^5$

Give your answer in standard form.

.....  
**(Total for Question 2 is 2 marks)**

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**3** Solve  $3x + 2 = 7$

$x =$  .....

**(Total for Question 3 is 2 marks)**

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- 4 Florian's football team played 30 matches last season.  
The team won 14 of these matches.  
Florian drew a pie chart for the results of the 30 matches.

Calculate the size of the angle, in degrees, of the sector for the 14 matches won.

.....°

**(Total for Question 4 is 2 marks)**

- 5 At the start of his diet, Julian had a weight of 96 kilograms.  
After one month, Julian had a weight of 90 kilograms.

Calculate the percentage decrease in Julian's weight.

.....%

**(Total for Question 5 is 3 marks)**



6 (a) Solve the inequality

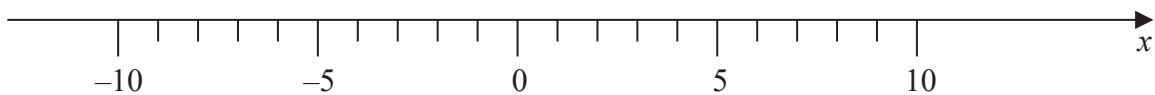
(i)  $19 + 3x \geq 4$

(ii)  $\frac{2x}{3} < 4$

(2)

(b) On the number line below, represent the set of values of  $x$  that satisfy both

$$19 + 3x \geq 4 \quad \text{and} \quad \frac{2x}{3} < 4$$



(1)

(Total for Question 6 is 3 marks)



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7 Find the inverse of the matrix  $\begin{pmatrix} 5 & -3 \\ 4 & -2 \end{pmatrix}$

$\left( \begin{array}{cc} & \\ & \end{array} \right)$

(Total for Question 7 is 3 marks)

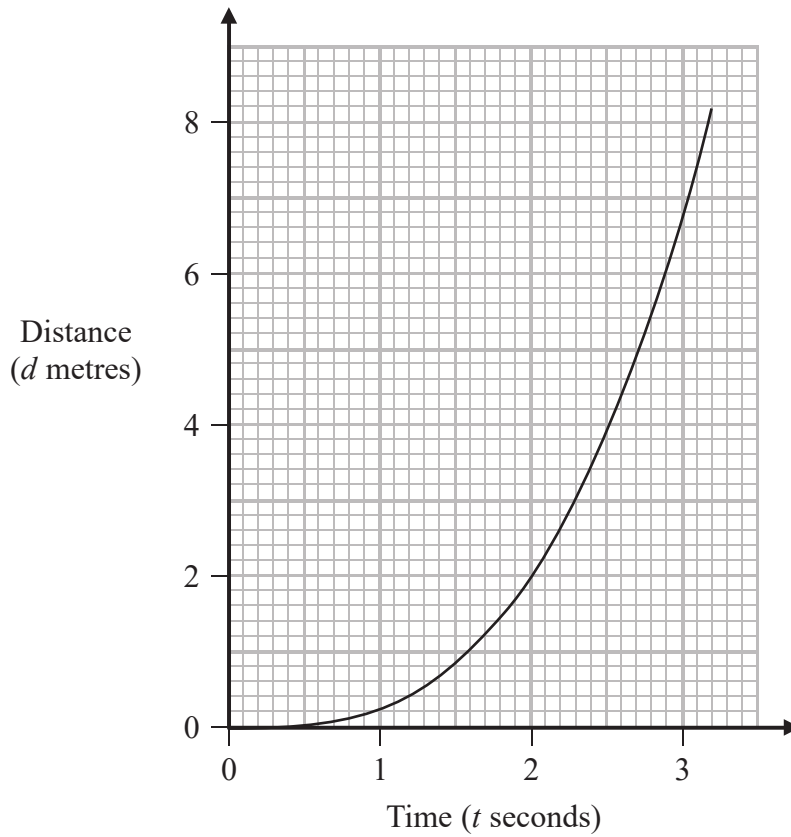
8 Show that  $(2 + \sqrt{6})(\sqrt{3} - \sqrt{2}) = \sqrt{2}$

You must show all your working.

(Total for Question 8 is 3 marks)



9



A particle is moving along a straight line.

The distance-time graph shows the distance,  $d$  metres, of the particle from a fixed point on the line at time  $t$  seconds after passing through this fixed point.

Calculate an estimate for the speed of the particle when  $t = 2$

..... m/s

(Total for Question 9 is 3 marks)



10

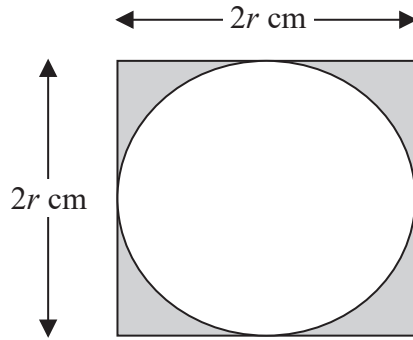


Diagram NOT accurately drawn

The diagram shows a square of side length  $2r$  cm and a circle of radius  $r$  cm. Each side of the square is a tangent to the circle.

Express the area of the shaded region as a percentage of the area of the square. Give your answer to 3 significant figures.

.....%

(Total for Question 10 is 3 marks)

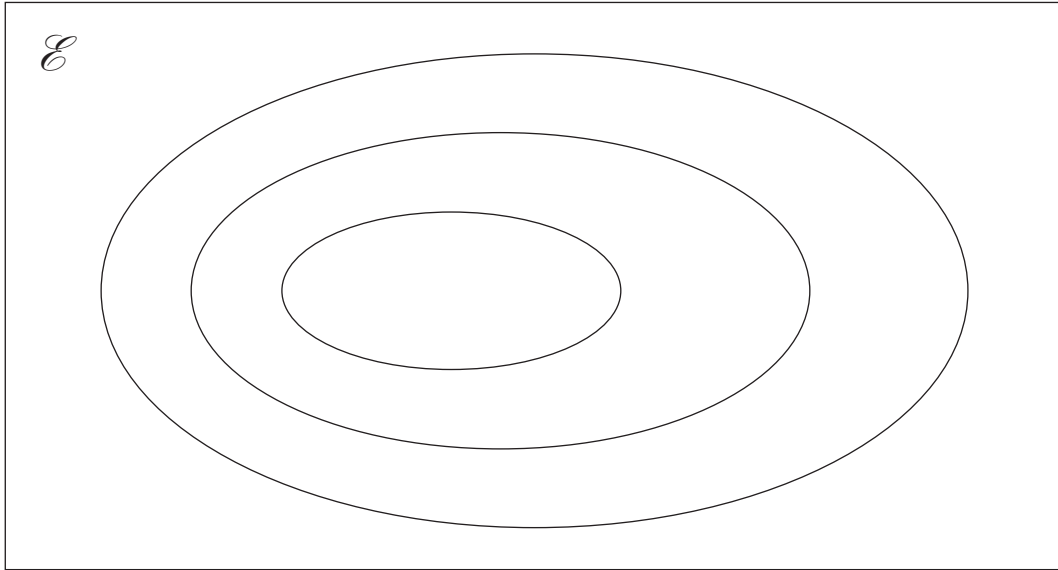
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11



$$E = \{\text{all numbers}\}$$

$$N = \{\text{natural numbers}\}$$

$$Q = \{\text{rational numbers}\}$$

$$Z = \{\text{integers}\}$$

(a) On the Venn diagram, label the set  $N$ , the set  $Q$  and the set  $Z$ . (1)

(b) On the Venn diagram, show the four elements

$$4, \sqrt{2}, -3, \frac{2}{3} \quad (2)$$

(Total for Question 11 is 3 marks)

$$12 \quad \mathbf{A} = \begin{pmatrix} 2 & 1 & 0 \\ 1 & 3 & -1 \\ -2 & 0 & 1 \end{pmatrix} \quad \mathbf{B} = \begin{pmatrix} 3 & 4 \\ 4 & 1 \\ 2 & -2 \end{pmatrix}$$

Calculate the matrix product  $\mathbf{AB}$ .

( )

(Total for Question 12 is 3 marks)



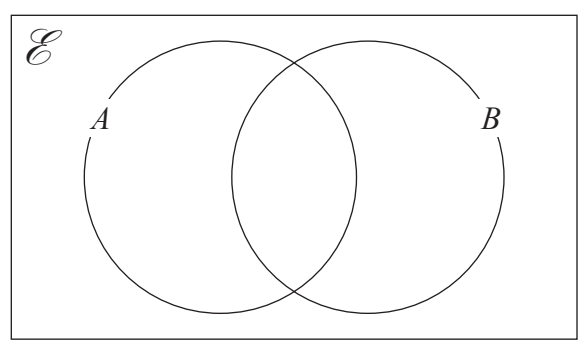


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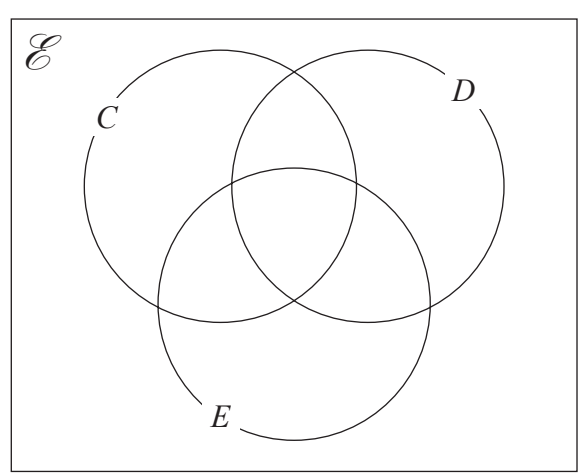
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13 (a) On the Venn diagram, shade the set  $A' \cap B$



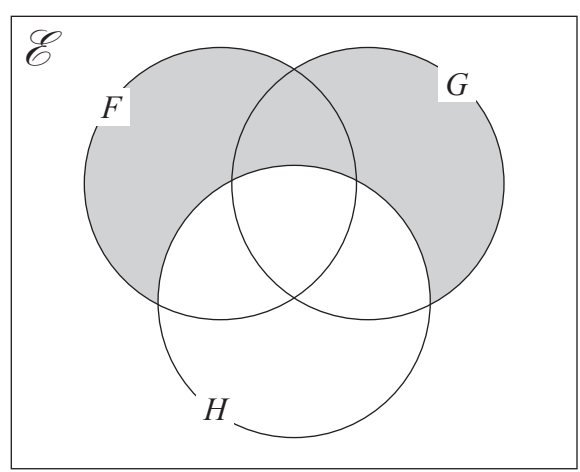
(1)

(b) On the Venn diagram, shade the set  $(C \cup D)' \cap E$



(1)

(c) Use set notation to describe the shaded region in the Venn diagram below.



(1)

(Total for Question 13 is 3 marks)



14 A bag contains 6 black discs and 4 white discs only.

Jasmin takes at random a disc from the bag and records the colour of the disc.

If the disc is black, she replaces the black disc in the bag.

If the disc is white, she does not replace the white disc in the bag.

Jasmin now takes at random a second disc from the bag and records the colour of the disc.

Calculate the probability that Jasmin records one disc of each colour.

.....  
(Total for Question 14 is 3 marks)

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15  $P$  and  $Q$  are two similar pyramids.

$P$  has volume  $400 \text{ cm}^3$  and surface area  $360 \text{ cm}^2$

$Q$  has volume  $1350 \text{ cm}^3$

Calculate the surface area of  $Q$ .

.....  $\text{cm}^2$

(Total for Question 15 is 3 marks)

16 Simplify fully  $\frac{2x^2 + 9x - 5}{12x^2 - 3}$

.....

(Total for Question 16 is 3 marks)



17 Laurent competed in a triathlon.

The incomplete table gives some information about each of his three stages of the triathlon.

| Stage | Distance (km) | Time taken    | Average speed (km/h) |
|-------|---------------|---------------|----------------------|
| Swim  | 1.5           | 22 min 30 sec | 4                    |
| Cycle | 40            |               | 32                   |
| Run   | 10            | 37 min 30 sec | 16                   |

(a) Calculate, in hours and minutes, the time taken by Laurent to complete the cycle stage.

..... hours ..... minutes  
(2)

(b) Calculate, in kilometres per hour, Laurent's overall average speed for all three stages of the triathlon.

Give your answer to 3 significant figures.

..... km/h  
(2)

(Total for Question 17 is 4 marks)



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18 Solve the simultaneous equations

$$\begin{aligned} 3x + y &= 7 \\ x + 7y &= -13 \end{aligned}$$

$x =$  .....

$y =$  .....

(Total for Question 18 is 4 marks)



19

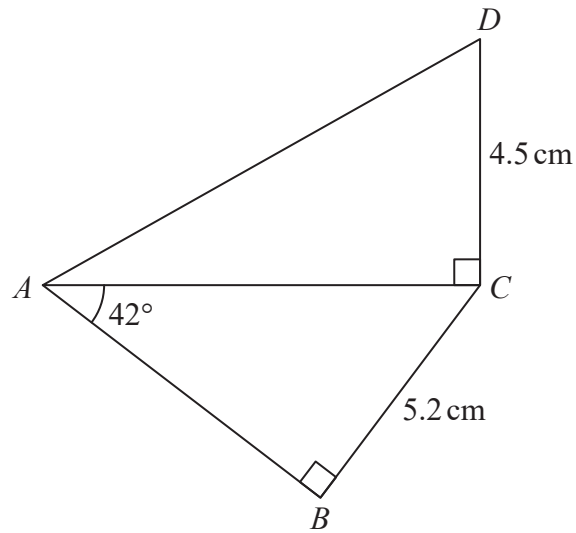


Diagram NOT  
accurately drawn

The diagram shows  $\triangle ABC$  and  $\triangle ACD$

$\angle ABC = \angle ACD = 90^\circ$  and  $\angle BAC = 42^\circ$

$BC = 5.2$  cm and  $CD = 4.5$  cm.

Calculate the size, in degrees correct to 1 decimal place, of  $\angle CAD$

(Total for Question 19 is 4 marks)

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20 The equation of a curve  $C$  is  $y = x^2 + \frac{16}{x}$

(a) Find  $\frac{dy}{dx}$

.....  
(2)

(b) Hence find the  $x$  coordinate of the stationary point on  $C$ .

$x =$  .....  
(2)

**(Total for Question 20 is 4 marks)**

21 Given that  $\mathbf{a} = \begin{pmatrix} 2 \\ y \end{pmatrix}$  and  $\mathbf{b} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$  and that  $3\mathbf{a} - x\mathbf{b} = \begin{pmatrix} 14 \\ -27 \end{pmatrix}$

find the value of  $x$  and the value of  $y$ .

$x =$  .....

$y =$  .....

**(Total for Question 21 is 4 marks)**



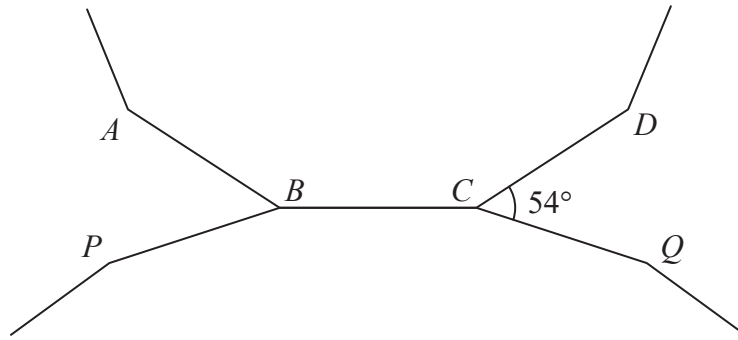


Diagram **NOT**  
accurately drawn

The diagram shows parts of two regular polygons.

$AB$ ,  $BC$  and  $CD$  are sides of a regular polygon with 12 sides.

$PB$ ,  $BC$  and  $CQ$  are sides of a regular polygon with  $n$  sides.

Given that  $\angle DCQ = 54^\circ$  find the value of  $n$ .

$n = \dots\dots\dots$

(Total for Question 22 is 4 marks)

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23 Given that  $n$  is a positive integer,

the  $n$ th term of sequence  $S$  is given by the expression  $n + 3$

and the  $n$ th term of sequence  $T$  is given by the expression  $n^2 - 9$

(a) Find the 12th term of sequence  $T$ .

.....  
(1)

Given also that the  $r$ th term of sequence  $T$  is 46 times the  $r$ th term of sequence  $S$ ,

(b) find the value of  $r$ .

$r =$  .....  
(3)

(Total for Question 23 is 4 marks)



- 24 In a computer game, a player can win up to 5 coins each time the game is played.  
The table shows information about the probability of winning each number of coins in any game.

|                            |     |     |           |      |     |     |
|----------------------------|-----|-----|-----------|------|-----|-----|
| <b>Number of coins won</b> | 0   | 1   | 2         | 3    | 4   | 5   |
| <b>Probability</b>         | 0.2 | $x$ | $x + 0.1$ | 0.18 | $x$ | 0.1 |

- (a) Find the value of  $x$ .

$$x = \dots\dots\dots (2)$$

- (b) Find the most likely number of coins that will be won in a game.

$$\dots\dots\dots (1)$$

The game is played 60 times.

- (c) Calculate an estimate for the number of times that 0 coins are won.

$$\dots\dots\dots (2)$$

**(Total for Question 24 is 5 marks)**



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25 The function  $f$  is such that  $f(x) = \frac{2x + 5}{x - 3}$

(a) Calculate  $f(2.5)$

.....  
(2)

(b) Find  $f^{-1}(x)$

$f^{-1}(x) =$  .....  
(3)

**(Total for Question 25 is 5 marks)**



26 A ship starts at point  $A$  and sails 5 kilometres on a bearing of  $135^\circ$  to point  $B$ .  
 The ship then sails 5 kilometres on a bearing of  $255^\circ$  to point  $C$ .  
 The ship then sails directly back to point  $A$ .

This information is shown in the diagram below.

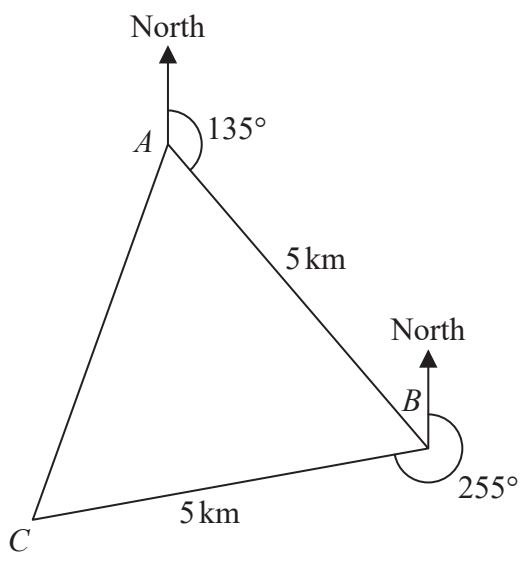


Diagram NOT accurately drawn

(a) Find the size of the acute angle  $ABC$ .

.....  
 (2)

(b) Write down the distance  $AC$ .

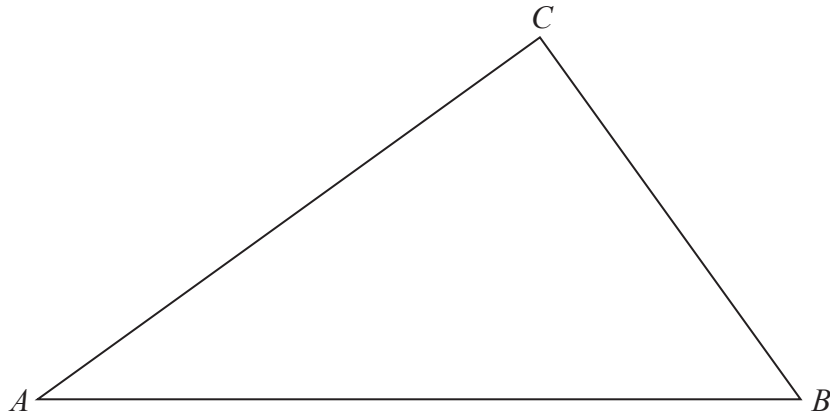
..... km  
 (1)

(c) Find the bearing of  $A$  from  $C$ .

.....  
 (2)

(Total for Question 26 is 5 marks)





The diagram shows the triangle  $ABC$ .

(a) **Showing all of your construction lines**, construct

- (i) the perpendicular bisector of  $AC$ ,
  - (ii) the locus of all points inside the triangle that are equidistant from  $AC$  and  $AB$ .
- (4)

The region  $R$  consists of all the points inside the triangle that are closer to  $AB$  than to  $AC$ , closer to  $C$  than to  $A$  and more than 5 cm from  $B$ .

- (b) Show, by shading, the region  $R$ .  
Label the region  $R$ .
- (2)

(Total for Question 27 is 6 marks)



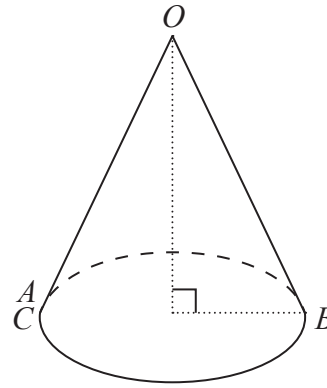
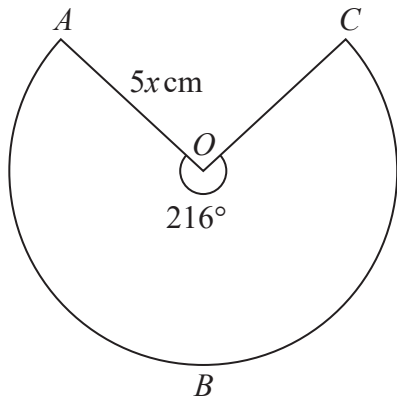


Diagram **NOT** accurately drawn

The diagram shows a piece of card in the shape of a sector,  $OABC$ , of a circle of radius  $5x$  cm and centre  $O$ .

The diagram also shows a hollow, right circular cone.

The cone is formed from the card by joining  $OA$  and  $OC$  together.

The arc  $ABC$  of the sector subtends an angle of  $216^\circ$  at  $O$ .

(a) Find an expression, in terms of  $x$ , for

(i) the radius of the cone,

radius = ..... cm  
(2)

(ii) the height of the cone.

height = ..... cm  
(2)

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Given that the volume of the cone is  $\frac{375\pi}{2} \text{ cm}^3$

(b) find the value of  $x$ .

$x = \dots\dots\dots$   
(3)

**(Total for Question 28 is 7 marks)**

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**TOTAL FOR PAPER IS 100 MARKS**



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