

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

Level 2 Certificate in Further Mathematics

FURTHER MATHEMATICS

Level 2 Paper 1 Non-Calculator

Monday 20 June 2016

Morning

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- mathematical instruments.
- You must **not** use a calculator.



Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information

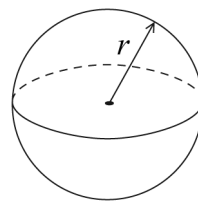
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 70.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.



Formulae Sheet

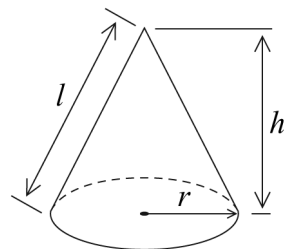
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

Curved surface area of cone $= \pi r l$



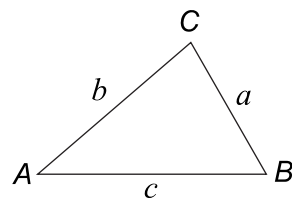
In any triangle ABC

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

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

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

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Trigonometric Identities

$$\tan \theta \equiv \frac{\sin \theta}{\cos \theta} \quad \sin^2 \theta + \cos^2 \theta \equiv 1$$



Answer **all** questions in the spaces provided.

1 $y = x^2(x - 10)$

Work out $\frac{dy}{dx}$

[3 marks]

Answer _____

2 $4 \begin{pmatrix} 1 - 2a \\ a \end{pmatrix} = \begin{pmatrix} b \\ 12 \end{pmatrix}$

Work out the values of a and b .

[3 marks]

$a =$ _____

$b =$ _____



3 The n th term of a sequence is $\frac{3n}{5n+12}$

3 (a) Work out the position of the term that has a value of $\frac{1}{2}$

[2 marks]

Answer _____

3 (b) Write down the limiting value of $\frac{3n}{5n+12}$ as $n \rightarrow \infty$

[1 mark]

Answer _____



4 The equation of a circle is $(x + 5)^2 + (y - 8)^2 = 10$

4 (a) What are the coordinates of the centre of the circle?
Circle your answer.

[1 mark]

$(-5, -8)$

$(-5, 8)$

$(5, 8)$

$(5, -8)$

4 (b) Write down the radius of the circle.

[1 mark]

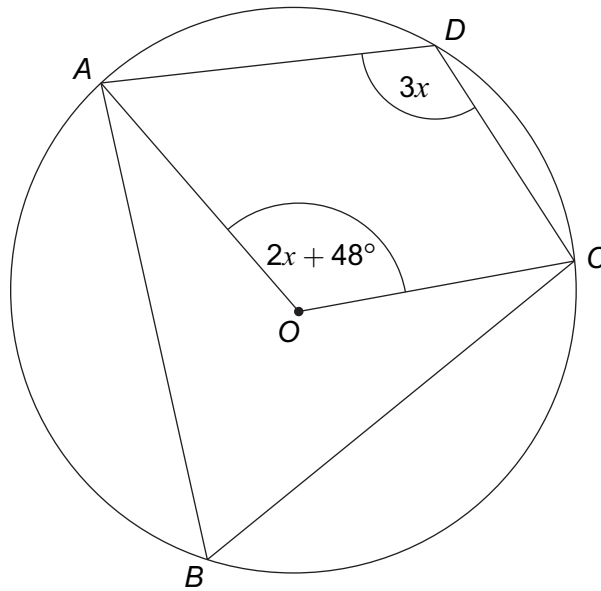
Answer _____

Turn over for the next question



- 5 A, B, C and D are points on a circle, centre O .

Not drawn
accurately



Work out the value of x .

[3 marks]

$x =$ _____ degrees



6 $mx + 4 - 2(x + p) \equiv 6(x + 1)$ where m and p are integers.

Work out the values of m and p .

[4 marks]

$$m = \underline{\hspace{2cm}}$$

$$p = \underline{\hspace{2cm}}$$

7 Work out the integer values of x for which $x^2 - 20x + 96 < 0$

[3 marks]

Answer $\underline{\hspace{2cm}}$



8 Solve $(3 - \sqrt{x})^{\frac{1}{3}} = -2$

[3 marks]

$x =$ _____

9 Expand and simplify $(x - 5)^3$

[3 marks]

Answer _____



10 $\sqrt[4]{x} = 2$ and $y^{-2} = 25$

$x > 0$ and $y < 0$

Work out the value of $\frac{x}{y}$

[4 marks]

Answer _____

Turn over for the next question



11 $A(1\frac{1}{5}, 3\frac{4}{5})$, $B(2, 1\frac{4}{5})$ and $C(5, 3)$ are points on a coordinate grid.

Show that the line segments AB and BC are perpendicular.

[3 marks]



12 You are given that $x^2 + 6x + 2 \equiv (x + h)^2 + k$

12 (a) Work out the values of h and k .

[2 marks]

$h =$ _____

$k =$ _____

12 (b) Write down the coordinates of the minimum point on the curve $y = x^2 + 6x + 2$

[1 mark]

Answer $(\text{_____}, \text{_____})$

12 (c) Solve the equation $x^2 + 6x + 2 = 0$

Give your answers in the form $a \pm \sqrt{b}$

[1 mark]

Answer _____

Turn over ►



13

Solve $\sqrt{125} + \sqrt{20} = \sqrt{80} + \sqrt{x}$ **[3 marks]**

 $x =$ _____

Show that the value of a is 1

[3 marks]

[illegible]

Answer



15

Rationalise the denominator and simplify fully

$$\frac{6}{\sqrt{7} + 2}$$

[3 marks]

Answer _____



16 Angle θ is obtuse and $\sin \theta = \frac{\sqrt{11}}{6}$

Work out the value of $\cos \theta$

[4 marks]

Answer _____

Turn over for the next question

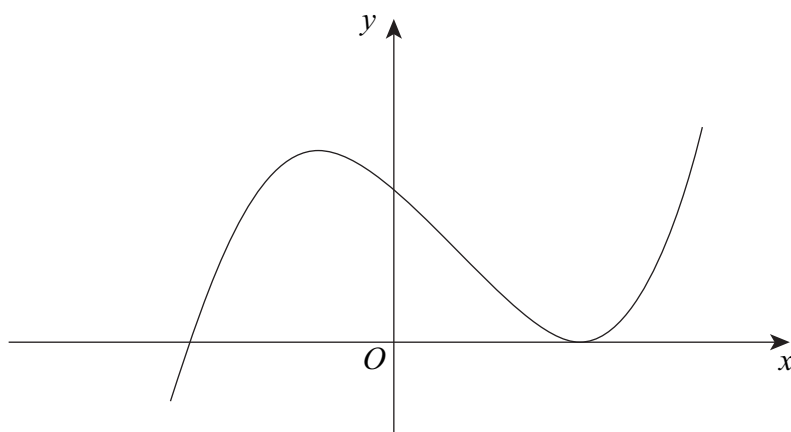
Turn over ►

7



The diagram shows a sketch of the cubic curve $y = \frac{1}{3}x^3 - x^2 - 3x + k$ where k is a constant.

Not drawn
accurately



[5 marks]

[illegible]
$$k =$$


18

Factorise fully

$x^4 - 81$

[2 marks]

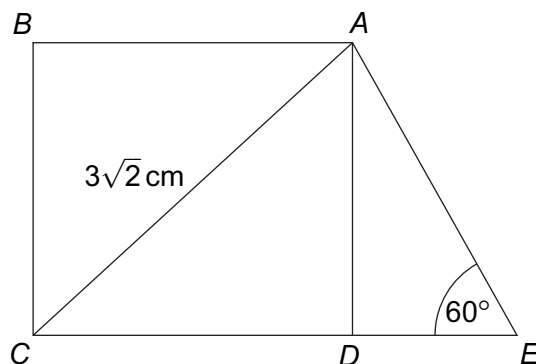
Answer _____

Turn over for the next question**Turn over ►**

19

$ABCD$ is a square.
 CDE is a straight line.

AC is $3\sqrt{2}$ cm and angle $DEA = 60^\circ$



Not drawn
accurately

19 (a)

Show that the side of the square is 3 cm

[2 marks]

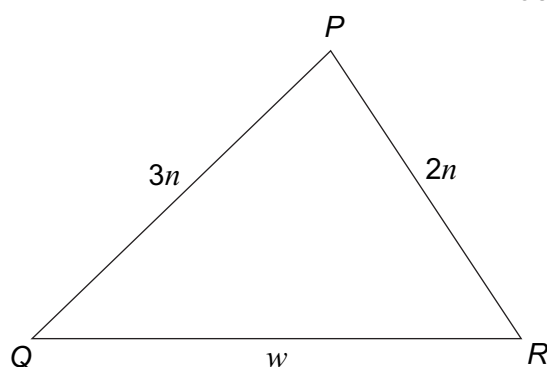
19 (b)

Show that the perimeter of trapezium $ABCE$ is $3(3 + \sqrt{3})$ cm

[4 marks]



20

In triangle PQR , $\cos P = \frac{1}{3}$ Not drawn
accuratelyShow that triangle PQR is isosceles.**[4 marks]**

END OF QUESTIONS

There are no questions printed on this page

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