Centre Number						Candidate Number				
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Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16	
TOTAL	

AQA

Level 2 Certificate in Further Mathematics
June 2013

Further Mathematics 8360/1

Level 2

Paper 1 Non-Calculator

Wednesday 19 June 2013 1.30 pm to 3.00 pm

For this paper you must have:
- mathematical instruments.

You may **not** use a calculator.

Time allowed
- 1 hour 30 minutes

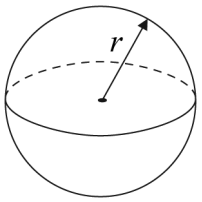
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that 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

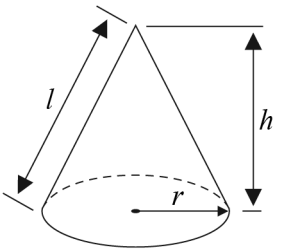
Volume of sphere $= \frac{4}{3}\pi r^3$

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



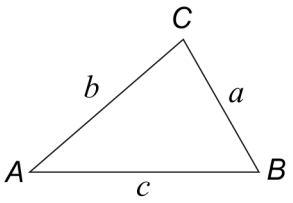
Volume of cone $= \frac{1}{3}\pi r^2 h$

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



In any triangle ABC

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



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

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

$\tan\theta \equiv \dfrac{\sin\theta}{\cos\theta}$ $\qquad \sin^2\theta + \cos^2\theta \equiv 1$

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

1 A curve has gradient function $\frac{dy}{dx} = 9 - x^3$

1 (a) Work out the gradient of the curve when $x = -1$

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Answer..... *(2 marks)*

1 (b) Work out the value of x where the rate of change of y with respect to x is 1.

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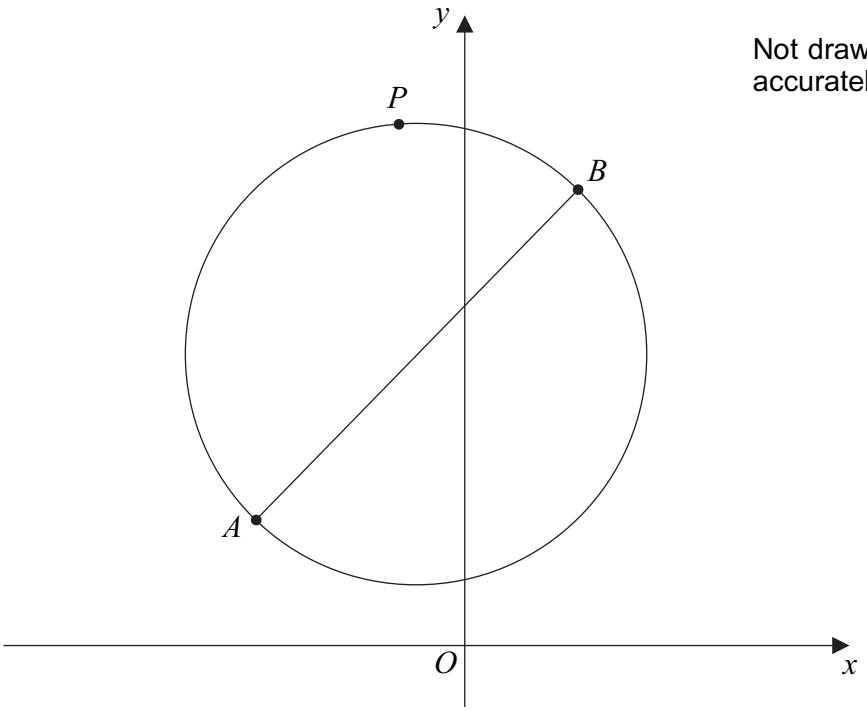
Answer..... *(2 marks)*

Turn over for the next question

4

2 A is $(-4, 3)$ and B is $(2, 11)$

AB is a diameter of the circle.



Not drawn accurately

2 (a) Work out the coordinates of the centre of the circle.

Centre $= \left(\text{.....}, \text{.....}\right)$ *(2 marks)*

2 (b) Work out the radius of the circle.

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Radius = ... *(2 marks)*

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

Answer ..... *(1 mark)*

2 (d) P is another point on the circle.
The gradient of the line AP is 2.

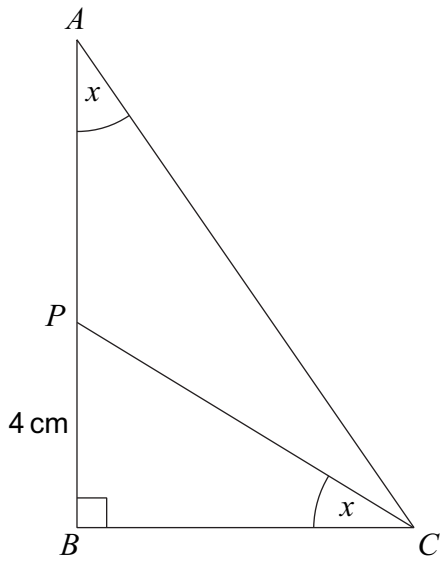
Write down the gradient of the line PB.

Answer..... *(1 mark)*

Turn over for the next question

6

3 ABC is a right-angled triangle.
P is a point on AB.



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$BP = 4\,\text{cm}$ and $\tan x = \frac{2}{3}$

3 (a) Work out the length of BC.

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Answer ..... cm *(2 marks)*

3 (b) Work out the length of AP.

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Answer ..... cm *(3 marks)*

4 Solve $\sqrt{(33+\sqrt{x})}=6$

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$x =$ ..... *(3 marks)*

5 (a) Show that $(x+7)^2-(x-3)^2$ simplifies to $20(x+2)$

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(3 marks)

5 (b) Hence, or otherwise, work out 107^2-97^2

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Answer..... *(2 marks)*

13

Turn over ▶

6 Simplify $(3xy^5)^4$

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Answer..... *(2 marks)*

7 Expand and simplify $(y^2 - 5y + 2)(2y - 3)$

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Answer..... *(3 marks)*

8 A curve has equation $y = x^4 - 5x^2 + 9$

8 (a) Work out $\frac{dy}{dx}$

$\frac{dy}{dx} =$ ..... *(2 marks)*

8 (b) Work out the equation of the tangent to the curve at the point where $x = 2$

Give your answer in the form $y = mx + c$

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Answer..... *(4 marks)*

11

9 Solve $x^2 + 6x + 7 = 0$

Give your answer in the form $a \pm \sqrt{b}$, where a and b are integers.

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Answer..... *(4 marks)*

10 Make x the subject of the formula $\dfrac{a + 2x}{a - x} = n$

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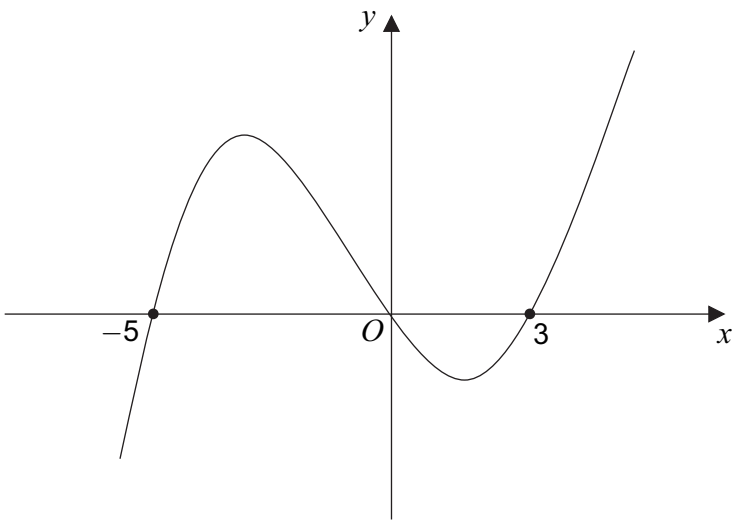
Answer..... *(4 marks)*

11 Here is a sketch of a cubic function $y = \mathrm{f}(x)$



11 (a) Use the sketch to write down the **three** linear factors of $\mathrm{f}(x)$.

Answer ..... , ... , ... *(2 marks)*

11 (b) You are given that $\mathrm{f}(x) = x^3 + bx^2 + cx$

Work out the values of b and c.

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$b =$ ..... , $c =$ ..... *(2 marks)*

12

12 Work out **all** solutions for x and y if $\begin{pmatrix} x & 3 \\ 1 & y \end{pmatrix}\begin{pmatrix} x \\ -4 \end{pmatrix} = \begin{pmatrix} 4x \\ 8 \end{pmatrix}$

Answer..... *(5 marks)*

13 Solve $y(\sqrt{3}-1)=8$

Give your answer in the form $a+b\sqrt{3}$ where a and b are integers.

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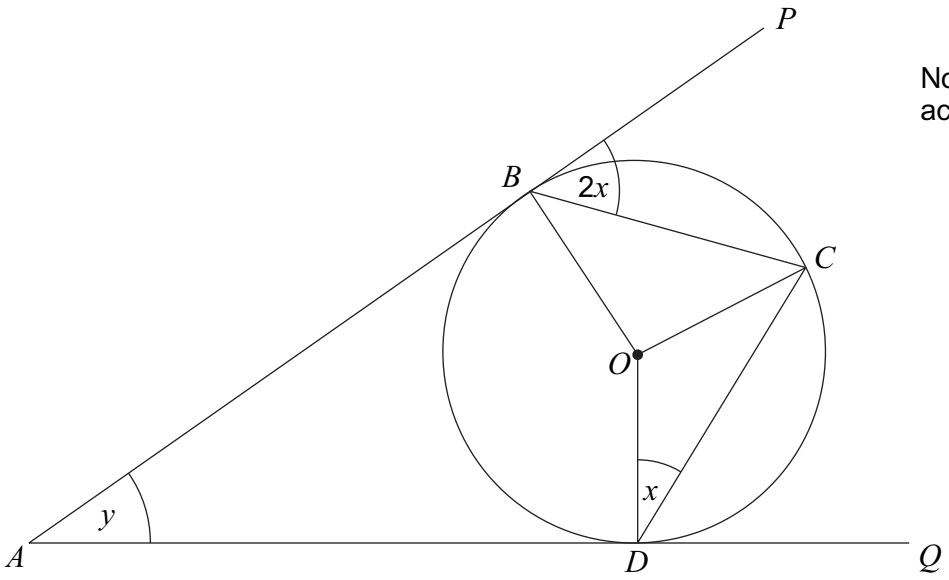
$y=$ ..... *(4 marks)*

Turn over for the next question

9

14 ABP and ADQ are tangents to the circle, centre O.

C lies on the circumference of the circle.



Not drawn accurately

Prove that $y = 2x$
Give reasons for any statements you make.

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(6 marks)

15 Express $2x^2 - 12x - 7$ in the form $a(x + b)^2 + c$

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Answer..... *(4 marks)*

Turn over for the next question

10

16 Solve $x^{-\frac{2}{3}} = 7\frac{1}{9}$

Write your answer as a proper fraction.

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$x =$ ..... *(5 marks)*

END OF QUESTIONS

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