

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



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

<p><b>For this paper you must have:</b></p> <ul style="list-style-type: none"> <li>mathematical instruments.</li> </ul> <p>You may <b>not</b> use a calculator.</p>	
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### 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.

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

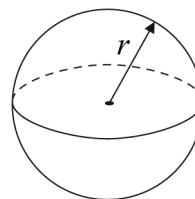


J U N 1 3 8 3 6 0 1 0 1

### Formulae Sheet

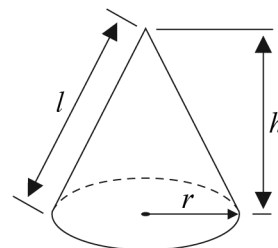
**Volume of sphere**  $= \frac{4}{3}\pi r^3$

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



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

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



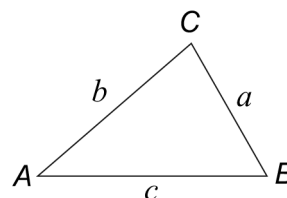
**In any triangle ABC**

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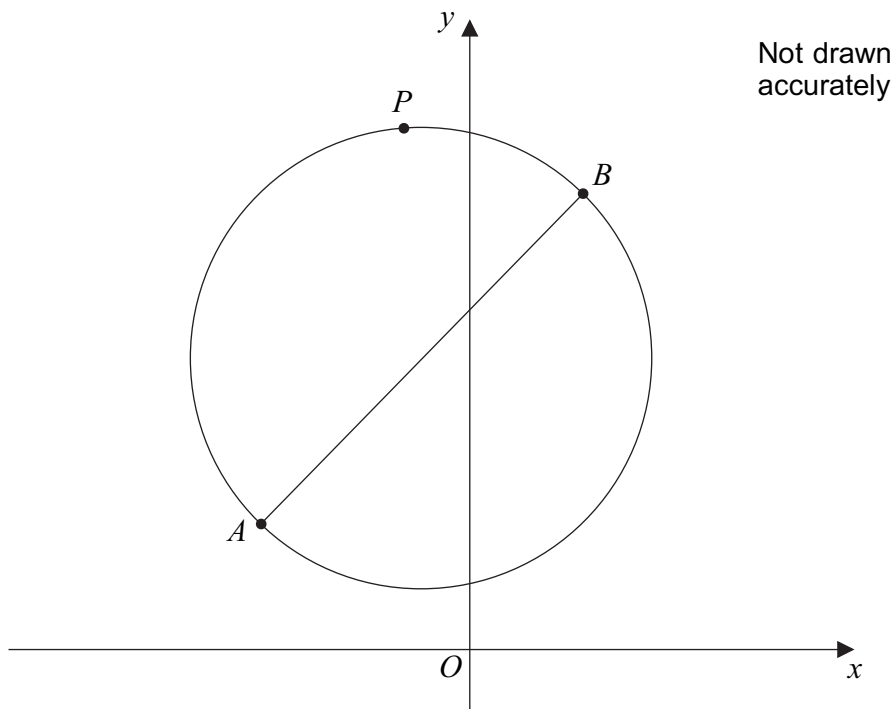
Answer..... (2 marks)

**Turn over for the next question**



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

$AB$  is a diameter of the circle.



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

Centre = ( ..... , ..... ) (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  $PB$ .

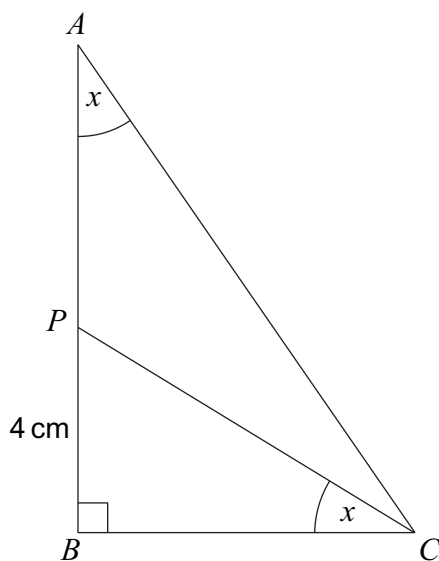
Answer..... (1 mark)

**Turn over for the next question**

**Turn over ►**



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



Not drawn  
accurately

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

- 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)



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  $\frac{dy}{dx}$

$$\frac{dy}{dx} = \dots\dots\dots (2 \text{ marks})$$

**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)



**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  $\frac{a + 2x}{a - x} = n$

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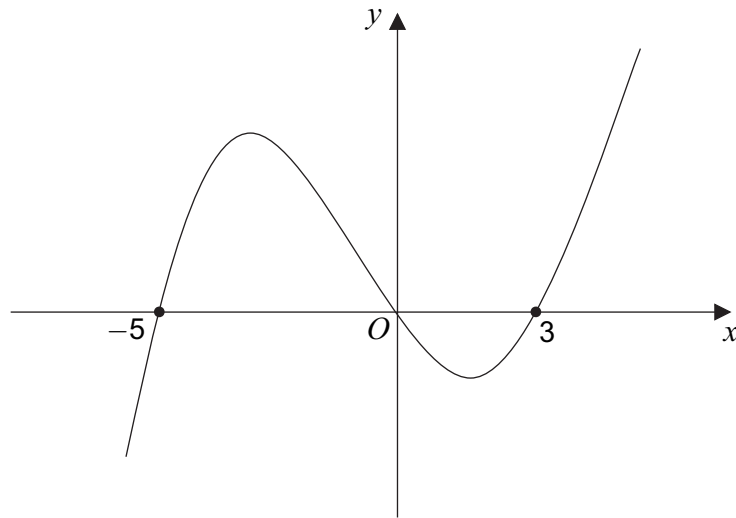
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Answer..... (4 marks)



- 11** Here is a sketch of a cubic function  $y = f(x)$



- 11 (a)** Use the sketch to write down the **three** linear factors of  $f(x)$ .

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

- 11 (b)** You are given that  $f(x) = x^3 + bx^2 + cx$

Work out the values of  $b$  and  $c$ .

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

Turn over ►



**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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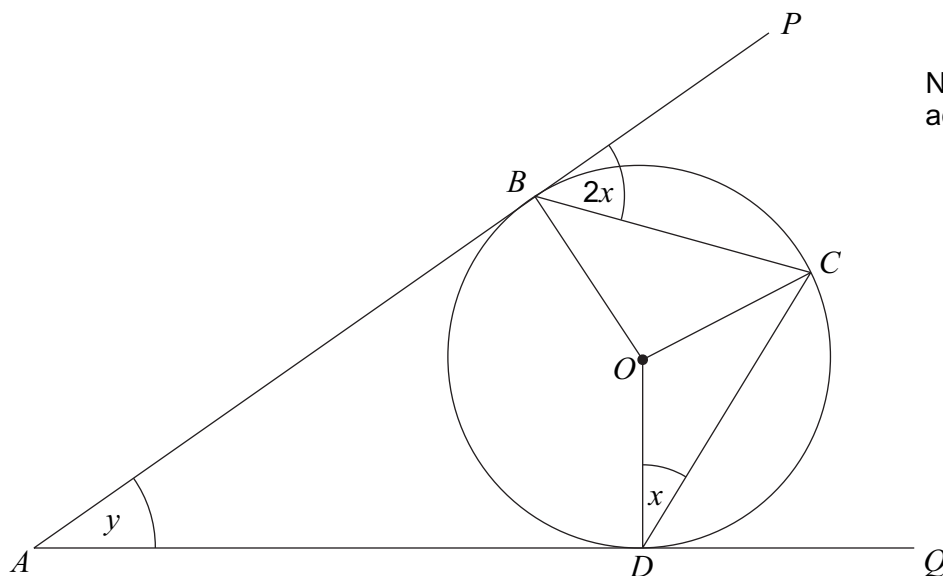
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 $y =$  ..... (4 marks)**Turn over for the next question**

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

Not drawn  
accurately



Give reasons for any statements you make.

[illegible]

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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**

**Turn over ►**



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**

