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	
TOTAL	

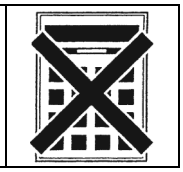
Level 2 Certificate in Further Mathematics
June 2012

Further Mathematics 8360/1
Level 2
Paper 1 Non-Calculator

Tuesday 29 May 2012 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

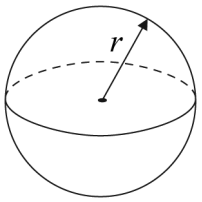
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this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

Formulae Sheet

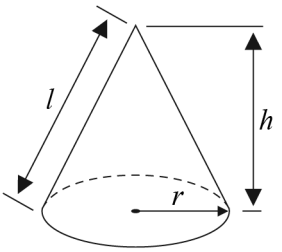
Volume of sphere $= \frac{4}{3}\pi r^3$

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



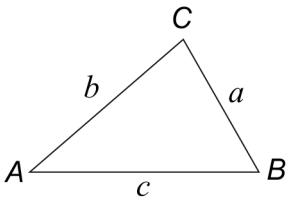
Volume of cone $= \frac{1}{3}\pi r^2 h$

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

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

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

1 $f(x) = 2x^2 + 7$ for all values of x.

1 (a) What is the value of $f(-1)$?

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

1 (b) What is the range of $f(x)$?

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

2 $\mathbf{A} = \begin{pmatrix} 2 & 0 \\ 1 & 3 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 5 \\ 4 \end{pmatrix}$

Work out the matrix **AB**.

AB = ... *(2 marks)*

4

3 Work out the greatest integer value of x that satisfies the inequality $3x + 10 < 1$

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

4 (a) Factorise fully $2x^2 - 2x - 40$

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

4 (b) Factorise fully $(x + y)^2 + (x + y)(2x + 5y)$

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

5 Simplify $(2cd^4)^3$

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

6 Solve the simultaneous equations

$$2y = 3x + 4$$
$$2x = -3y - 7$$

Do **not** use trial and improvement.

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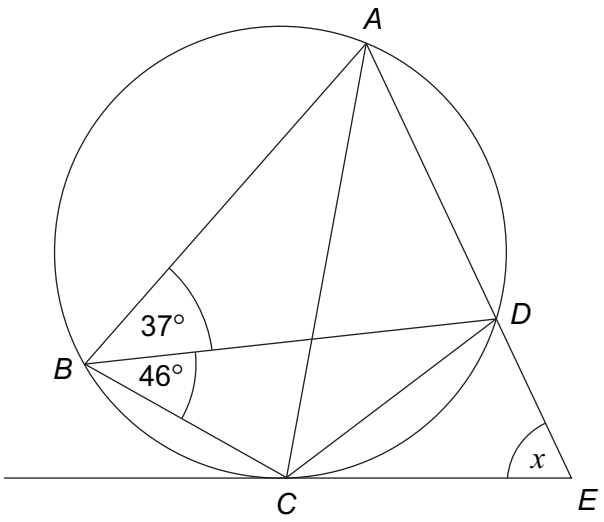
Answer..... *(4 marks)*

14

7 The diagram shows a cyclic quadrilateral *ABCD*.

ADE is a straight line.
CE is a tangent to the circle.



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Work out the size of angle x.

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

8 A curve has equation $y = x^3 + 5x^2 + 1$

8 (a) When $x = -1$, show that the value of $\frac{dy}{dx}$ is -7.

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(2 marks)

8 (b) Work out the equation of the tangent to the curve $y = x^3 + 5x^2 + 1$ at the point where $x = -1$

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

Turn over for the next question

9 Write this ratio in its simplest form

$$\sqrt{12} : \sqrt{48} : \sqrt{300}$$

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

10 The n^{th} term of the linear sequence 2 7 12 17 ... is $5n - 3$

A new sequence is formed by squaring each term of the linear sequence and adding 1.

Prove algebraically that **all** the terms in the new sequence are multiples of 5.

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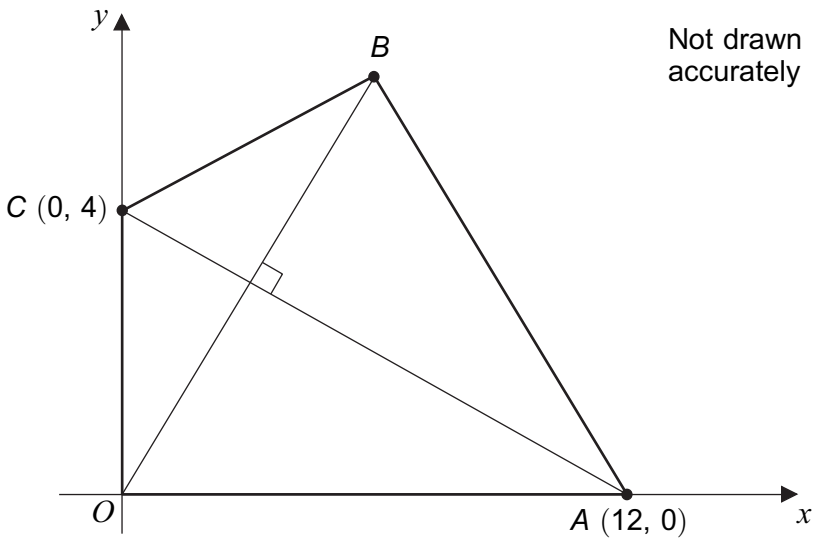
(4 marks)

11 $OABC$ is a kite.



11 (a) Work out the equation of AC.

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

11 (b) Work out the coordinates of B.

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Answer (..... , ...) *(6 marks)*

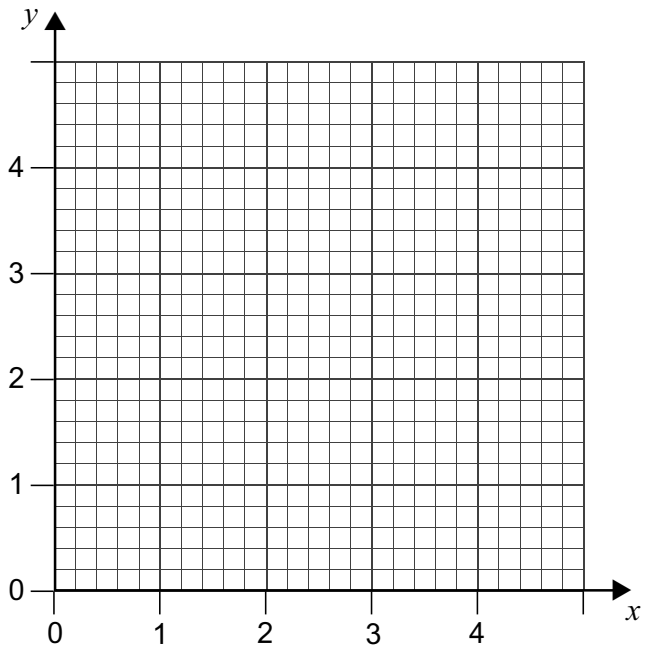
15

Turn over ▶

12 (a) A graph passes through $(0, 0)$.

The rate of change of y with respect to x is always $\frac{1}{2}$.

Draw the graph of y for values of x from 0 to 4.

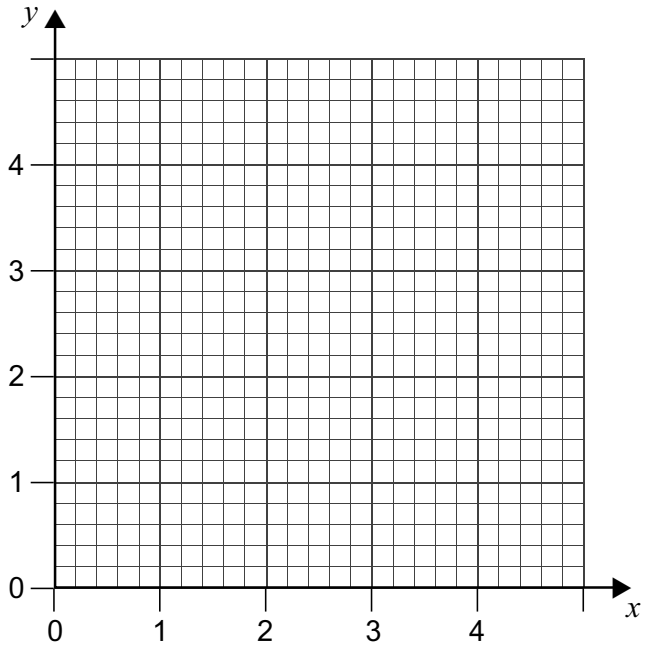


(1 mark)

12 (b) A graph passes through $(1, 2)$.

The rate of change of y with respect to x is always 0.

Draw the graph of y for values of x from 0 to 4.



(1 mark)

12 (c) $y = 2x^3 + ax$, where a is a constant.

The value of $\frac{dy}{dx}$ when $x = 2$ is twice the value of $\frac{dy}{dx}$ when $x = -1$

Work out the value of a.

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

Turn over for the next question

7

13 Simplify $\dfrac{x^2 + 4x - 12}{x^2 - 25} \div \dfrac{x + 6}{x^2 - 5x}$

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

14 $x^{\frac{3}{2}} = 8$ where $x > 0$ and $y^{-2} = \dfrac{25}{4}$ where $y > 0$

Work out the value of $\dfrac{x}{y}$.

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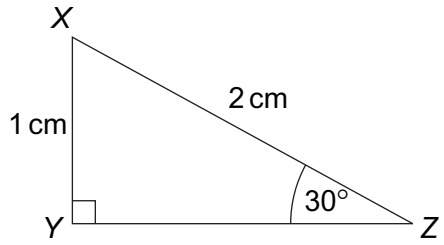
$\dfrac{x}{y} =$ ..... *(5 marks)*

15 (a) *XYZ* is a right-angled triangle.



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Use triangle *XYZ* to show that $\sin 60° = \frac{\sqrt{3}}{2}$

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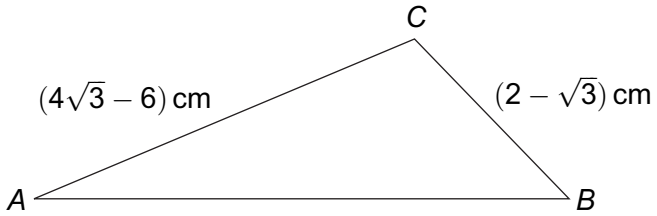
(2 marks)

15 (b) Triangle *ABC* has an obtuse angle at *C*.



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Given that $\sin A = \frac{1}{4}$, use triangle *ABC* to show that angle $B = 60°$

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(6 marks)

18

16 Prove that $\tan\theta + \frac{1}{\tan\theta} \equiv \frac{1}{\sin\theta\cos\theta}$

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(3 marks)

END OF QUESTIONS

3

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