

Centre Number						Candidate Number				
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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

<p>For this paper you must have:</p> <ul style="list-style-type: none"> mathematical instruments. <p>You may not 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 booklet.

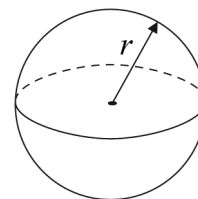


J U N 1 2 8 3 6 0 1 0 1

Formulae Sheet

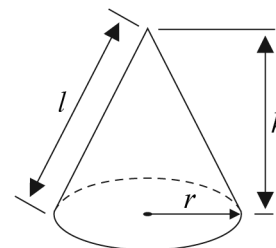
$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

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



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

$$\text{Curved surface area of cone} = \pi r l$$



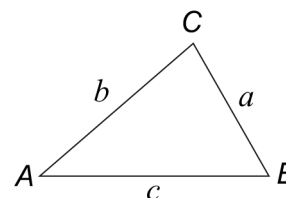
In any triangle ABC

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

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

$$\text{Cosine rule} \quad a^2 = b^2 + c^2 - 2bc \cos A$$

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



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 $f(x) = 2x^2 + 7$ 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)



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.

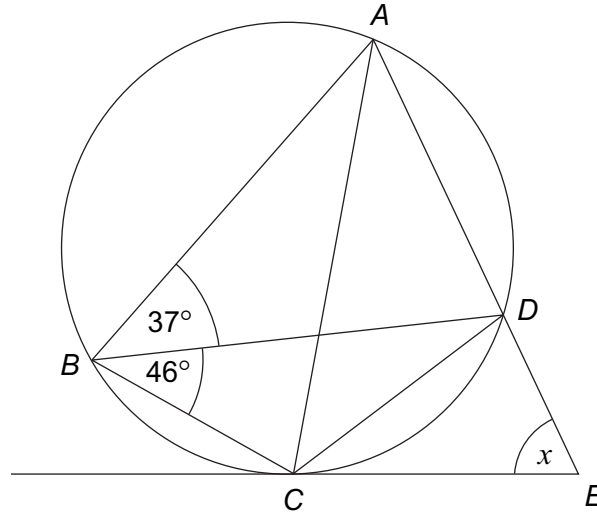
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Answer..... (4 marks)



7 The diagram shows a cyclic quadrilateral $ABCD$.

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



Not drawn
accurately

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.

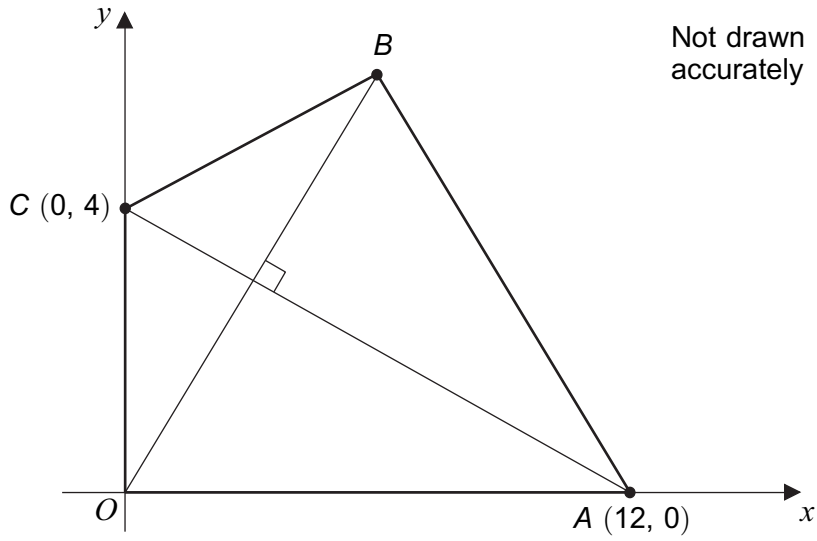
Prove algebraically that **all** the terms in the new sequence are multiples of 5.

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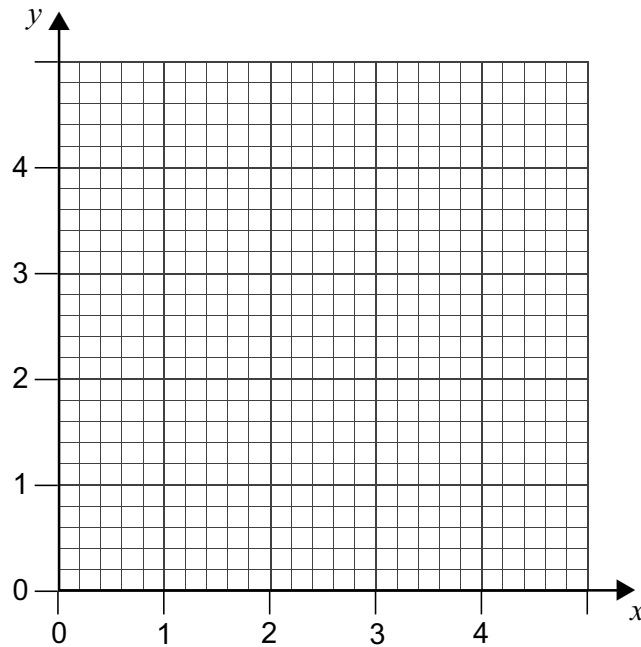
Answer (..... ,) (6 marks)



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.

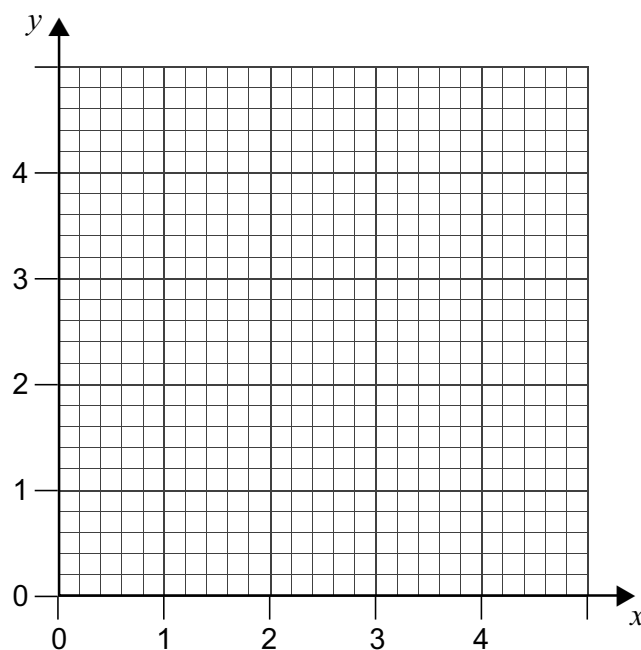


(1 mark)

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

Turn over ►



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

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Answer..... (5 marks)

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

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

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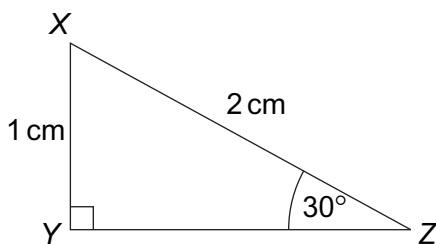
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$\frac{x}{y} =$ (5 marks)



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



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accurately

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

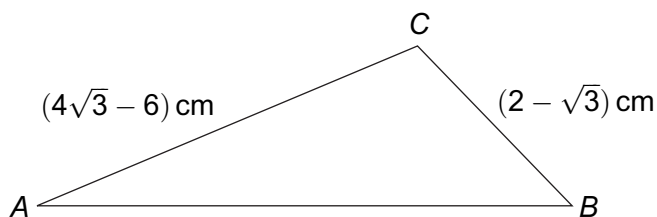
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(2 marks)

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



Not drawn
accurately

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

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(6 marks)



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



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