Centre Number					Candidate Number				
Surname									
Other Names									
Candidate Signature									

AQA

Level 2 Certificate in Further Mathematics
June 2014

Further Mathematics 8360/1

Level 2

Paper 1   Non-Calculator

Monday 16 June 2014   9.00 am to 10.30 am

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.

8360/1

2

Formulae Sheet

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

Surface area of sphere $= 4\pi r^2$
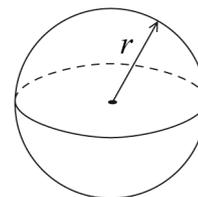
Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$
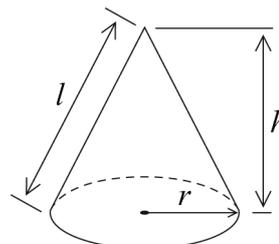
In any triangle ABC

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

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

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

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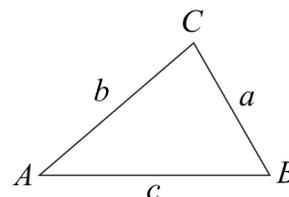
The Quadratic Equation

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

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

4

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

1 A straight line has gradient -2 and passes through the point $(-3, 10)$.

Work out the equation of the line.
Give your answer in the form $y = mx + c$

[2 marks]

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Answer ....

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

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

[2 marks]

Answer ....

Turn over for the next question

4

Turn over ▶

3 A transformation is given by the matrix **M**, where $\mathbf{M} = \begin{pmatrix} 1 & a \\ 0 & 2 \end{pmatrix}$

The image of the point $(b, 5)$ under **M** is $(5, b)$.

Work out the values of a and b.

[3 marks]

$a = $ .... , $b = $ ....

4 Solve $20 + w < 3(w + 2)$

[3 marks]

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Answer ....

5 $f(x) = 10 - x^2$ for all values of x.

$g(x) = (x + 2a)(x + 3)$ for all values of x.

5 (a)   Circle the correct value of $f(-4)$

[1 mark]

26   −6   36   16   196

5 (b)   Write down the range of $f(x)$.

[1 mark]

Answer ....

5 (c) $g(0) = 24$

Show that $a = 4$

[1 mark]

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5 (d)   Hence solve $f(x) = g(x)$

[4 marks]

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Answer ....

6 The nth term of a sequence is $\dfrac{2n^2 + 7}{3n^2 - 2}$

6 (a) Work out the 7th term.
Give your answer as a fraction in its simplest form.

[2 marks]

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Answer ....

6 (b) Show that the limiting value of $\dfrac{2n^2 + 7}{3n^2 - 2}$ as $n \to \infty$ is $\dfrac{2}{3}$

[2 marks]

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7 $ABCD$ is a cyclic quadrilateral.

Not drawn
accurately

Work out the values of x and y.

[5 marks]

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$x =$ .... , $y =$ ....

9

Turn over ▶

8 (a)   Factorise fully $3x^2 - 12$

[2 marks]

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Answer ....

8 (b)   Factorise $5x^2 + 4xy - 12y^2$

[3 marks]

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Answer ....

9 ABC is a straight line.
BC is 20% of AC.

$A(-9, 18)$

Not drawn accurately

B

$C(16, 3)$
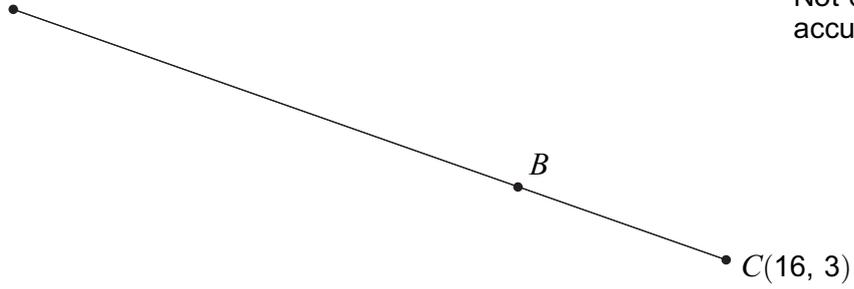
Work out the coordinates of B.

[4 marks]

Answer (................ , ...)

Turn over for the next question

9

10 Rationalise the denominator of $\dfrac{8}{3-\sqrt{5}}$

Give your answer in the form $a + b\sqrt{5}$ where a and b are integers.

[3 marks]

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Answer ....

11 (a)   Here is triangle ABC.
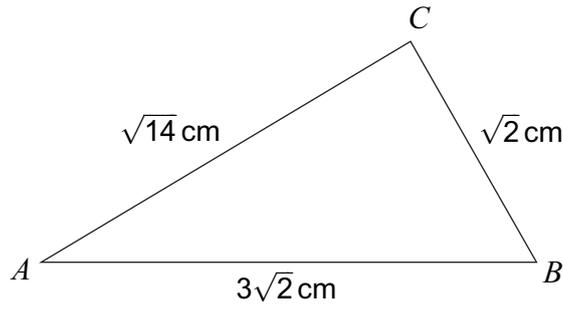
Not drawn accurately

Show that angle $B = 60°$

[3 marks]

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11 (b)   Hence work out the area of triangle ABC.

[3 marks]

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Answer .... cm^2

9

Turn over ▶

12 The line $x = -9$ is a tangent to the circle, centre $C(8, 20)$
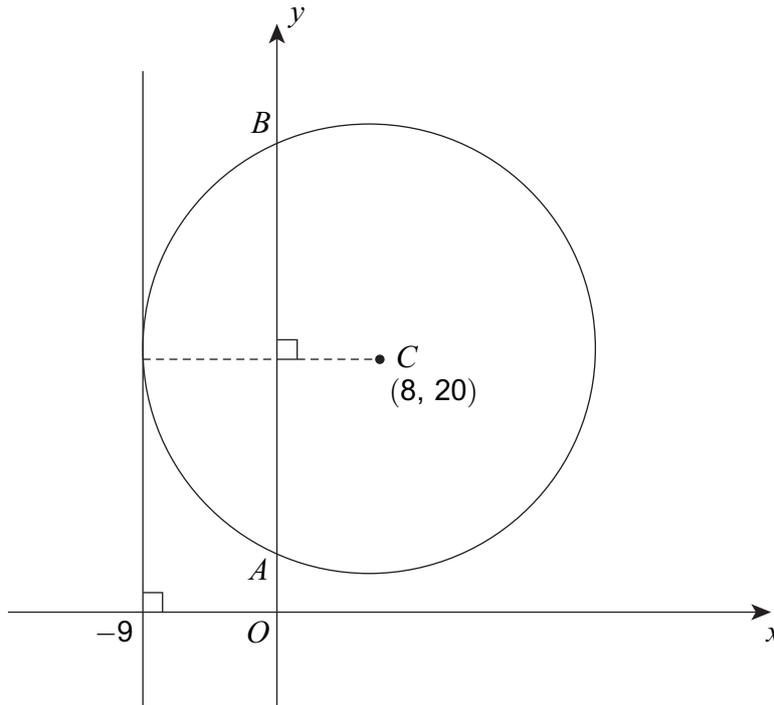
Not drawn
accurately

12 (a) Show that the radius of the circle is 17.

[1 mark]

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12 (b) The circle intersects the y-axis at A and B.

Show that the length AB is 30.

[3 marks]

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13 A curve has equation $y = x^3 - 3x^2 + 5$

13 (a) Show that the curve has a minimum point when $x = 2$

[4 marks]

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13 (b) Show that the tangent at the minimum point meets the curve again when $x = -1$

[3 marks]

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11

Turn over ▶

14 $(x - a)$ is a factor of $x^3 + 2ax^2 - a^2x - 16$

14 (a) Show that $a = 2$

[2 marks]

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14 (b) Solve $x^3 + 4x^2 - 4x - 16 = 0$

[4 marks]

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Answer ....

15   Prove that $\dfrac{\sin\theta - \sin^3\theta}{\cos^3\theta} \equiv \tan\theta$

[3 marks]

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Turn over for the next question

9

Turn over ▶

16 $2x^2 - 2bx + 7a \equiv 2(x - a)^2 + 3$

Work out the **two** possible pairs of values of a and b.

[6 marks]

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$a =$ ...., $b =$ ....

and

$a =$ ...., $b =$ ....

END OF QUESTIONS

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