| Centre Number | | | | | | Candidate Number | | | | |
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| Other Names | | | | | | | | | | |
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| For Examiner's Use | |
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| 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 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

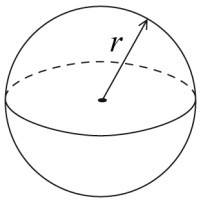
**Instructions**
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this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

## Formulae Sheet

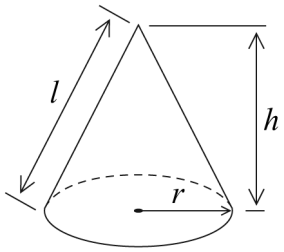
**Volume of sphere** $= \frac{4}{3}\pi r^3$

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



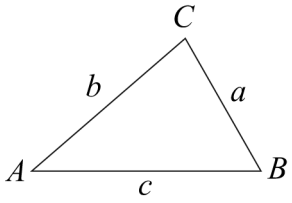

**Volume of cone** $= \frac{1}{3}\pi r^2 h$

**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 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 $\frac{\mathrm{d}y}{\mathrm{d}x}$

**[2 marks]**

Answer .....

**Turn over for the next question**

4

**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 .....

13

**6** The $n$th 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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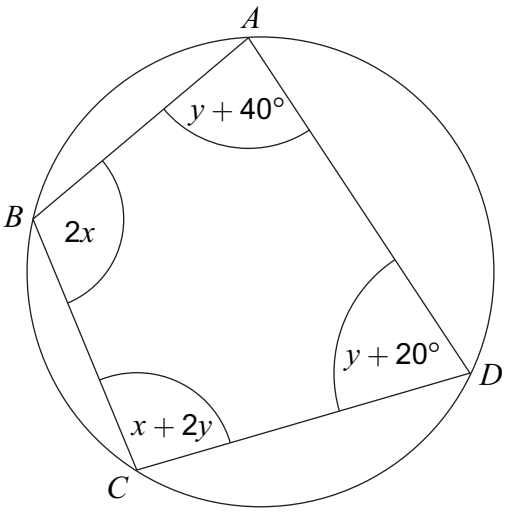
**7** $ABCD$ is a cyclic quadrilateral.




Not drawn accurately

Work out the values of $x$ and $y$.

**[5 marks]**

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

9

**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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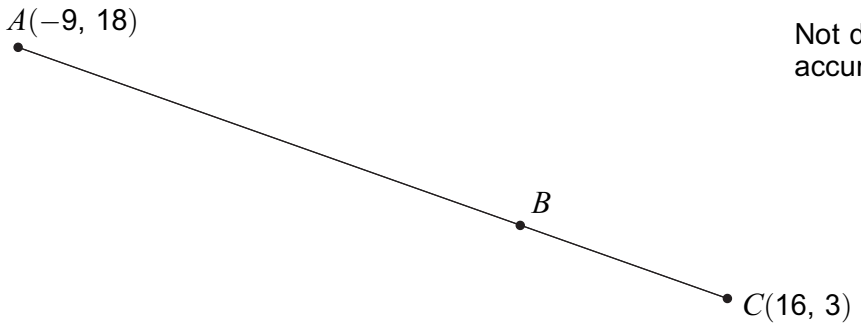
Answer .....

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

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Work out the coordinates of $B$.

**[4 marks]**

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

**Turn over for the next question**

**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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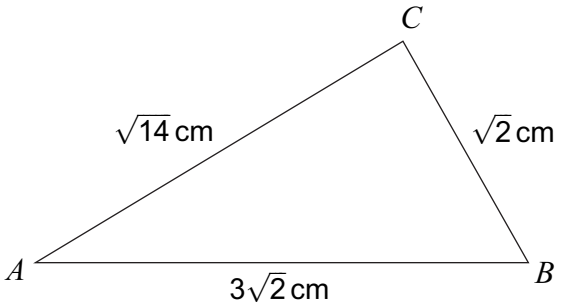
Answer .....

**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 ..... $cm^2$

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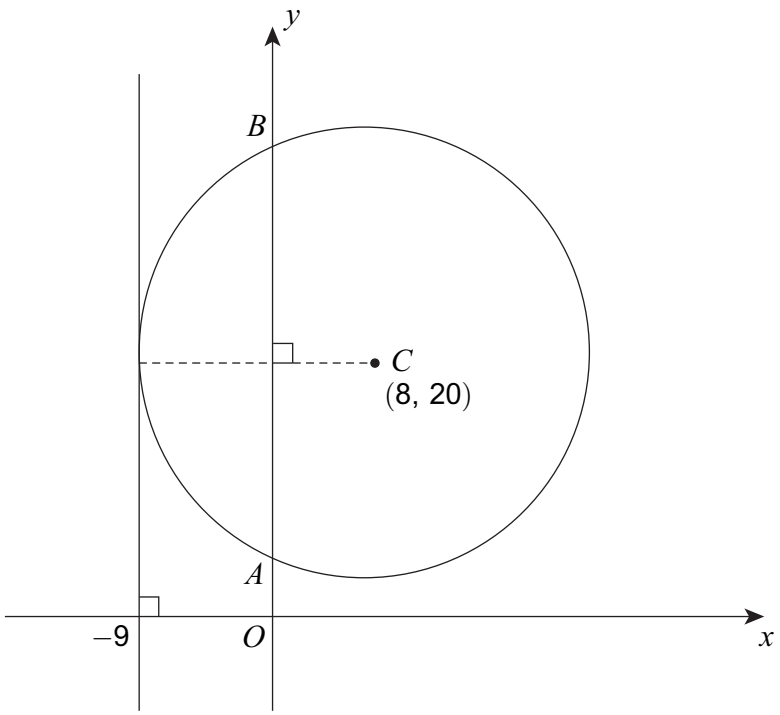
**12** The line $x = -9$ is a tangent to the circle, centre $C(8, 20)$




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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**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**

**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**



6