

Centre Number						Candidate Number				
Surname										
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Candidate Signature										



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

<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 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 4 8 3 6 0 1 0 1

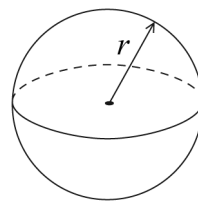
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Formulae Sheet

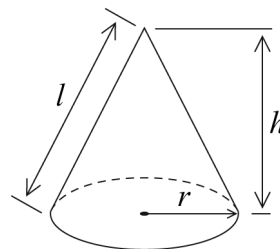
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

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



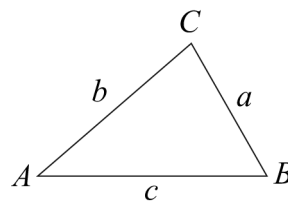
In any triangle ABC

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 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 $\frac{dy}{dx}$

[2 marks]

Answer

Turn over for the next question



3

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

The image of the point $(b, 5)$ under \mathbf{M} is $(5, b)$.

Work out the values of a and b .

[3 marks]

$a = \dots\dots\dots, b = \dots\dots\dots$

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 n th term of a sequence is $\frac{2n^2 + 7}{3n^2 - 2}$

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 $\frac{2n^2 + 7}{3n^2 - 2}$ as $n \rightarrow \infty$ is $\frac{2}{3}$

[2 marks]

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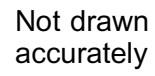
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$ABCD$ is a cyclic quadrilateral.



[5 marks]

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$x = \dots\dots\dots, y = \dots\dots\dots$

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

Turn over ►



10

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

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

[3 marks]

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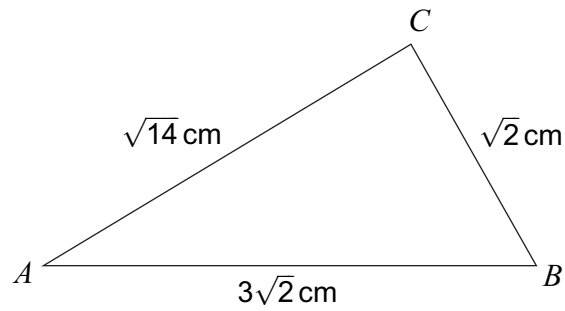
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Answer



11 (a) Here is triangle ABC .



Not drawn
accurately

Show that angle $B = 60^\circ$

[3 marks]

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

[3 marks]

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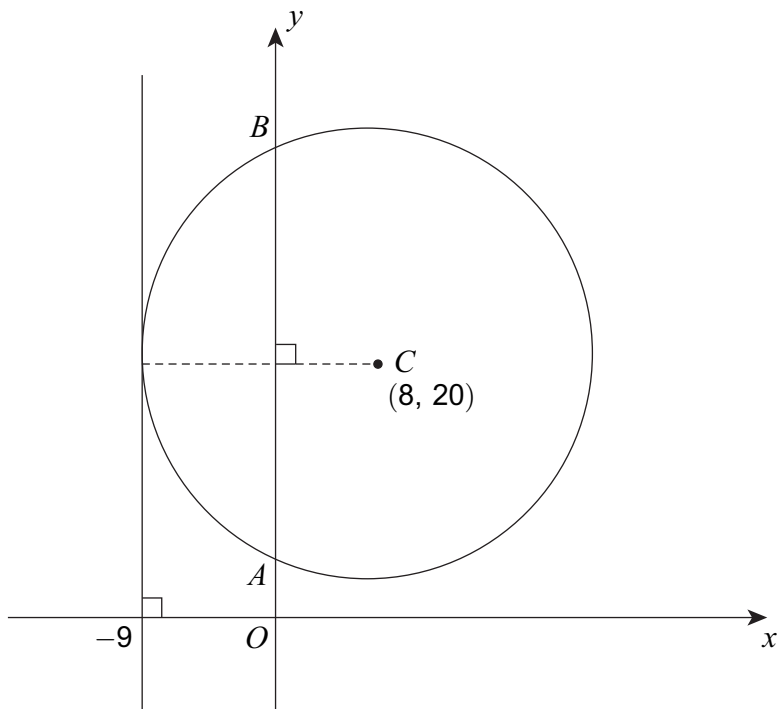
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Answer cm^2

Turn over ►



12The 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 $\frac{\sin \theta - \sin^3 \theta}{\cos^3 \theta} \equiv \tan \theta$

[3 marks]

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Turn over for the next question**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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$$a = \dots\dots\dots, b = \dots\dots\dots$$

and

$$a = \dots\dots\dots, b = \dots\dots\dots$$

END OF QUESTIONS