

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



Level 2 Certificate in Further Mathematics
June 2015

Further Mathematics

8360/1

Level 2

Paper 1 Non-Calculator

Monday 15 June 2015 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.

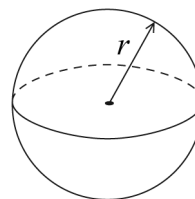
For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16 – 17	
18 – 19	
20 – 21	
TOTAL	



Formulae Sheet

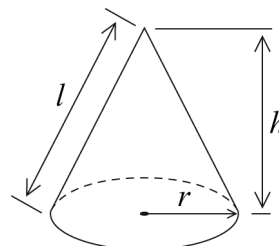
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

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



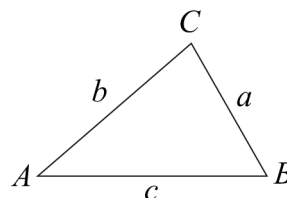
In any triangle ABC

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 GH is a straight line.

The coordinates of G are $(-2, 8)$

The midpoint of GH is $(5, -3)$

Work out the coordinates of H .

[2 marks]

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Answer (.....,))

Turn over for the next question

2

Turn over ►



2 A straight line with equation $y = mx + c$ has gradient m and y -intercept c .

Here are the equations of four straight lines, P, Q, R and S.

P $2y - 4x = 5$

Q $5y = 2x - 4$

R $2y - 4 = 5x$

S $4y = 5 - 2x$

2 (a) Circle the line that passes through $(7, 2)$ **[1 mark]**

P

Q

R

S

2 (b) Circle the line with gradient $2\frac{1}{2}$ **[1 mark]**

P

Q

R

S

2 (c) Circle the line with y -intercept $2\frac{1}{2}$ **[1 mark]**

P

Q

R

S

2 (d) Circle the line with a negative gradient. **[1 mark]**

P

Q

R

S

2 (e) Circle a pair of perpendicular lines. **[1 mark]**

P

Q

R

S



3

Solve $2(3x + 1) > 3 - 4x$

[2 marks]

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Answer

Turn over for the next question



4 The equation of a curve is $y = x^2 - 5x$

4 (a) Work out $\frac{dy}{dx}$

[2 marks]

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Answer

4 (b) P is a point on the curve.
The tangent to the curve at P has gradient 1

Work out the coordinates of P .

[2 marks]

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Answer (..... ,)



5 In the expansion of $(x + 2)(x^2 + kx - 3)$ the coefficient of x^2 is zero.

5 (a) Work out the value of k .

[1 mark]

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Answer

5 (b) Work out the coefficient of x .

[2 marks]

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Answer

Turn over for the next question



6 A bag contains $5x$ red balls and $2x$ blue balls.
The number of red balls is **decreased** by 20%
The number of blue balls is **increased** by 30%
There are now 35 **more** red balls than blue balls in the bag.
Work out the value of x .

[4 marks]

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Answer



7 $3x^3 - 2x^2 - 147x + 98 \equiv (ax - c)(bx + d)(bx - d)$

where a, b, c and d are positive integers.

Work out the values of a, b, c and d .

[3 marks]

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$a = \dots\dots\dots b = \dots\dots\dots c = \dots\dots\dots d = \dots\dots\dots$

Turn over for the next question



Turn over ►

7

8

Simplify fully

$$\frac{5x}{(x+4)(x-6)} - \frac{3}{(x-6)}$$

[4 marks]

Answer



9 Given that $\begin{pmatrix} 3 & -1 \\ 2 & 1 \end{pmatrix} \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} b \\ a+1 \end{pmatrix}$

work out the values of a and b .

[5 marks]

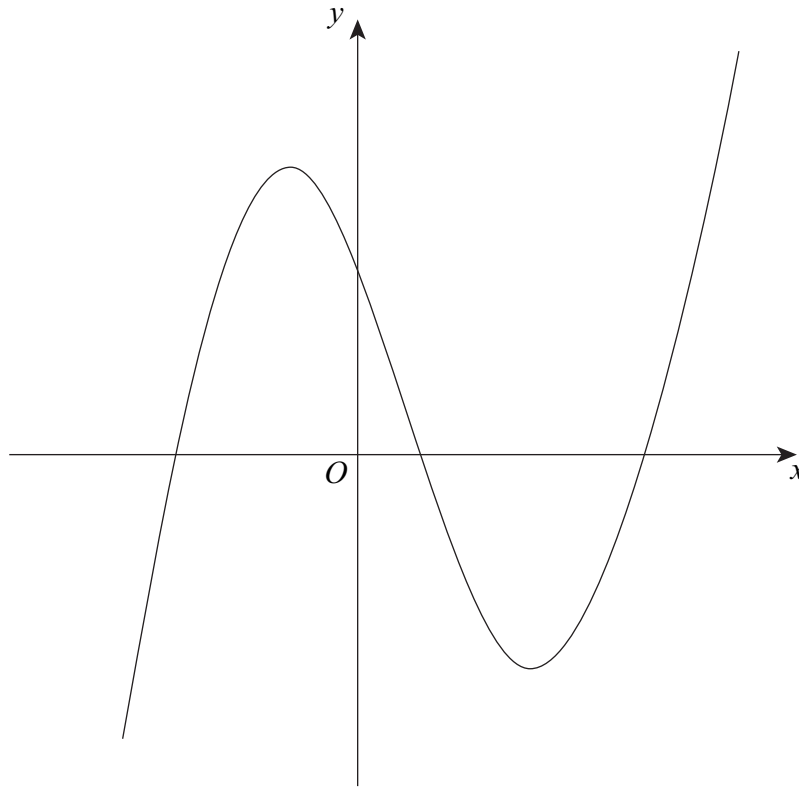
$a = \dots\dots\dots, b = \dots\dots\dots$

9

Turn over ►



10 This is a sketch of the curve $y = f(x)$



10 (a) For this curve $\frac{dy}{dx} = 3x^2 - 4x - 4$

Work out the range of values of x for which $f(x)$ is a decreasing function.
Write your answer as an inequality.

[4 marks]

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Answer



10 (b)

Work out the equation of the normal to the curve at the point (1, -2)
Give your answer in the form $y = mx + c$

[5 marks]

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Answer

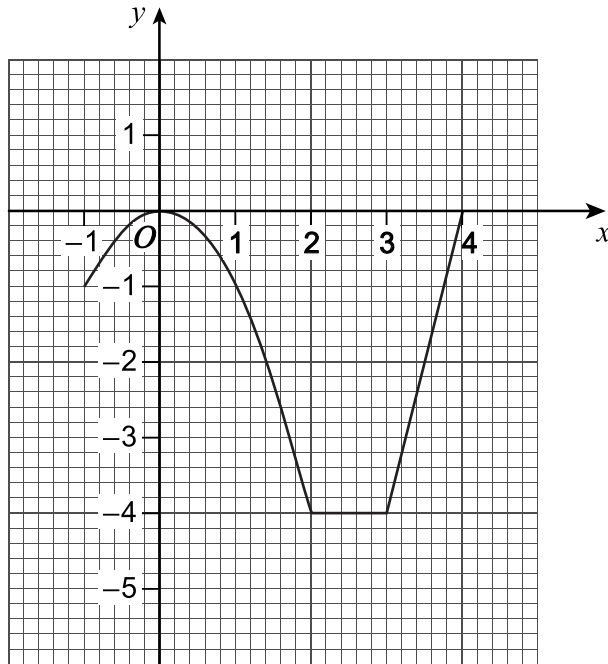
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11

Here is the graph of $y = f(x)$

It consists of a quadratic curve and two straight lines.



Define $f(x)$, stating clearly the domain for each part.

[4 marks]

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$f(x) =$

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12

Make y the subject of

$$\sqrt{\frac{3xy}{x+y}} = 4$$

[4 marks]

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Answer

Turn over for the next question

Turn over ►



13

$$x^2 + 2ax + b \equiv (x - 5)^2 - a$$

Work out the values of a and b .

[3 marks]

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



15

The diagram shows two circles touching externally at T .
Points X , Y and W lie on the larger circle.

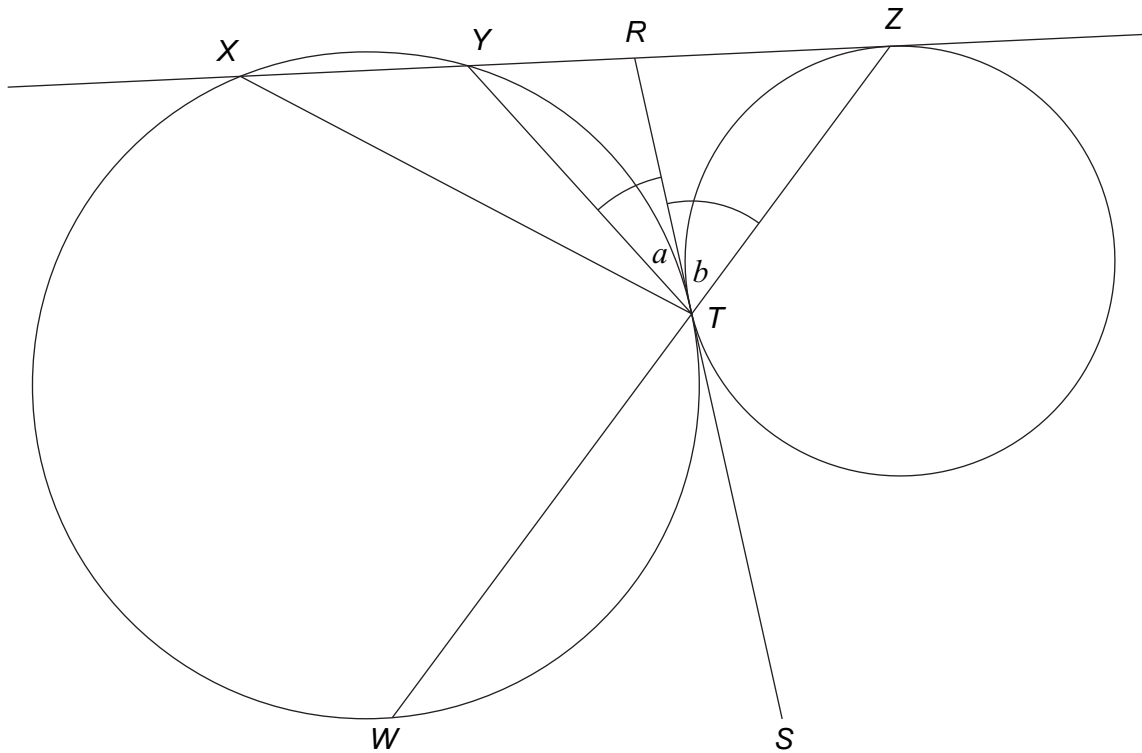
RTS is a tangent to both circles.

$XYRZ$ is a tangent to the smaller circle at Z .

ZTW is a straight line.

Angle $YTR = a$ and angle $ZTR = b$

Not drawn
accurately



16

By factorising fully, simplify

$$\frac{x^4 - x^3 - 2x^2}{x^4 - 5x^2 + 4}$$

[5 marks]

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Answer



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