Centre Number						Candidate Number				
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Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4 - 5	
6 - 7	
8 - 9	
10 - 11	
12 - 13	
14 - 15	
TOTAL	

Level 2 Certificate in Further Mathematics

Further Mathematics 8360/1
Level 2

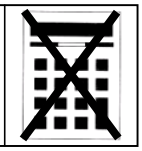
Practice Paper Set 1

Paper 1

Non-Calculator

For this paper you must have:
- mathematical instruments.

You may **not** use a calculator.



Time allowed
1 hour 30 minutes

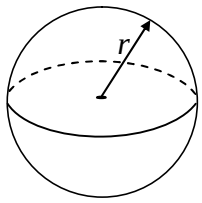
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.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

Formulae Sheet

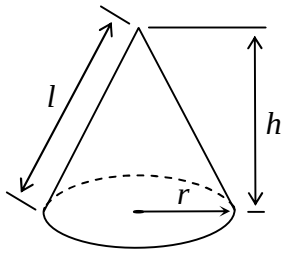
Volume of sphere = $\frac{4}{3}\pi r^3$

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



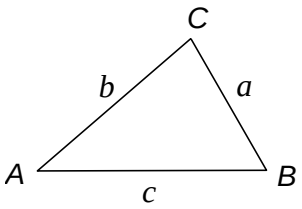
Volume of cone = $\frac{1}{3}\pi r^2 h$

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

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

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

1 (a) x is an integer such that $6 < 3x \leqslant 20$

Write down all the possible values of x.

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Answer ..... *(3 marks)*

1 (b) Given that $-1 < n < 2$ state a value of n for which

1 (b) (i) $n^2 > 1$

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Answer ..... *(1 mark)*

1 (b) (ii) $\frac{1}{n} > 1$

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Answer ..... *(1 mark)*

1 (b) (iii) $1 - n > 1$

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Answer ..... *(1 mark)*

Turn over for the next question

6

Do not write outside the box

2 (a) A function f(x) is defined as

$$\begin{aligned} f(x) &= 3 && 0 \leqslant x < 2 \\ &= x + 1 && 2 \leqslant x < 4 \\ &= 9 - x && 4 \leqslant x \leqslant 9 \end{aligned}$$

Draw the graph of $y = f(x)$ on the grid below for values of x from 0 to 9.

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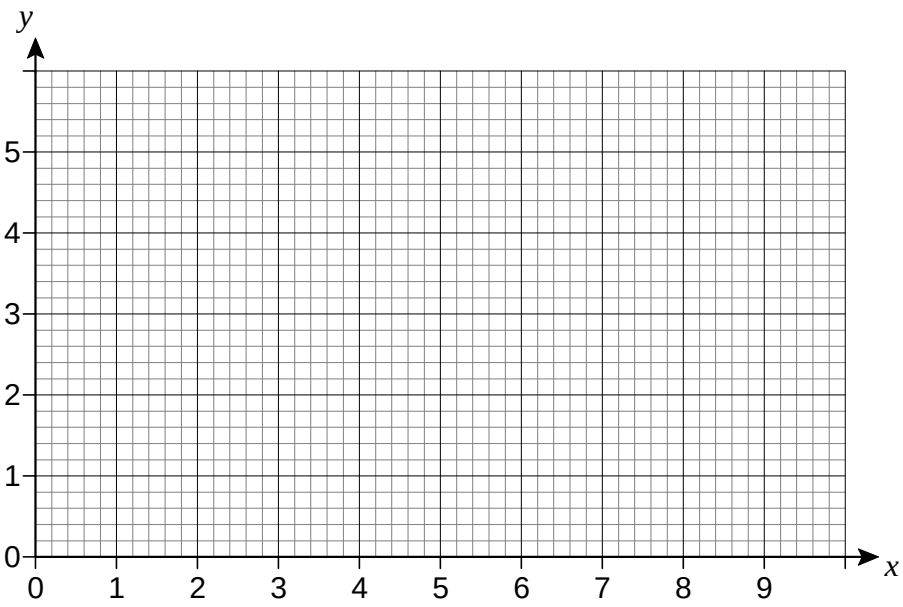
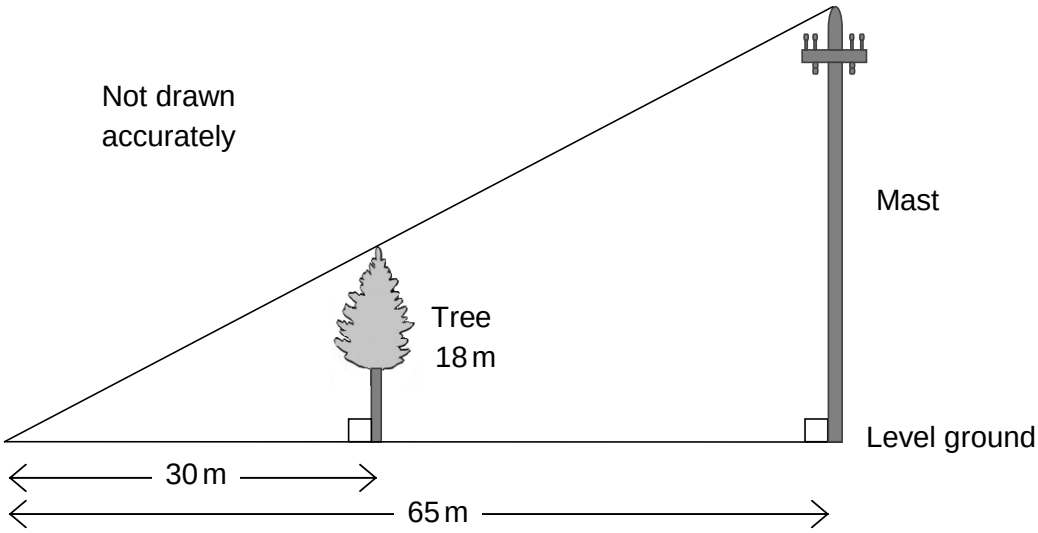


(3 marks)

2 (b) Write down the range of f(x).

Answer ..... *(1 mark)*

3 The diagram shows a tree of height 18 metres and a mast on level ground.



The mast is about to fall over, pivoting about its base.

Could it hit the tree?

Show clearly how you decide.

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(4 marks)

Turn over for the next question

8

4 (a) Simplify fully $\dfrac{\sqrt{12}}{\sqrt{48}}$

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Answer ..... *(3 marks)*

4 (b) Write down the value of $(\sqrt{6} - \sqrt{2})(\sqrt{6} + \sqrt{2})$

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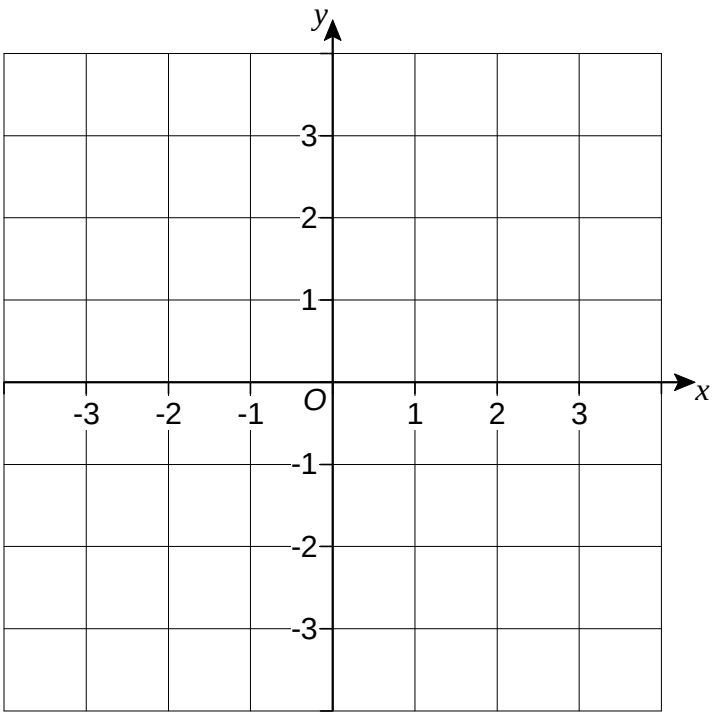
Answer ..... *(2 marks)*

5 (a) Sketch the graphs of $x^2 + y^2 = 4$ and $y = 2x + 1$



(2 marks)

5 (b) On your sketch, shade the region that satisfies both of the inequalities

$x^2 + y^2 \leqslant 4$ and $y \geqslant 2x + 1$

(1 mark)

T

6 Given that $\sin\theta = \frac{3}{5}$, work out the **two** possible values of $\cos\theta$.

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Answer ..... and ..... *(3 marks)*

7 Here are the equations of three lines.

$y = \frac{1}{2}x + 11$ $y = \frac{1}{3}x + 14$ $y = 2x - 16$

Do all three lines meet at a common point?

Show how you decide.

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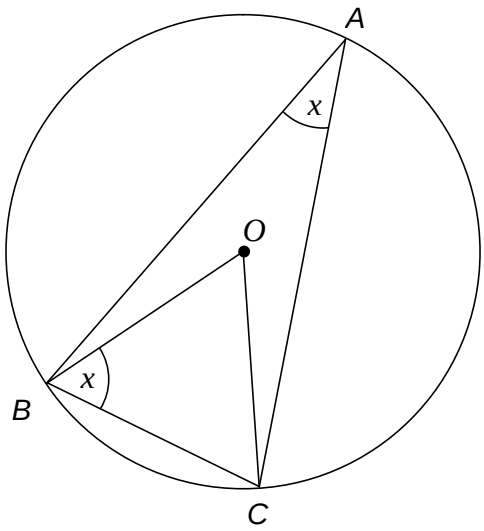
(5 marks)

Turn over for the next question

16

8 *A*, *B* and *C* are points on a circle, centre *O*.

Angle *BAC* = angle *OBC* = *x*.



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Prove that angle *BOC* = 90°

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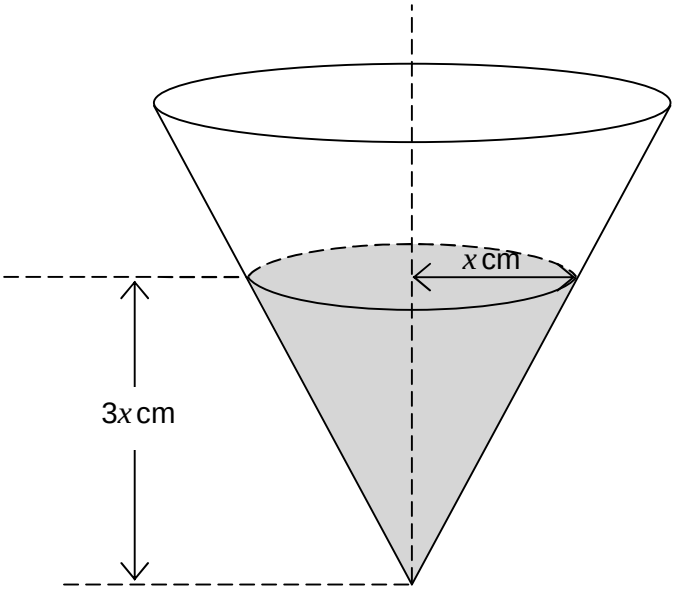
(4 marks)

9 A right circular cone is being filled with water.

The volume of the water is $y\,\text{cm}^3$ when the depth of water is $3x$ cm and the radius of the surface is x cm.



9 (a) Show that $y = \pi x^3$

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(1 mark)

9 (b) Work out $\frac{\mathrm{d}y}{\mathrm{d}x}$

Give your answer in terms of π.

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Answer ..... *(1 mark)*

9 (c) Work out the rate of change of y with respect to x when $x = 5$.

Give your answer in terms of π.

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Answer ..... *(2 marks)*

8

10 Simplify fully $\dfrac{3x^2 - x - 14}{9x^2 - 4} \div \dfrac{x + 2}{3x^2 + 2x}$

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Answer ..... *(5 marks)*

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11 Show that the tangents to the curve $y = x^3 + 3x^2 + 3x + 1$ at $x = 1$ and $x = -3$ are parallel.

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(5 marks)

Turn over for the next question

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12 Make x the subject of $\frac{12}{y} = \frac{4}{x} - \frac{1}{3}$

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Answer ..... *(5 marks)*

13 $x^3 + 2x^2 - 9x - 18 \equiv (x^2 - a^2)(x + b)$ where a and b are integers.

Work out the three linear factors of $x^3 + 2x^2 - 9x - 18$

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Answer ..... *(3 marks)*

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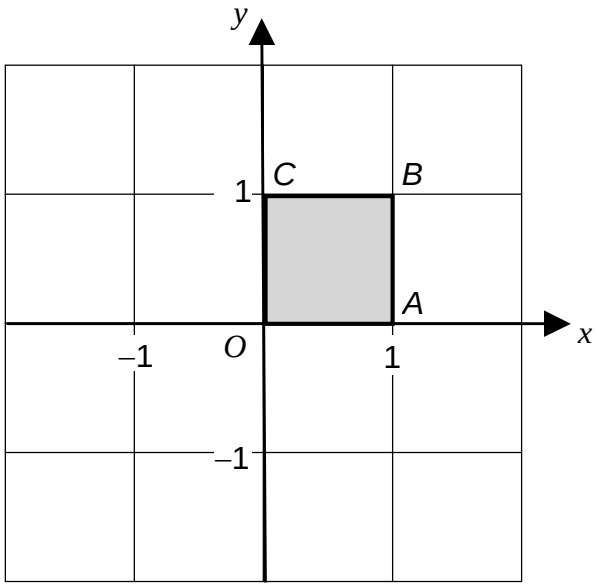
14 The diagram shows the unit square *OABC*.



14 (a) The image of *OABC* after transformation by the matrix $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ is *OA'B'C'*.

Draw and label *OA'B'C'*.

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(2 marks)

14 (b) The unit square *OABC* is transformed by reflection in the line $y = x$ followed by enlargement about the origin with scale factor 2.

What is the matrix of the combined transformation?

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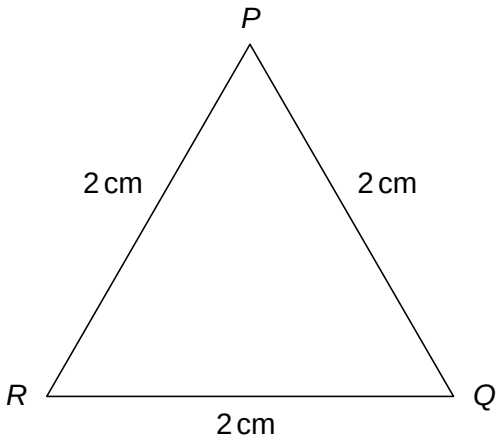
Answer $\begin{pmatrix} & \\ & \end{pmatrix}$ *(4 marks)*

14

15 (a) Use the equilateral triangle *PQR* to show that $\cos 60° = \frac{1}{2}$



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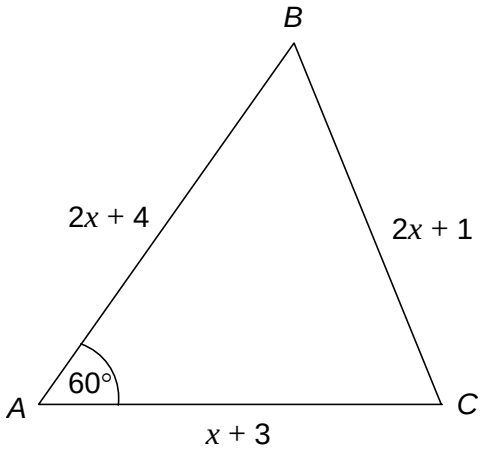
(2 marks)

15 (b) In triangle *ABC*, angle *BAC* = 60°



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Use the cosine rule to show that $x = 4 + 2\sqrt{7}$

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(6 marks)

END OF QUESTIONS

8

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED