Centre Number						Candidate Number				
Surname										
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	
16 - 17	
TOTAL	

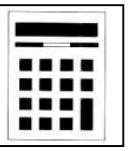
Level 2 Certificate in Further Mathematics

Further Mathematics 8360/2
Level 2

Practice Paper Set 1

Paper 2

Calculator

For this paper you must have:	
• a calculator • mathematical instruments.	

Time allowed
2 hours

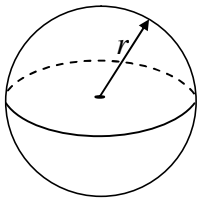
Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. 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 105.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer booklet.

Formulae Sheet

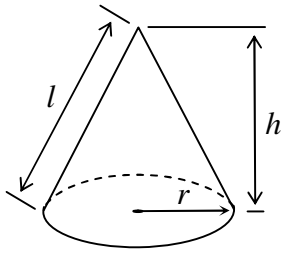
Volume of sphere = $\frac{4}{3}\pi r^3$

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



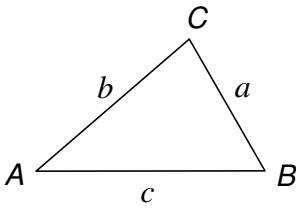
Volume of cone = $\frac{1}{3}\pi r^2 h$

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

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

Do not write outside the box

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

1 (a) The ratio of males to females at a party is 3 : 5
There are 12 more females than males.

How many people are at the party?

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

1 (b) Show that a% of b = b% of a

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(2 marks)

1 (c) A runner increases the distance she runs by 10% each week.
In week 1 she runs 16 miles.

In which week will she first run over 20 miles?
You **must** show your working.

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

Turn over for the next question

7

2 (a) Expand and simplify $4(2x + 3) + 2(x - 7)$

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

2 (b) Expand $m^3 (m + 2)$

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

2 (c) Solve $\frac{9 - 2d}{4} = 1 - d$

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Answer d = ... *(3 marks)*

3 (a) The nth term of a sequence is $4n - 10$.

3 (a) (i) Show that the $(n + 1)$th term can be written as $4n - 6$.

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(2 marks)

3 (a) (ii) Prove that the sum of any two consecutive terms of the sequence is divisible by 8.

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(2 marks)

3 (b) The nth term of a different sequence is $\dfrac{3n}{n + 5}$

3 (b) (i) Explain why 1 is **not** a term in this sequence.

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(3 marks)

3 (b) (ii) Work out the limiting value of the sequence as $n \to \infty$

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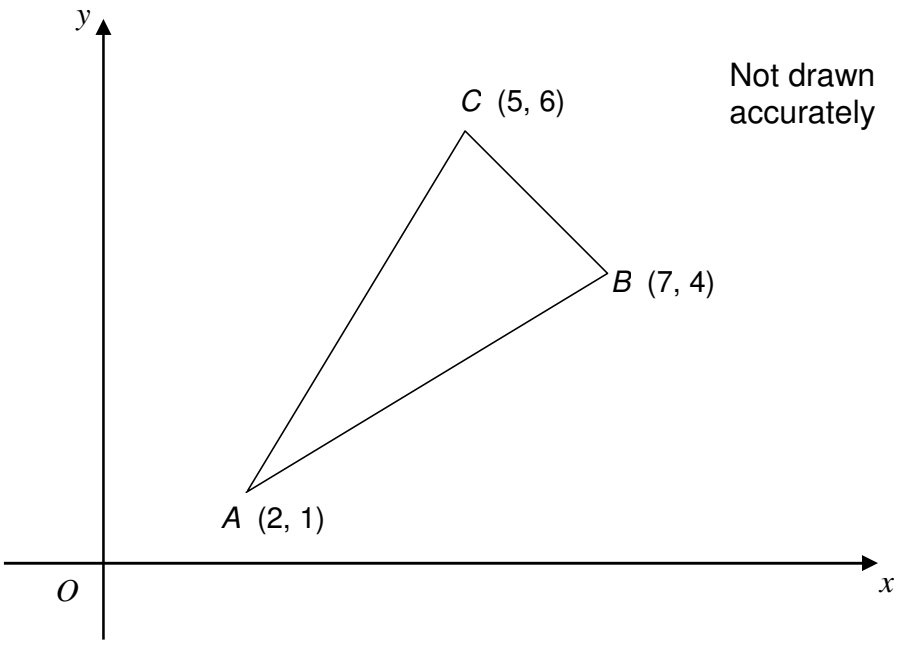
Answer ..... *(2 marks)*

Turn over for the next question

16

4 The diagram shows an isosceles triangle *ABC*, with *AB* = *AC*.



Work out the area of the triangle.

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Answer ..... units^2 *(5 marks)*

5 (a) Solve $x^2 - 11x + 28 = 0$

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

5 (b) Use your answer to part **(a)** to solve $x - 11\sqrt{x} + 28 = 0$

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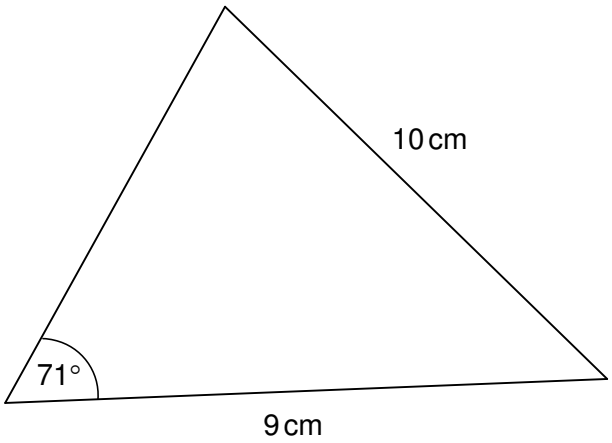
Answer ..... *(2 marks)*

6 Here is a triangle.



Not drawn accurately

Work out the size of the smallest angle in the triangle.

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Answer ..... degrees *(4 marks)*

14

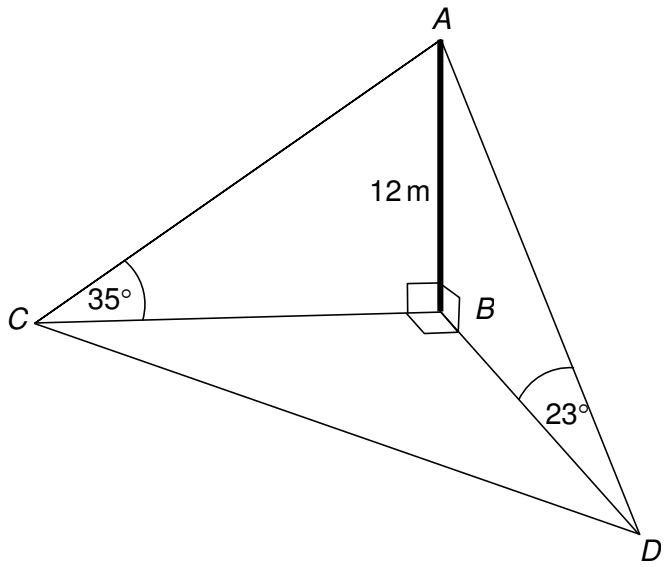
7 The diagram shows a vertical mast, *AB*, 12 metres high.
Points *B*, *C* and *D* are on a horizontal plane.

Point *C* is due West of *B*.

The angle of elevation of *A* from *C* is 35°.

Point *D* is due South of *B*.

The angle of elevation of *A* from *D* is 23°.



Not drawn accurately

7 (a) Calculate the distance *CD*.

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Answer ..... metres *(6 marks)*

7 (b) Calculate the bearing of *D* from *C*.

Give your answer to the nearest degree.

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Answer ..... ° *(3 marks)*

8 (a) The function f(x) is defined as

$$f(x) = 22 - 7x \qquad -2 \leqslant x \leqslant p$$

The range of f(x) is $-13 \leqslant f(x) \leqslant 36$

Work out the value of p.

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

8 (b) The function g(x) is defined as

$$g(x) = x^2 - 4x + 5 \qquad \text{for all } x$$

8 (b) (i) Express g(x) in the form $(x - a)^2 + b$

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

8 (b) (ii) Write down the range of g(x).

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

9 The equation of line *A* is $y = 5 - 2x$
Line *B* is parallel to line *A*.
Line *B* passes through the point (–3, 7).

Work out the coordinates of the point where line *B* intersects the x-axis.

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Answer (.....,.....) *(4 marks)*

18

10 (a) Factorise fully $n^3 - n$

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

10 (b) n is an integer greater than 1.

Explain why $n^3 - n$ is divisible by 6.

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(2 marks)

11 You are given that $x = 5^m$ and $y = 5^n$

11 (a) Write 5^{m+2} in terms of x.

Give your answer in its simplest form.

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

11 (b) Write 5^{m-n} in terms of x and y.

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

11 (c) Write 5^{3n} in terms of y.

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

11 (d) Write $5^{\frac{m+n}{2}}$ in terms of x and y.

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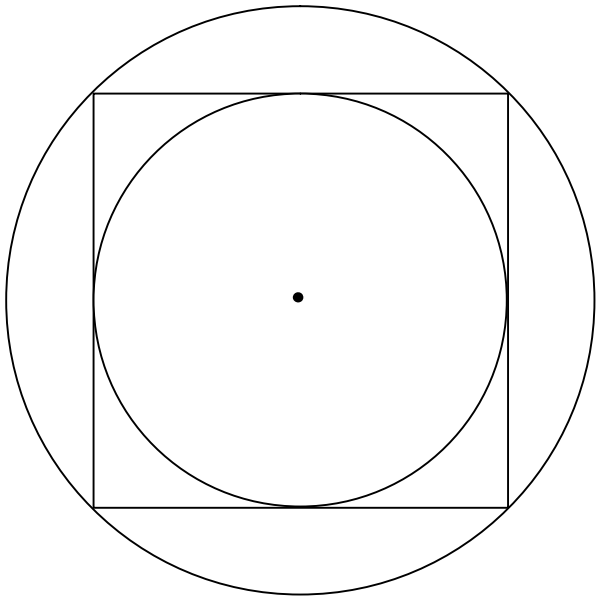
Answer ..... *(2 marks)*

12 The diagram shows a square and two circles.
The smaller circle has radius r and touches the sides of the square.
The larger circle has radius R and passes through the vertices of the square.



Show that $R = r\sqrt{2}$

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(3 marks)

Turn over for the next question

13 (a) Solve $5y - 4 < 2y + 6$

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

13 (b) Solve $x^2 - 2x - 3 \geq 0$

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Answer ..... *(4 marks)*

14 (a) Work out the stationary points on the curve $y = x^3 - 12x$

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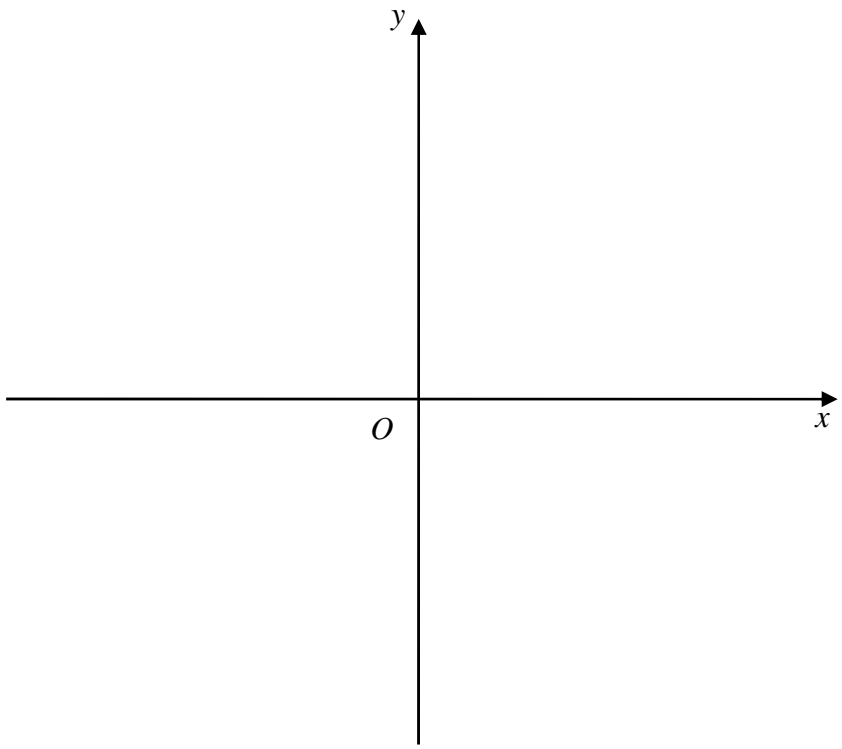
Answer ..... *(4 marks)*

14 (b) Sketch the curve $y = x^3 - 12x$

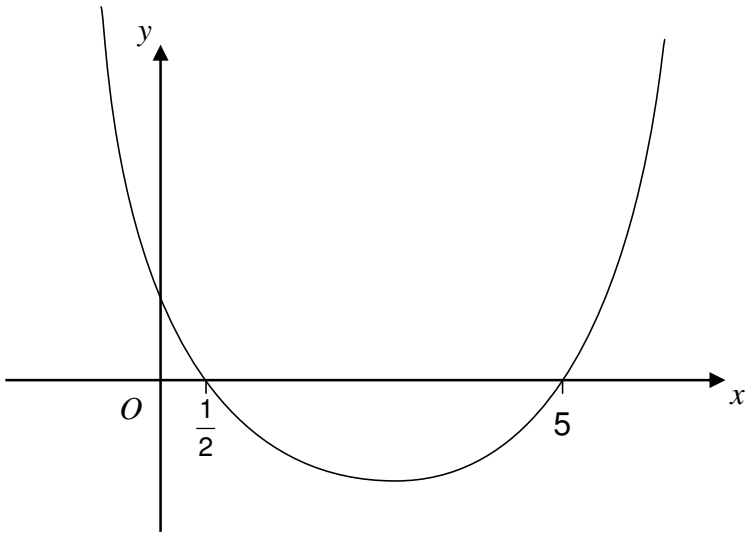


(3 marks)

Turn over for the next question

13

15 The diagram shows a quadratic graph that intersects the x-axis when $x = \frac{1}{2}$ and $x = 5$.



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Work out the equation of the quadratic graph.

Give your answer in the form $y = ax^2 + bx + c$ where a, b and c are integers.

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

16 (a) Solve $\sin x = 0.8$ for $0° \leqslant x \leqslant 180°$

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

16 (b) Solve $2 \sin x = -3 \cos x$ for $0° \leqslant x \leqslant 360°$

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Answer ..... *(4 marks)*

17 Work out the equation of the normal to the curve $y = 2x^3 - x^2 + 1$ at the point (1, 2).

Give your answer in the form $y = mx + c$

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Answer …..... *(5 marks)*

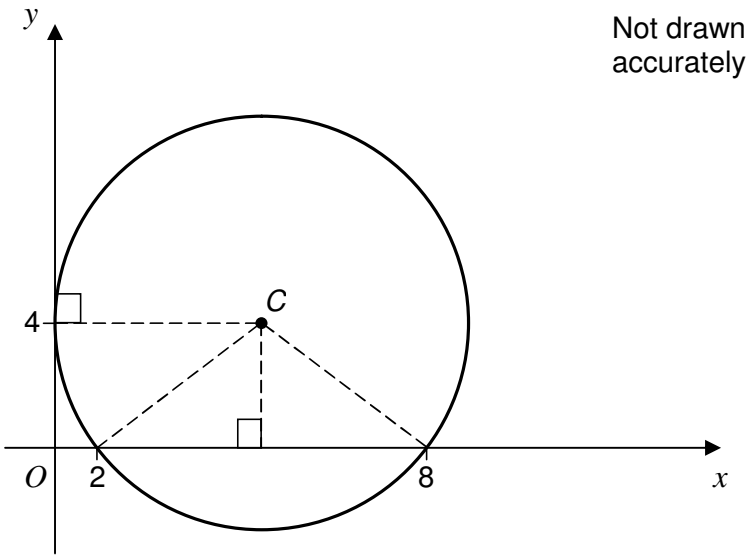
Turn over for the next question

14

18 The diagram shows a circle, centre *C*.

The circle touches the y-axis at (0, 4).

The circle intersects the x-axis at (2, 0) and (8, 0).



Work out the equation of the circle.

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

19 The equation $x^3 - x^2 + ax + b = 0$ has three integer solutions.
Two of these solutions are $x = 1$ and $x = 2$.

Work out the third solution to the equation.

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Answer $x =$ ..... *(5 marks)*

END OF QUESTIONS

10

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