

Centre Number						Candidate Number				
Surname										
Other Names										
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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

Level 2

8360/2

Practice Paper Set 1

Paper 2

Calculator

<p>For this paper you must have:</p> <ul style="list-style-type: none"> • a calculator • mathematical instruments. 	
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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.

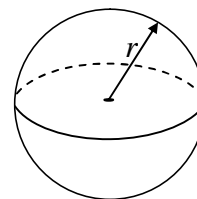
Information

- 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

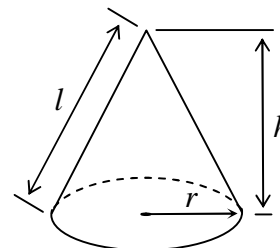
$$\text{Volume of sphere} = \frac{4}{3} \pi r^3$$

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



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

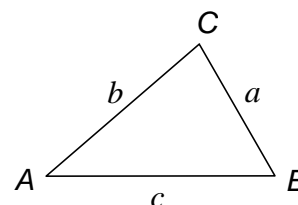
$$\text{Curved surface area of cone} = \pi r l$$



In any triangle ABC

$$\text{Area of triangle} = \frac{1}{2} ab \sin C$$

$$\text{Sine rule} \quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$



$$\text{Cosine rule} \quad a^2 = b^2 + c^2 - 2bc \cos A$$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

The Quadratic Equation

$$\text{The solutions of } ax^2 + bx + c = 0, \text{ where } a \neq 0, \text{ are given by } x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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)** 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

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 n th 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 n th term of a different sequence is $\frac{3n}{n + 5}$

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

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(3 marks)

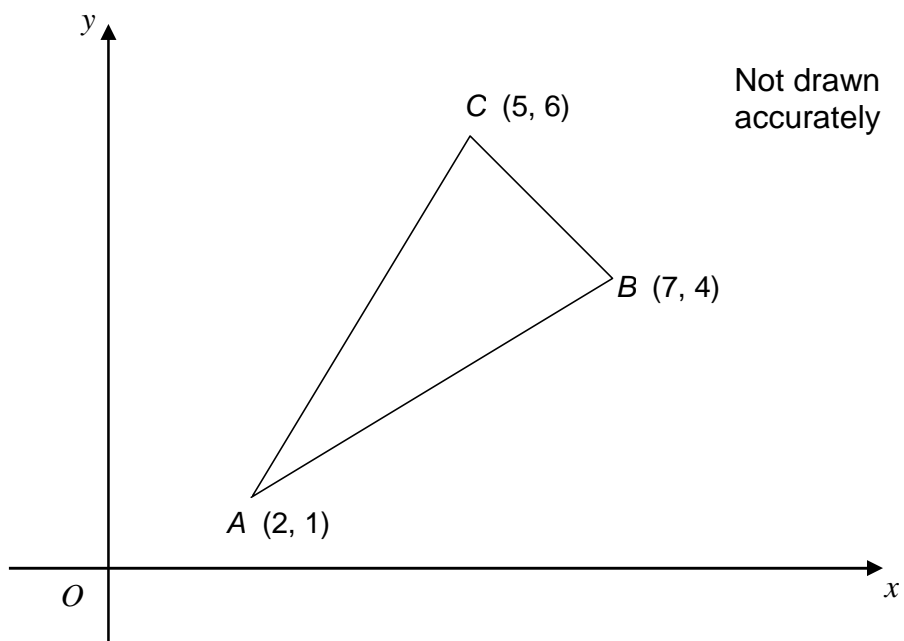
3 (b) (ii) Work out the limiting value of the sequence as $n \rightarrow \infty$

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Answer (2 marks)

Turn over for the next question

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



Work out the area of the triangle.

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Answer units² (5 marks)

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

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Answer (3 marks)

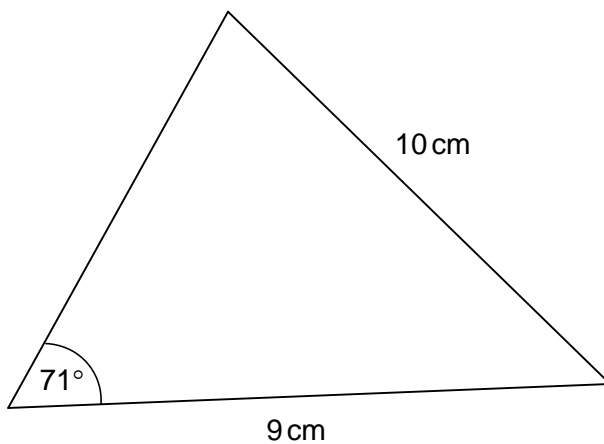
5 (b) Use your answer to part (a) to solve $x - 11\sqrt{x} + 28 = 0$

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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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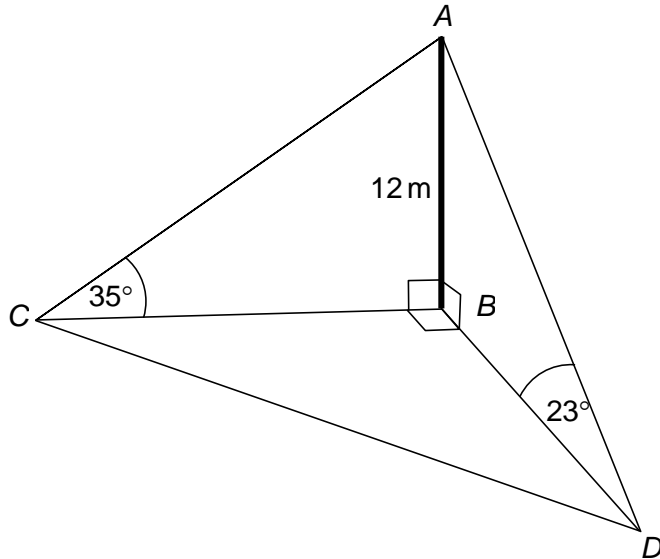
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Answer degrees (4 marks)

- 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 $^\circ$ (3 marks)

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

$$f(x) = 22 - 7x \quad -2 \leq x \leq p$$

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

Work out the value of p .

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Answer (2 marks)

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

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

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)

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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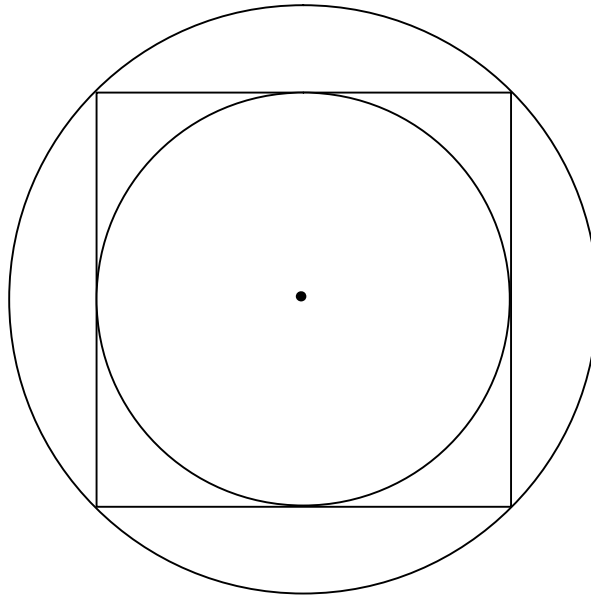
Answer (2 marks)

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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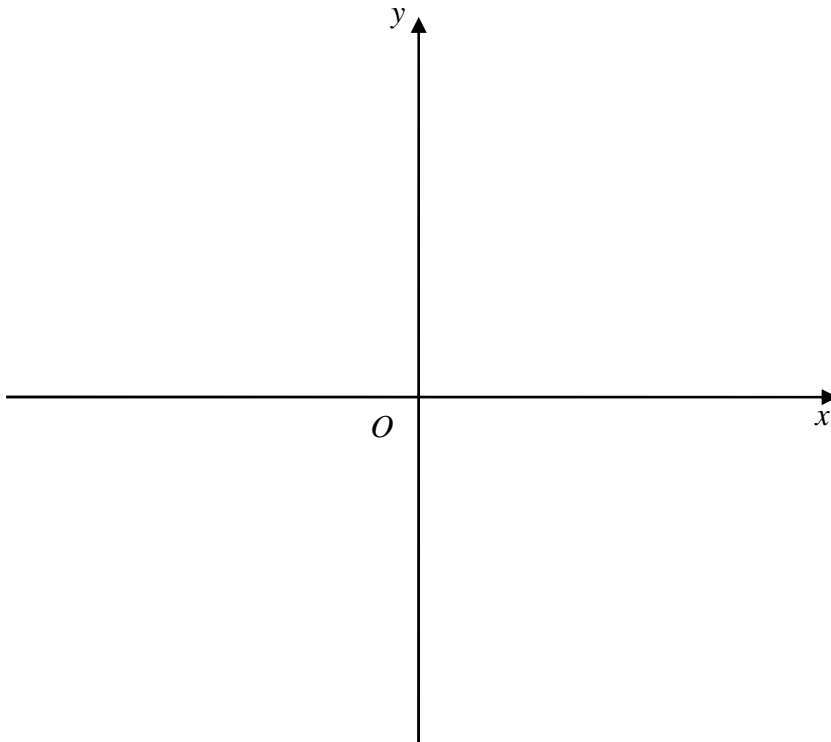
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Answer (4 marks)

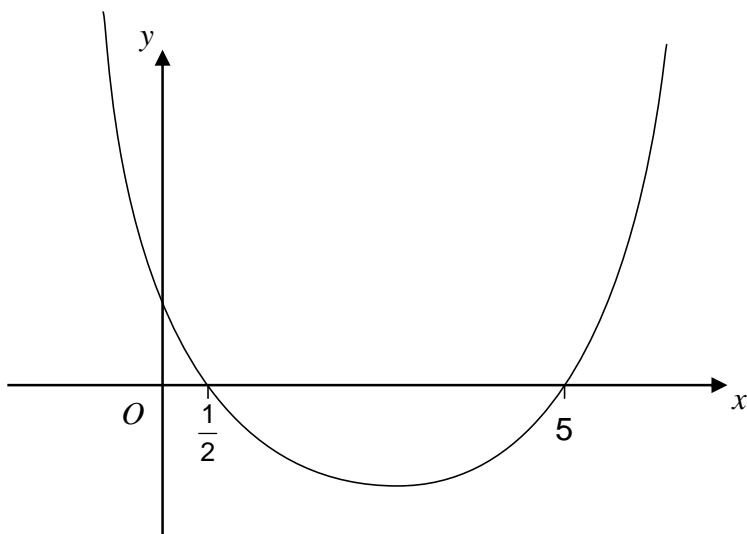
14 (b) Sketch the curve $y = x^3 - 12x$



(3 marks)

Turn over for the next question

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



Not drawn
accurately

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 $0^\circ \leq x \leq 180^\circ$

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Answer (2 marks)

- 16 (b)** Solve $2 \sin x = -3 \cos x$ for $0^\circ \leq x \leq 360^\circ$

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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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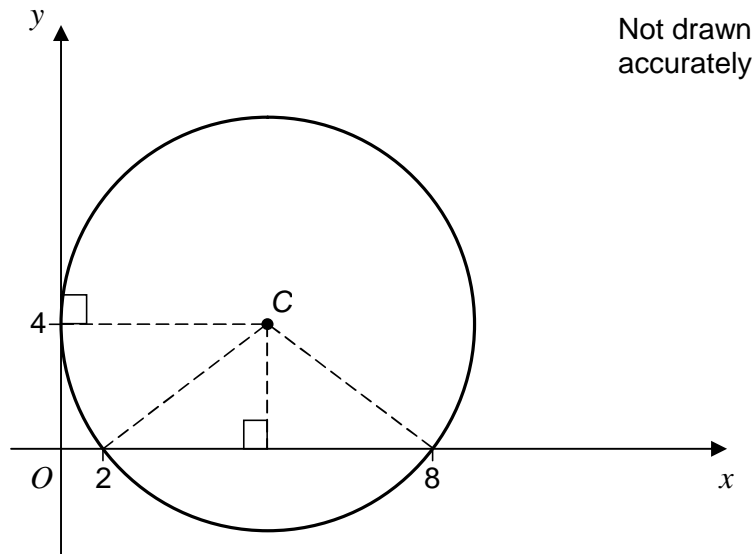
Answer (5 marks)

Turn over for the next question

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

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