

Surname	Centre Number	Candidate Number
First name(s)		4



LEVEL 2 CERTIFICATE

9550/01



WEDNESDAY, 21 JUNE 2023 – MORNING

ADDITIONAL MATHEMATICS

2 hours 30 minutes

ADDITIONAL MATERIALS

A calculator will be required for this paper.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3.14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question 7.

When you are asked to show your working you must include enough intermediate steps to show that a calculator has not been used.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	5	
2.	4	
3.	4	
4.	4	
5.	6	
6.	8	
7.	9	
8.	6	
9.	2	
10.	9	
11.	9	
12.	5	
13.	7	
14.	5	
15.	4	
16.	7	
17.	6	
Total	100	

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1. Find $\frac{dy}{dx}$ for **each** of the following.

(a) $y = 3x^9 - 5 + x^{-8}$ [3]

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(b) $y = x^{\frac{5}{6}}$ [1]

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(c) $y = \frac{1}{4x^7}$ [1]

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2. **Do not use a calculator** to answer this question.

Solve, by completing the square, $x^2 = 20x - 28$.

Give your answers in the form $a + b\sqrt{c}$, where a , b and c are integers, and c is as small as possible.

You must show all your working. [4]

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3. Simplify **each** of the following.

(a) $3x^{\frac{1}{5}} \times 4x^{\frac{1}{2}}$

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(b) $\left(x^{\frac{1}{4}} \times x^{\frac{3}{4}}\right)^5$

[1]

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(c) $x^{-\frac{1}{4}} \left(2x^{\frac{1}{4}} + 5x^{\frac{3}{4}}\right)$

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4. Use a method of factorising to solve $\frac{x^2 + 5x}{2} = 18$. [4]

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5. Do not use a calculator to answer this question.

- (a) The area of a rectangle is 142 cm^2 .
It has a length of $(2 + 5\sqrt{3}) \text{ cm}$.

$$(2 + 5\sqrt{3}) \text{ cm}$$

$$\text{Area} = 142 \text{ cm}^2$$

Calculate the width of the rectangle.

Give your answer in the form $a(b + c\sqrt{d})$, where $a > 1$, and a, b, c and d are integers.

You must show all your working.

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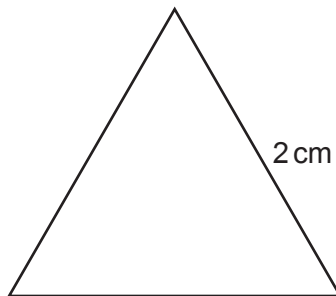
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- (b) The equilateral triangle below has sides of length 2 cm.

Use this to show that $\cos 30^\circ = \frac{\sqrt{3}}{2}$.

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6. (a) Find the remainder when $4x^3 - 2x^2 - x$ is divided by $x + 5$. [2]

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- (b) (i) Show that $x - 2$ is a factor of $x^3 - 6x^2 - 13x + 42$. [2]

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- (ii) Hence factorise $x^3 - 6x^2 - 13x + 42$. [4]

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7. You will be assessed on the quality of your written communication in this question.

Total surface area of a cone, $A = \pi r(r + l)$

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

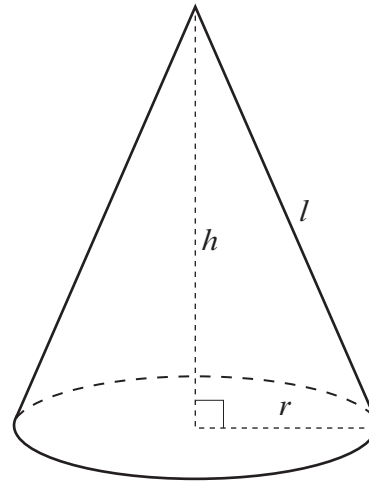


Diagram not drawn to scale

The total surface area of a cone is 326.4 cm^2 .
The radius of the base of the cone is 5.6 cm .

Calculate the volume of the cone.

You must show all your working.

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Examiner
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A large rectangular area with a solid border, containing ten horizontal dotted lines for writing.

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8. Find, using an algebraic method, the coordinates of the points of intersection of

$$y = 4x^2 + 2x - 3 \quad \text{and} \quad 10x - 2y + 3 = 0.$$

You must show all your working.

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9. Find $\frac{d^2y}{dx^2}$ when $y = 2x^{12}$.

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10. (a) The coordinates of the points A and B are $(4, 6)$ and $(-8, 1)$ respectively.

(i) Calculate the length of the line AB .

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(ii) Find the gradient of a line perpendicular to the line AB .

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(iii) Find the coordinates of the midpoint of the line AB .

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- (b) Find the equation of the straight line with gradient 4 that passes through the point $(-3, 9)$.
Express your answer in the form $y = mx + c$.

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11. (a) Find $\int \left(14x^6 - 5 + \frac{4}{x^3} \right) dx$.

Simplify your answer.

You must show all your working.

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(b) Evaluate $\int_2^3 (8x^3 + 4x) dx$.

You must show all your working.

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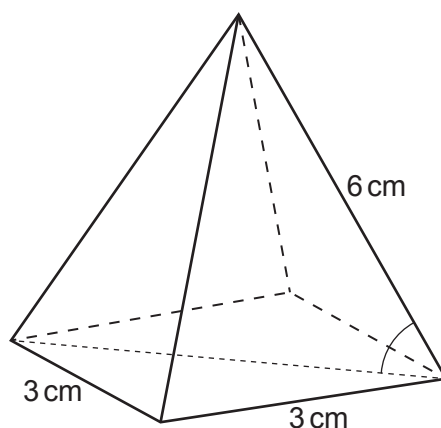


Diagram not drawn to scale

A square-based pyramid has base sides of length 3 cm and sloping edges of length 6 cm.

Calculate the angle between the diagonal of the base and the 6 cm sloping edge shown. [5]

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13. Find the **x-coordinate** and the nature of each of the stationary points on the curve

$$y = \frac{x^3}{3} + x^2 - 15x.$$

You must show all your working.

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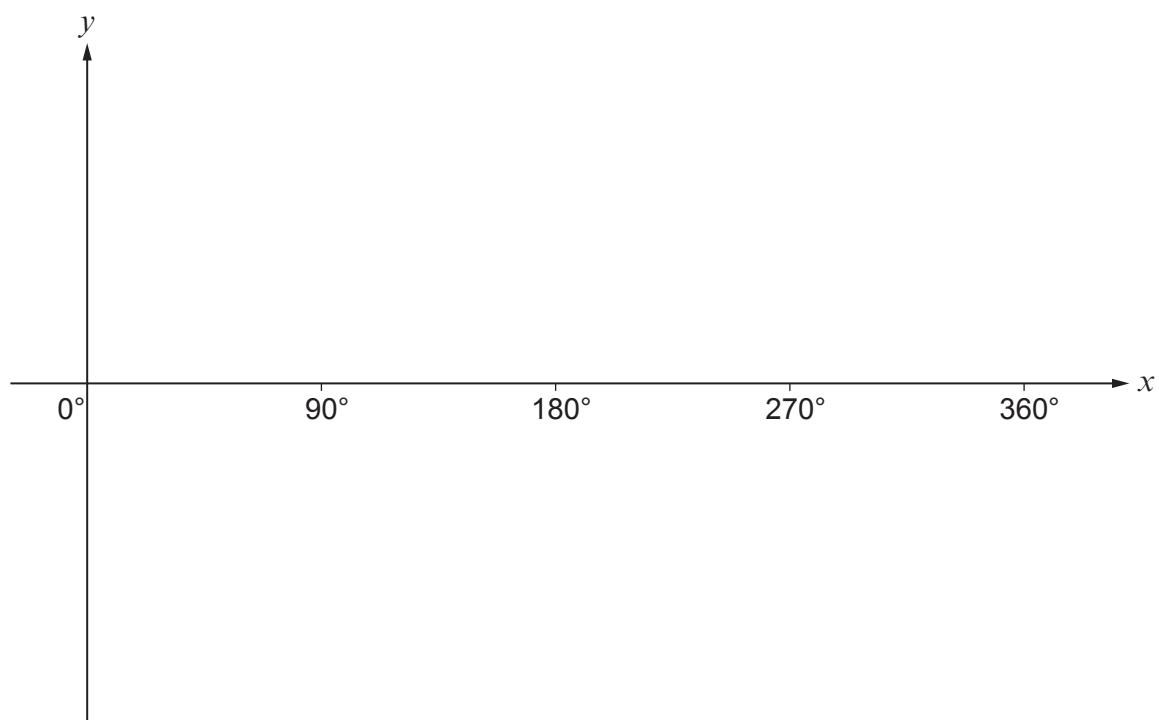
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15. (a) On the axes below, sketch the graph of $y = 3\sin 2x$ for values of x from 0° to 360° . [2]



- (b) Find all the solutions of the equation $3\sin 2x = 0.777$ for values of x from 0° to 360° .

Give your solutions correct to 1 decimal place.

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