Surname	Centre Number	Candidate Number
First name(s)		4

LEVEL 2 CERTIFICATE

W22-9550-01

9550/01

WEDNESDAY, 12 JANUARY 2022 – MORNING

ADDITIONAL MATHEMATICS

2 hours 30 minutes

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

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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 in the spaces provided.

If you run out of space, use the additional page at the back of the booklet. Question numbers must be given for the work written on the additional page.

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 **6**.

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

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Examiner only

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

(a) $y = 3x^{10} + 4x^2 - 9 + x^{-4}$ [4]

(b) $y = 5x^{\frac{4}{5}}$ [1]

(c) $y = \frac{2}{x^8}$ [1]

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

Simplify $\left(2\sqrt{5}+3\right)^2 - \left(2\sqrt{5}-3\right)^2$.

All working must be shown. [4]

Examiner only

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

All working must be shown.

(a) Find the value of $\left(3^{\frac{1}{6}}\right)^{-24}$.

You must show all your working. [2]

(b) Rationalise the denominator in the following expression.

$$\frac{1}{8-\sqrt{5}}$$

You must show all your working. [2]

Examiner only

4. Simplify each of the following.

(a) $4x^{\frac{4}{5}} \times 9x^{\frac{4}{5}}$ [1]

(b) $\left(x^{\frac{2}{3}} \times x^{\frac{1}{3}}\right)^{\frac{1}{2}}$ [1]

(c) $\dfrac{7x^{\frac{2}{9}} + 14x^{\frac{1}{9}} + 7x^{\frac{5}{9}}}{7x^{\frac{1}{9}}}$ [2]

Examiner only

5. (a) Find the remainder when $4x^3 - 2x^2 + 10x + 1$ is divided by $x + 2$. [2]

(b) (i) Show that $x + 5$ is a factor of $x^3 + 11x^2 + 14x - 80$. [2]

(ii) **Hence** factorise $x^3 + 11x^2 + 14x - 80$. [4]

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Examiner only

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

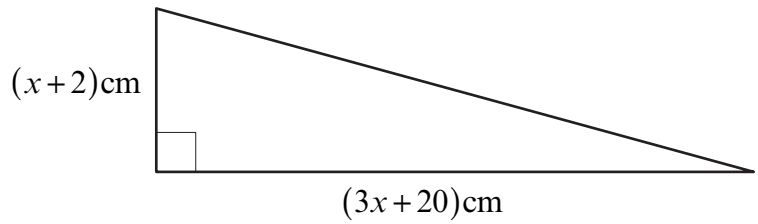

Diagram not drawn to scale

The area of the triangle is 220 cm^2.

Use an algebraic method to calculate the **perimeter** of the triangle.

You must show all your working. [7 + 2 QWC]

Examiner only

Turn over.

Examiner only

7. The expression $x^2 + 50x + 700$ has a minimum value.

By **completing the square**, complete the statements below.

You must show all your working. [3]

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'The minimum value of $x^2 + 50x + 700$ occurs when x = ...'

'The minimum value of $x^2 + 50x + 700$ is .....'

Examiner only

8. Find the coordinates of the points of intersection of $y = 3x^2 + 4x - 6$ and $y = 5x - 2$. [6]

Examiner only

9. The diagram shows a slanted cone with a circular base, diameter 10·2 cm.

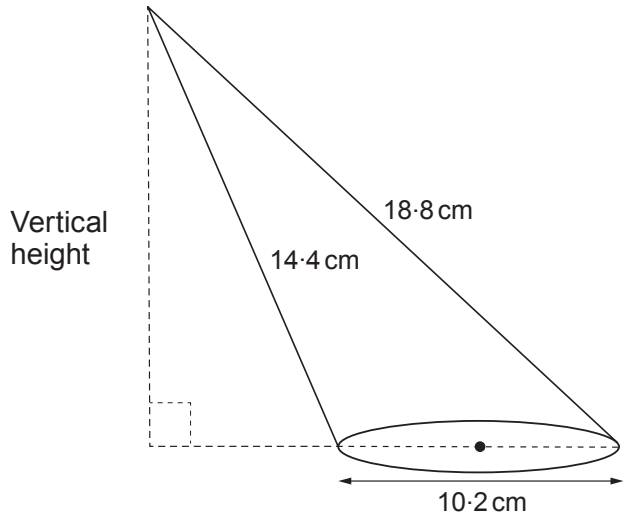


Diagram not drawn to scale

Calculate the volume of the cone. [7]

Examiner only

10. (a) Find $\frac{\mathrm{d}^2y}{\mathrm{d}x^2}$ when $y = 2x^6$. [2]

(b) Given the following facts, find the values of a, b, c and d.

- $y = ax^3 + bx^2 + cx + d$
- $\frac{\mathrm{d}y}{\mathrm{d}x} = 15x^2 + 8x + 3$
- The value of d is equal to the coefficient of x in $\frac{\mathrm{d}^2y}{\mathrm{d}x^2}$. [4]

$a =$ ..... $b =$ ..... $c =$ ..... $d =$ .....

Turn over.

Examiner only

11. The coordinates of the points *A* and *B* are (10, 8) and (−6, 2) respectively.

(a) Calculate the length of the line *AB*.

Express your answer as a surd in its simplest form, $n\sqrt{m}$. [3]

(b) Find the equation of the straight line **perpendicular** to *AB* that passes through the midpoint of *AB*.

Express your answer in the form $ax + by + c = 0$. [7]

Examiner only

12. Find $\int\left(14x^6+16x^3-2+\frac{4}{x^3}\right)\mathrm{d}x$.

Simplify your answer.

You must show all your working. [6]

Examiner only

13. Find the coordinates and the nature of each of the stationary points on the curve

$$y = 3x^3 - 9x^2 + 5.$$

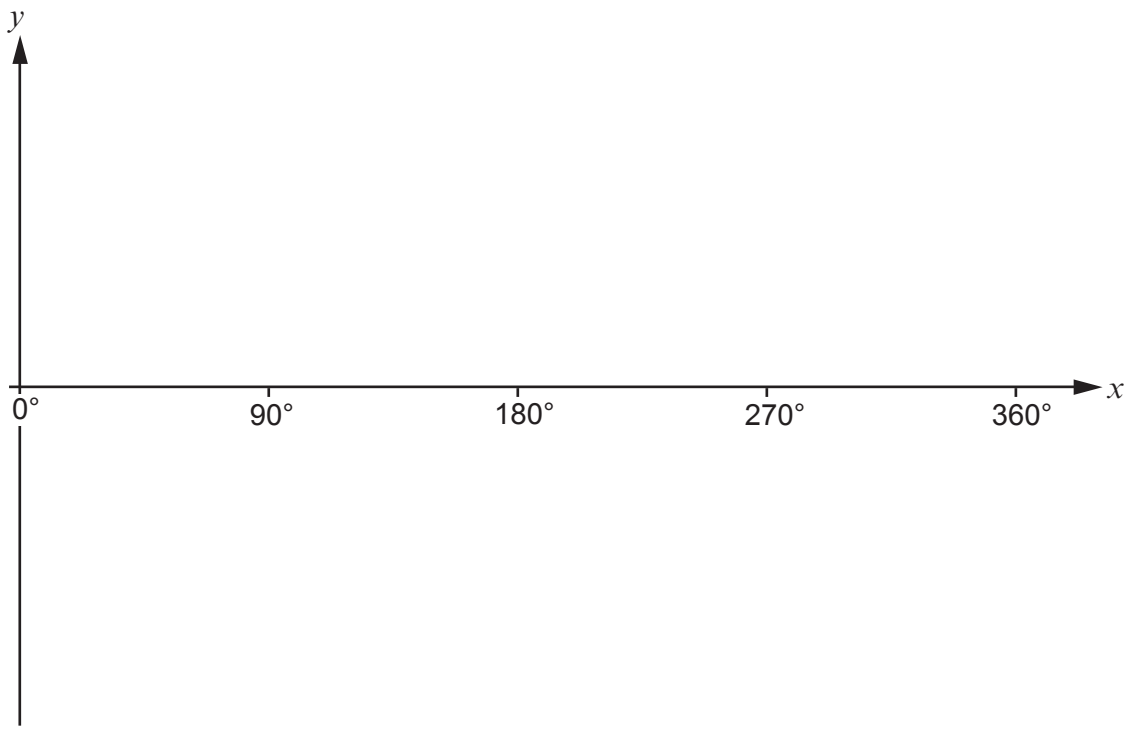
You must show all your working. [7]

Examiner only

14. Given that $y = x^2 + 17x$, find $\frac{\mathrm{d}y}{\mathrm{d}x}$ from first principles. [5]

Examiner only

15. (a) On the axes below, sketch the graph of $y = 5\sin x$ for values of x from 0° to 360°. [2]



(b) Find all the solutions of the equation $5\sin x = 3{\cdot}15$ for values of x from 0° to 360°. [2]

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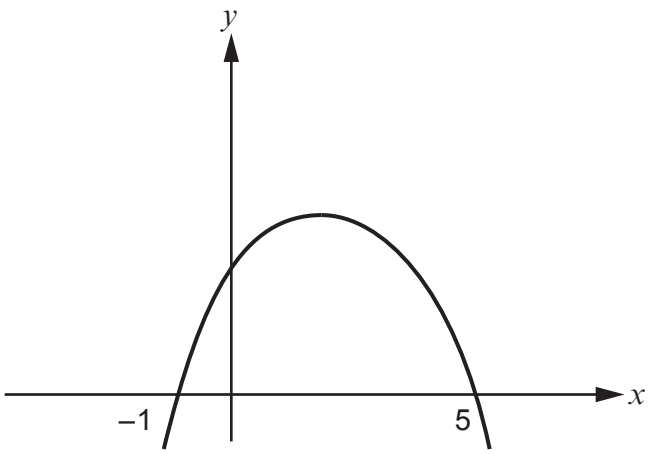
Examiner only

16. The diagram shows a sketch of $y = -x^2 + 4x + 5$.



Calculate the area of the region defined by $y \leqslant -x^2 + 4x + 5$, $x \geqslant 3$ and $y \geqslant 0$.

You must show all your working. [5]

Examiner only

17. Find the equation of the tangent to the curve $y = 5x^2 - 4x + 3$ at the point where $x = 2$.

Simplify your answer and write it in the form $y = mx + c$. [6]

END OF PAPER

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

Examiner only

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