Surname	Centre Number	Candidate Number
Other Names		0

LEVEL 2 CERTIFICATE

9550/01

S17-9550-01

ADDITIONAL MATHEMATICS

THURSDAY, 22 JUNE 2017 – MORNING

2 hours 30 minutes

ADDITIONAL MATERIALS

A calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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

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

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.	**4**	
2.	**6**	
3.	**3**	
4.	**8**	
5.	**6**	
6.	**12**	
7.	**10**	
8.	**5**	
9.	**2**	
10.	**10**	
11.	**7**	
12.	**5**	
13.	**6**	
14.	**5**	
15.	**4**	
16.	**4**	
17.	**3**	
Total	**100**	

9550 010001

Examiner only

1. Factorise $20x^2 + 7x - 3$ and **hence** solve the equation $20x^2 + 7x - 3 = 0$. [4]

Examiner only

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

(a) $y = 7x^{10} - 5x - 22$ [3]

(b) $y = x^{-12}$ [1]

(c) $y = x^{\frac{3}{8}}$ [1]

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

Turn over.

Examiner only

3. The expression $x^2 + 22x + 123$ has a minimum value.
By **completing the square**, complete the statements below.
You must show your working. [3]

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'The minimum value of $x^2 + 22x + 123$ occurs when $x =$ ..... .'

'The minimum value of $x^2 + 22x + 123$ is ..... .'

Examiner only

4. *(a)* Find the remainder when $2x^3 - 5x^2 + 8x - 6$ is divided by $x + 4$. [2]

(b) (i) Show that $x - 2$ is a factor of $x^3 + 9x^2 + 8x - 60$. [2]

(ii) **Hence** factorise $x^3 + 9x^2 + 8x - 60$. [4]

Turn over.

Examiner only

5. Find the coordinates of the points of intersection of the curve $y = 4x^2 + 8x - 3$ and the straight line $y = 3x - 1$.
Use an algebraic method and give your answers correct to 2 decimal places. [6]

Examiner only

6. The coordinates of the points *F* and *G* are (8, 20) and (–4, 10) respectively.

(a) Calculate the length of the line *FG*.
Express your answer as a surd in its simplest form, $n\sqrt{m}$. [3]

(b) Find the equation of the straight line **perpendicular** to *FG* that passes through the mid-point of *FG*.
Express your answer in the form $ax + by + c = 0$, where a, b and c are integers.
Give your answer in its simplest form. [9]

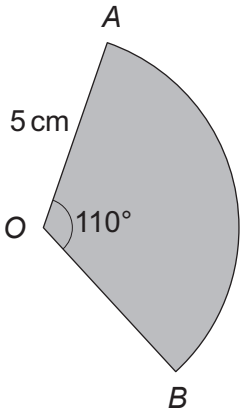
Turn over.

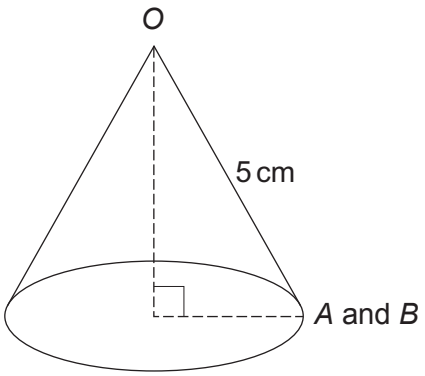
Examiner only

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

$$\textit{The volume of a cone} = \frac{1}{3} \times \textit{area of the base} \times \textit{perpendicular height.}$$

A thin piece of card in the shape of a sector of a circle has a centre *O*, and a radius of 5 cm, as shown below.
The card is used to form a cone by sticking *OA* and *OB* together with no overlap, such that the **arc** *AB* becomes the **circumference** of the base of the cone.





Diagrams not drawn to scale

Calculate the volume of the cone correct to 3 significant figures. [10]

Examiner only

Turn over.

Examiner only

8. *(a)* Find $\frac{d^2y}{dx^2}$ when $y = 3x^{20}$. [2]

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

- $y = ax^4 + bx^3 + c$
- $\frac{dy}{dx} = 12x^3 + 6x^2$
- when $x = 0$, $y = -6$ [3]

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

Examiner only

9. Do not use a calculator to answer this question.
All working must be shown.

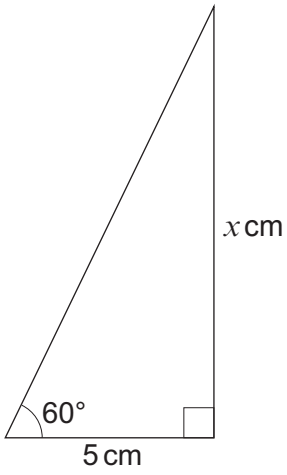


Diagram not drawn to scale

Calculate the value of x.
Give your answer in surd form.
You must show all your calculations. [2]

Examiner only

10. *(a)* Find $\int\left(10x^4 + 24x^2 - 2 + \frac{3}{x^4}\right)\mathrm{d}x$. [5]

(b) Evaluate $\int_1^2 \left(12x^3 + 6x^2\right)\mathrm{d}x$.

You must show all your working. [5]

Examiner only

11. Find the coordinates and the nature of each of the stationary points on the curve $y = 3x^3 + 9x^2 + 4$.
You must show all your working. [7]

Examiner only

12. Given that $y = x^2 + 10x$, find $\frac{dy}{dx}$ from first principles. [5]

Examiner only

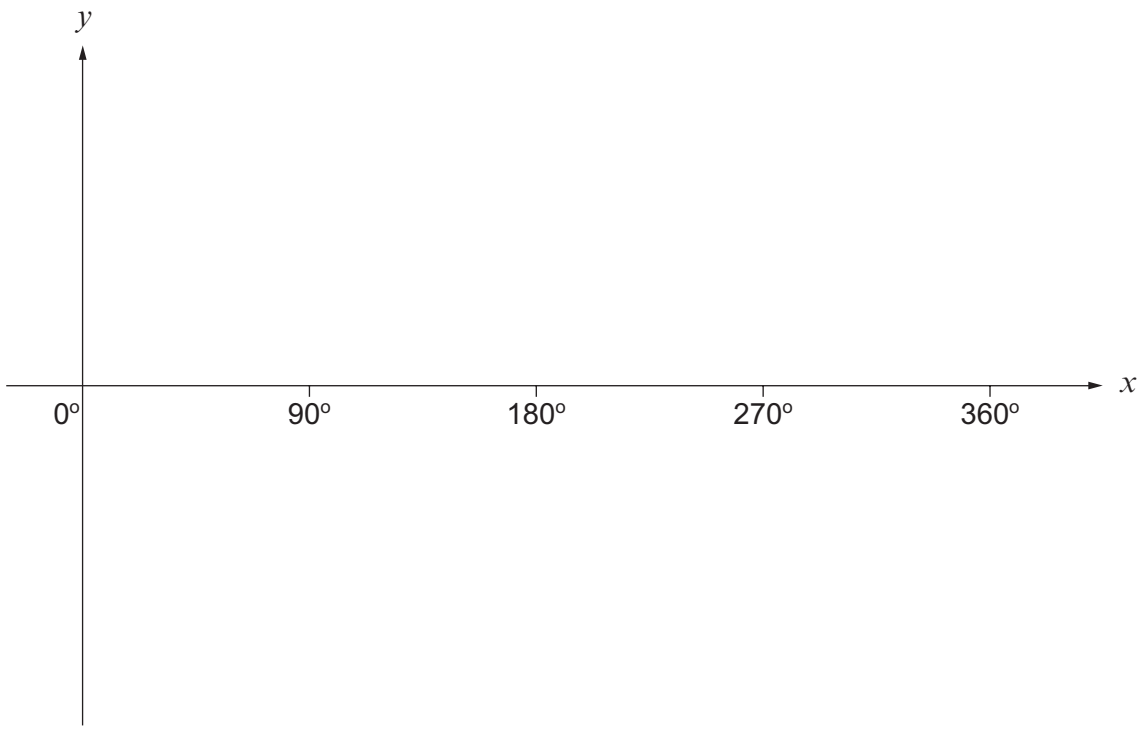
13. Find the equation of the tangent to the curve $y = 5x^2 - 20x$ at the point where $x = 4$.
Give your answer in the form $ax + by + c = 0$. [6]

Examiner only

14. $(2x + 5)$ hats cost £36 altogether.
$(3x - 1)$ umbrellas cost £55 altogether.
Write an expression for the total cost, in pounds, of 1 hat and 1 umbrella.
You must simplify your expression to give your answer as a single fraction in terms of x. [5]

Examiner only

15. *(a)* On the axes below, sketch the graph of $y = 4\sin x$ for values of x from 0° to 360°. [2]



(b) Find all the solutions of the equation $4\sin x = 1$ for values of x from 0° to 360°. [2]

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Turn over.

Examiner only

16. Showing all your working, simplify each of the following.

(a) $\dfrac{6x^{\frac{13}{8}} \times 10x^{\frac{3}{8}}}{x^{\frac{1}{5}}}$ [2]

(b) $\dfrac{18x^{\frac{2}{5}} + 9x^{\frac{4}{5}}}{9x^{\frac{1}{5}}}$ [2]

Examiner only

17. Do not use a calculator to answer this question.
All working must be shown.

(a) Find the value of $\left(15^{\frac{1}{3}}\right)^6$.

Show all your working. [1]

(b) Rationalise the denominator in the following expression.

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

Show all your working. [2]

END OF PAPER