LEVEL 2 CERTIFICATE

wjec cbac

9550/01

S18-9550-01

ADDITIONAL MATHEMATICS

TUESDAY, 19 JUNE 2018 – 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 **6**.

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.	6	
2.	4	
3.	4	
4.	4	
5.	8	
6.	6	
7.	3	
8.	6	
9.	3	
10.	6	
11.	11	
12.	6	
13.	7	
14.	5	
15.	4	
16.	5	
17.	6	
18.	6	
Total	100	

1. Find $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ for **each** of the following.

(a) $y = 5x^8 - 3x - 13 + x^{-1}$ [4]

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

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(c) $y = \dfrac{3}{x^6}$ [1]

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2. Factorise $14x^2 - 5x - 1$ and **hence** solve the equation $14x^2 - 5x - 1 = 0$. [4]

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

(a) Find the value of $(4^{\frac{1}{4}})^{-12}$.

You must show all your working. [2]

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(b) Rationalise the denominator in the following expression.

$$\frac{1}{12-\sqrt{11}}$$

You must show all your working. [2]

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4. Simplify each of the following.

(a) $5x^{\frac{3}{5}} \times 6x^{\frac{4}{5}}$ [1]

(b) $(6x^{\frac{4}{5}} \times 6x^{\frac{4}{5}})^{\frac{1}{2}}$ [1]

(c) $\dfrac{6x^{\frac{2}{7}} + 3x^{\frac{4}{7}} + 6x^{\frac{1}{7}}}{6x^{\frac{1}{7}}}$ [2]

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

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(b) (i) Show that $x + 2$ is a factor of $x^3 - 6x^2 - 49x - 66$. [2]

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(ii) **Hence** factorise $x^3 - 6x^2 - 49x - 66$. [4]

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

8 cm

60°

17 cm

Diagram not drawn to scale

You **must not** use your calculator in answering this question.

Calculate the area of the parallelogram in cm^2.
Give your answer in the form $a\sqrt{b}$.   [6]

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7. The expression $x^2 + 18x + 92$ 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 $x^2 + 18x + 92$ occurs when x = ...'

'The minimum value of $x^2 + 18x + 92$ is ....'

8. Solve the following simultaneous equations.

$$y = 5x^2 + 6x - 7$$
$$y = 2x + 3$$

Use an algebraic method and give your answers correct to 2 decimal places. [6]

9. The diagram shows a rectangular-based pyramid.
The length of the rectangular base is 4 cm and the width of the base is 3 cm.
Each slant edge of the pyramid is of length 6 cm.
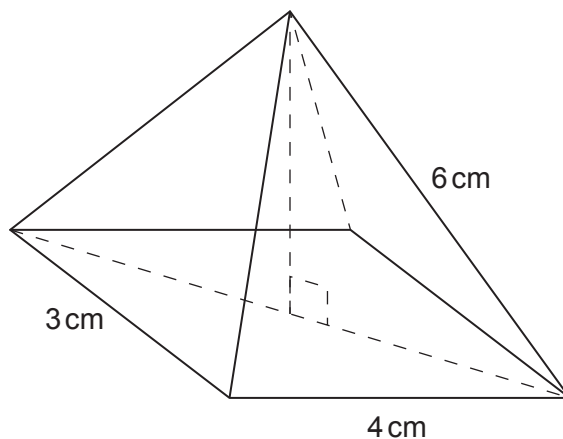
Diagram not drawn to scale

Calculate the perpendicular height of the pyramid.
You must show your working. [3]

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The perpendicular height is .... cm

10. *(a)* Find $\dfrac{d^2 y}{dx^2}$ when $y = 2x^{16}$. [2]

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

- $y = ax^3 + bx^2 + cx + d$
- $\dfrac{dy}{dx} = 12x^2 + 4x + 1$
- When $x = 1$, $y = 10$. [4]

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

11. The coordinates of the points A and B are (10, 16) and (–6, 8) respectively.

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

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(b) Find the equation of the straight line **perpendicular** to AB that passes through the midpoint of AB.
Express your answer in the form $y = mx + c$.
Give your answer in its simplest form. [8]

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12. Find $\int (12x^5 + 24x^3 - 2 + \dfrac{4}{x^5}) \, dx$.

Simplify your answer.
You must show all your working. [6]

**13.** Find the coordinates and the nature of each of the stationary points on the curve
$y = 2x^3 + 12x^2 + 11$.
You must show all your working. [7]

14. Given that $y = x^2 + 13x$, find $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ from first principles. [5]

15. *(a)* On the axes below, sketch the graph of $y = 6\cos x$ for values of x from 0° to 360°. [2]

y

x

0°   90°   180°   270°   360°
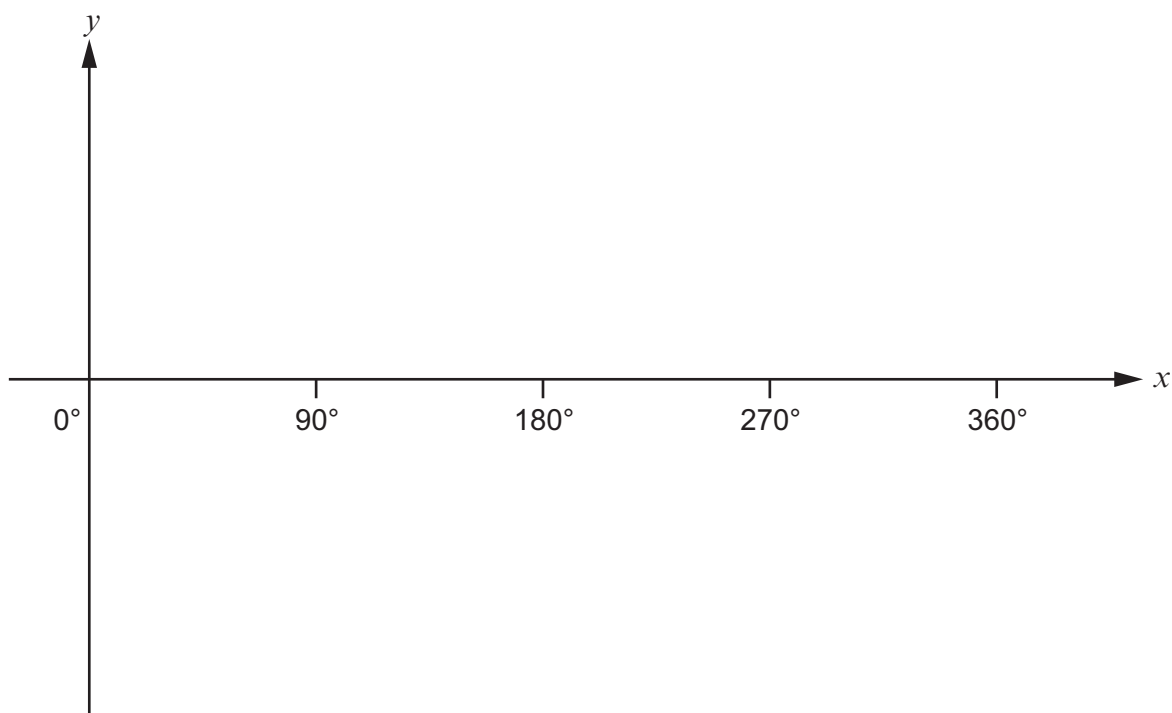
(b) Find all the solutions of the equation $6\cos x = -1$ for values of x from 0° to 360°. [2]

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16. The diagram shows a sketch of $y = -x^2 + 2x + 3$.
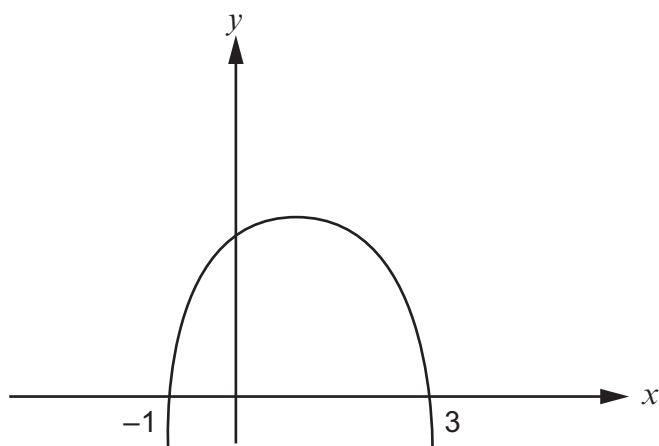
Showing all your working, calculate the area of the region bounded by the curve $y = -x^2 + 2x + 3$ and the x-axis. [5]

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17. Find the equation of the tangent to the curve $y = 6x^2 - 18x + 13$ at the point where $x = 2$.
Simplify your answer and write it in the form $ax + by + c = 0$. [6]

18. $(3x + 5)$ ice creams cost £44 altogether.
$(3x - 1)$ ice lollies cost £7 altogether.

Write an expression for the total cost, in pounds, of 2 ice creams and 3 ice lollies.
You must simplify your expression to give your answer as a single fraction in terms of x.   [6]

END OF PAPER

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