Surname	Centre Number	Candidate Number
Other Names		0

WJEC LEVEL 2 CERTIFICATE

9550/01

S16-9550-01

ADDITIONAL MATHEMATICS

A.M. TUESDAY, 21 June 2016

2 hours 30 minutes

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

ADDITIONAL MATERIALS

A calculator will be required for this paper.

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 **5**.

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

9550 010001

Examiner only

1. *(a)* (i) Factorise $21x^2 - 8x - 4$. [2]

(ii) **Hence** solve the equation $21x^2 - 8x - 4 = 0$. [2]

(b) (i) Use the method of completing the square to find the least value of

$$x^2 + 12x + 49.$$ [3]

Least value of $x^2 + 12x + 49$ is .....

(ii) What is the value of x when $x^2 + 12x + 49$ has its least value? [1]

Examiner only

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

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

(b) $y = x^{-8}$ [1]

(c) $y = x^{\frac{3}{4}}$ [1]

Turn over.

Examiner only

3. Prove that $\frac{3x}{2} - \frac{x-6}{5} + \frac{2x+3}{7} \equiv \frac{111x+114}{70}$. [4]

4. Given that $y = x^2 + 3x$, find $\frac{\mathrm{d}y}{\mathrm{d}x}$ from first principles. [5]

Examiner only

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

A cylindrical package is made with a radius of 4 cm and a height of 18 cm.
The net of the cylinder is drawn on a thin rectangular piece of card as shown in the sketch below.

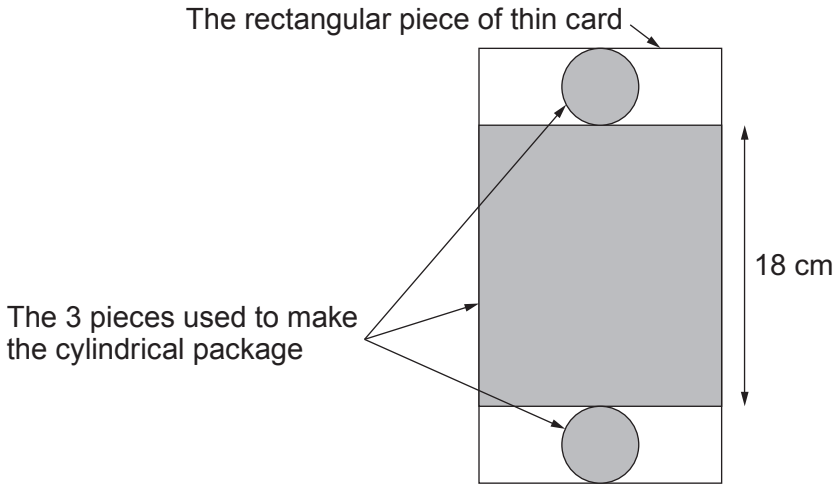


Diagram not drawn to scale

The circular ends of the package touch the rectangular piece of the net and the edges of the thin card exactly.

Calculate the area of the thin rectangular piece of card that is wasted in making this cylindrical package.
You must show all your working. [8]

Examiner only

6. *(a)* Simplify $\frac{3}{5+\sqrt{2}}$, leaving your answer in surd form.

Do not use a calculator to answer this question.
You **must** show all your working. [3]

(b) Showing all your working, simplify each of the following.

(i) $\frac{x^{-\frac{2}{5}} \times x^{\frac{17}{5}}}{x^{\frac{1}{2}}}$ [2]

(ii) $\frac{8x^{\frac{1}{9}} + x^{\frac{2}{9}}}{x^{\frac{2}{9}}}$ [2]

Examiner only

7. The coordinates of the points *F* and *G* are (–2, 14) and (4, 6) respectively.

(a) Calculate the length of the line *FG*. [2]

(b) Find the gradient of the straight line that passes through points *F* and *G*. [2]

(c) Find the equation of the straight line that
- passes through the mid-point of the line *FG*, and
- is perpendicular to the line *FG*.

Express your answer in the form $ax + by + c = 0$, where a, b and c are integers. [6]

Examiner only

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

Examiner only

9. Do **not** use a calculator to answer any part of this question.
You must show all your working.

(a) Simplify $\frac{\cos 45^\circ}{\sin 45^\circ}$. [1]

(b) Express $\frac{\sin 30^\circ}{\tan 60^\circ}$ in the form $\frac{\sqrt{a}}{b}$, where a and b are integers to be found. [2]

(c) $(\sin 60^\circ)^2$ is written $\sin^2 60^\circ$.
Simplify $\sin^2 60^\circ + \tan^2 45^\circ$. [2]

Turn over.

Examiner only

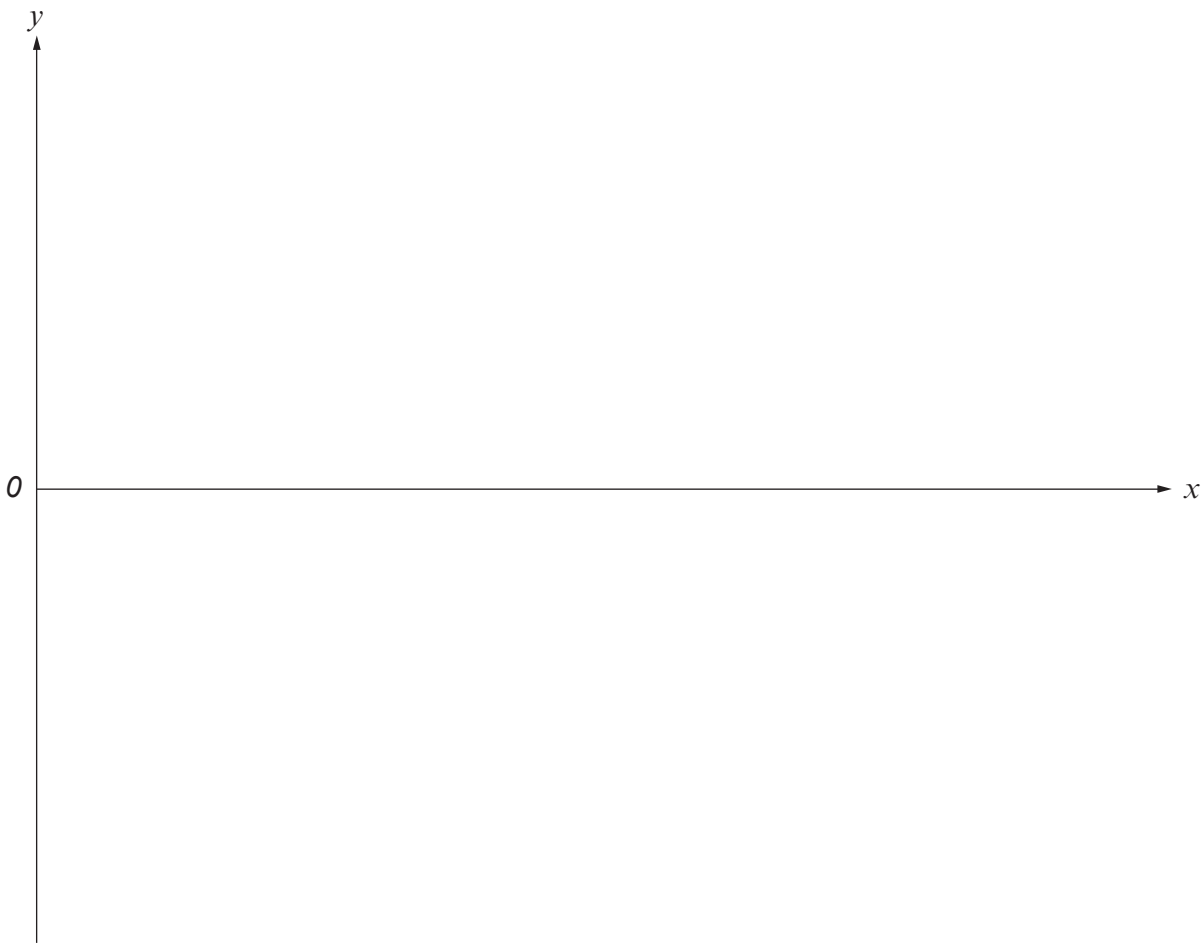
10. *(a)* Find the remainder when $x^3 + 6x^2 - x - 30$ is divided by $x - 4$. [2]

(b) (i) Show that $x - 2$ is a factor of $x^3 + 6x^2 - x - 30$. [2]

(ii) **Hence** factorise $x^3 + 6x^2 - x - 30$. [4]

Examiner only

11. *(a)* Use the axes below to sketch the graph of $y = -3\cos x + 5$ for values of x from 0° to 360°. You must label any important values on the axes. [3]



(b) State the maximum and minimum values of $y = -3\cos x + 5$. [2]

Maximum value .....

Minimum value .....

Turn over.

Examiner only

12. *(a)* Find $\frac{\mathrm{d}^2y}{\mathrm{d}x^2}$ when $y = 3x^7 + 4x$. [2]

(b) Find $\int \left(4x^3 + 2x + 4x^{-2}\right)\mathrm{d}x$. [4]

(c) Showing all your working, evaluate $\int_2^3 (8x + 2)\mathrm{d}x$. [5]

Examiner only

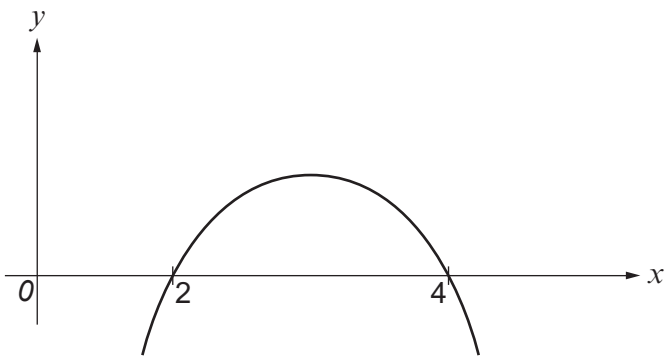
13. Find the equation of the tangent to the curve $y = 3x^2 + 6$ at the point where $x = 3$. [6]

Examiner only

14. Find, using an algebraic method, the coordinates of the points of intersection of the curve $y = x^2 - 6x + 14$ and the straight line $x + y = 10$.
You must show all your working. [4]

Examiner only

15. Millie has sketched the curve $y = -x^2 + 6x - 8$.



(a) Millie states that the points (2, 0) and (4, 0) lie on the curve $y = -x^2 + 6x - 8$.
Show that Millie is correct. [2]

(b) Calculate the area of the region bounded by the curve $y = -x^2 + 6x - 8$ and the x-axis.
You must show all your working. [5]

END OF PAPER

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