WJEC LEVEL 2 CERTIFICATE

9550/01

ADDITIONAL MATHEMATICS

A.M. MONDAY, 23 June 2014

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.

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 **3**.

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

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

   (a) $y = 6x^5 + 7x - 2$ [3]

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

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   (c) $y = x^{\frac{5}{2}}$ [1]

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2. *(a)* Factorise $15x^2 - 14x - 8$. [4]

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Hence solve the equation $15x^2 - 14x - 8 = 0$.

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(b) Use the method of completing the square to find the least value of $x^2 + 10x + 3$. [3]

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

Diagram not drawn to scale

ADC is a sector of a circle, centre *A*.
AEB is a sector of another circle, also with centre *A*.
Calculate the perimeter of the shape *BCDE*.
You must show all your working.   [8]

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4. Prove that $\dfrac{2x}{3} - \dfrac{x-7}{4} + \dfrac{3x+1}{5} \equiv \dfrac{61x+117}{60}$. [4]

5. Given that $y = x^2 + 8x$, find $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ from first principles. [5]

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

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

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

(i) $\dfrac{3x^{-\frac{7}{4}} \times 2x^{\frac{17}{4}}}{x^{\frac{3}{2}}}$ [2]

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(ii) $\dfrac{28x^{\frac{1}{7}} + 7x^{\frac{2}{7}}}{7x^{\frac{1}{7}}}$ [2]

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7. The coordinates of the points *D* and *E* are (–1, 13) and (5, 5) respectively.

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

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

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(c) Find the equation of the straight line that passes through points *D* and *E*.
Express your answer in the form $ax + by = c$, where a, b and c are whole numbers. [4]

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8. Find the coordinates and nature of each of the stationary points on the curve $y = 4x^3 - 12x + 7$. You must show all your working. [7]

Examiner
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9.

Diagram not drawn to scale

Calculate the length of *BC*.
Give your answer in surd form.
Do not use your calculator to answer this question.
You must show all your working. [7]

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Turn over.

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

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(b) (i) Show that $x - 1$ is a factor of $x^3 + 5x^2 + 2x - 8$. [2]

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(ii) **Hence** factorise $x^3 + 5x^2 + 2x - 8$. [4]

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Diagram not drawn to scale

The area of the trapezium in the diagram is $28\,\text{cm}^2$.
A rectangle of length $(x + y)$ cm and width y cm has an area of $43\,\text{cm}^2$.

(a)   Show that $xy = 28 - 2y$ and $xy = 43 - y^2$.   [3]

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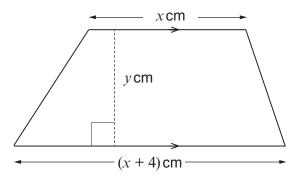(b)   Hence write down a quadratic equation in terms of y to calculate the lengths of the parallel sides of the trapezium.
You must use an algebraic method, **not** a trial and improvement method.   [4]

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12. *(a)* Find $\dfrac{d^2y}{dx^2}$ when $y = 2x^6 + 3x$. [2]

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(b) Find $\displaystyle\int 3x^4 + 6x + 8x^{-2}\, dx$. [4]

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(c) Showing all your working, evaluate $\displaystyle\int_2^5 4x + 1\, dx$. [5]

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13. The following equations represent straight lines.

$$2x + 4y = 7$$
$$2x + 5y = 7$$
$$x + 2y = 7$$
$$4x - 2y = 7$$
$$2x - 4y = 7$$

(a) Which equations represent lines that are parallel?
You must explain how you know that these lines are parallel. [2]

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(b) Write down any two of the equations that represent lines that are perpendicular.
You must explain how you know that these lines are perpendicular. [3]

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14. Find the coordinates of the points of intersection of the curve $y = x^2 - 7x + 12$ and the straight line $x + y = 4$. [4]

15. Dan has sketched the curve $y = -x^2 + 7x - 10$.

He has indicated two points on the curve, (2, 0) and (5, 0).

(a) Show that these points lie on this curve. [2]

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(b) Showing all your working, calculate the area of the region bounded by the curve $y = -x^2 + 7x - 10$ and the x-axis. [5]

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END OF PAPER