

Candidate Name	Centre Number	Candidate Number



**WJEC LEVEL 2 CERTIFICATE IN  
ADDITIONAL MATHEMATICS  
SPECIMEN PAPER**

**SUMMER 2011**

$2\frac{1}{2}$  hours

**ADDITIONAL MATERIALS**

A calculator will be required for this paper.

**INSTRUCTIONS TO CANDIDATES**

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  $\pi$  as  $3 \cdot 14$  or use the  $\pi$  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 **15**.

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
<b>1</b>	<b>7</b>	
<b>2</b>	<b>8</b>	
<b>3</b>	<b>5</b>	
<b>4</b>	<b>4</b>	
<b>5</b>	<b>7</b>	
<b>6</b>	<b>7</b>	
<b>7</b>	<b>5</b>	
<b>8</b>	<b>4</b>	
<b>9</b>	<b>7</b>	
<b>10</b>	<b>5</b>	
<b>11</b>	<b>6</b>	
<b>12</b>	<b>5</b>	
<b>13</b>	<b>7</b>	
<b>14</b>	<b>5</b>	
<b>15</b>	<b>5</b>	
<b>16</b>	<b>4</b>	
<b>17</b>	<b>9</b>	
<b>TOTAL MARK</b>		

1. (a) Showing all your working, find the value of each of the following.

(i)  $25^{\frac{3}{2}} \times 27^{-\frac{4}{3}}$

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(ii)  $\left(16^{\frac{1}{4}}\right)^{-4}$

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

(i)  $\frac{5y^{\frac{3}{2}} \times 4y^{-\frac{3}{4}}}{(y^3)^{\frac{1}{4}}}$  ,

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(ii)  $\frac{2x^{\frac{1}{3}} + 5x^{\frac{4}{3}}}{4x^{\frac{1}{3}}}$  .

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2. (a) Find the remainder when  $3x^3 - x^2 + 5x + 42$  is divided by  $x + 2$ .

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- (b) (i) Show that  $x - 4$  is a factor of  $2x^3 - 3x^2 - 23x + 12$ .

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- (ii) **Hence** factorise  $2x^3 - 3x^2 - 23x + 12$ .

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

(a)  $y = 7x^5 + x - 18$

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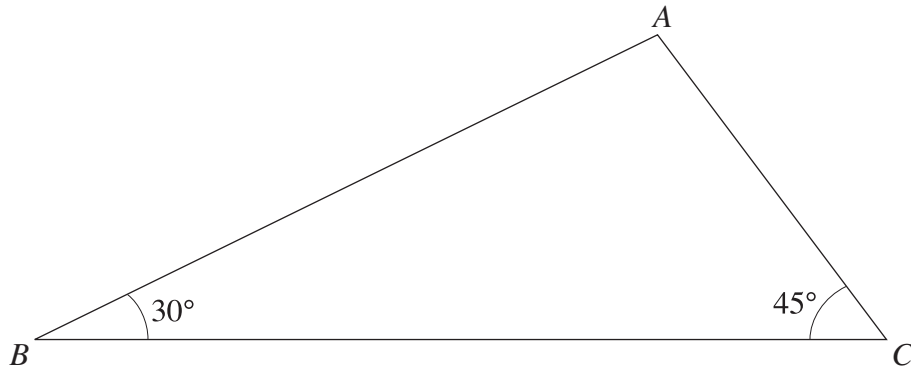
(b)  $y = x^{-6}$

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(c)  $y = x^{\frac{2}{3}}$

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4. The diagram shows triangle  $ABC$  with  $\hat{A}BC = 30^\circ$  and  $\hat{A}CB = 45^\circ$ .



*Diagram not drawn to scale.*

The perpendicular distance from  $A$  to  $BC$  is 5 cm. Show that  $BC = 5(\sqrt{3} + 1)$  cm .

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5. Find the coordinates of the stationary points on the curve  $y = x^3 - 3x - 2$  and determine their nature. You must show all your working.

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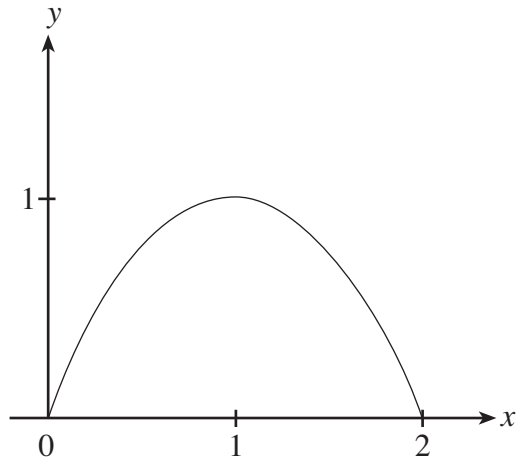
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7. The diagram shows the curve  $y = 2x - x^2$ .



Calculate the area of the region bounded by the curve  $y = 2x - x^2$  and the  $x$ -axis.

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8. Solve the equation  $\frac{2}{2x+3} + 4 = \frac{4x}{x-2}$ .

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9. (a) Factorise  $12x^2 + 11x - 15$ .

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**Hence** solve the equation  $12x^2 + 11x - 15 = 0$ .

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- (b) Use the method of completing the square to find the least value of  $x^2 + 16x + 3$ .

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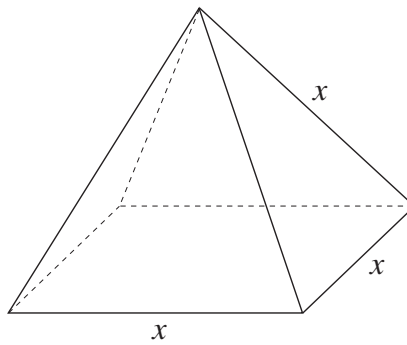
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10. The diagram shows a square based pyramid. The length of each of the edges is  $x$ .



*Diagram not drawn to scale.*

Show that the total surface area of the pyramid is  $x^2(1 + \sqrt{3})$ .

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11. Find the equation of the tangent to the curve  $y = x^3 - 3x^2 + 2$  at the point on the curve where  $x = -1$ .

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12. The coordinates of the points  $P$  and  $Q$  are  $(2, 3)$  and  $(14, 19)$  respectively.

(a) Calculate the length of the line  $PQ$ .

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(b) Find the gradient of a straight line perpendicular to  $PQ$ .

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13. (a) Given that  $y = x^2 - x$ , find  $\frac{dy}{dx}$  from first principles.

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- (b) Find the  $x$ -coordinate of the point on the curve  $y = x^2 - x$  where the gradient of the tangent to the curve is 3.

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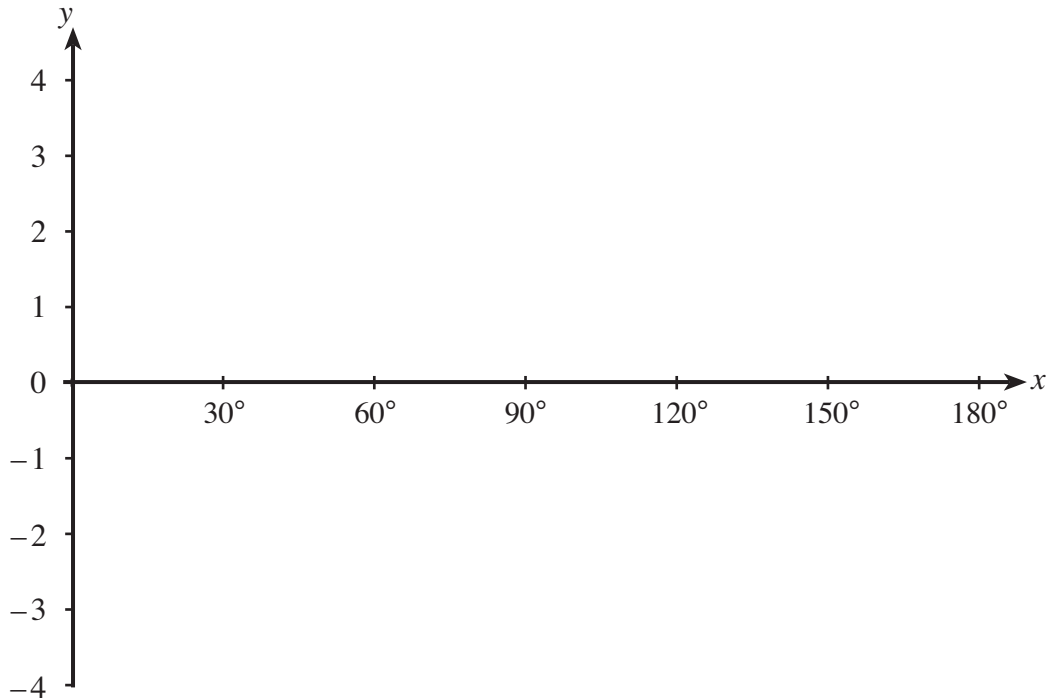
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14. (a) On the axes below, sketch the graph of  $y = 2 \sin 3x$  for values of  $x$  from  $0^\circ$  to  $180^\circ$ .



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- (b) Find all the solutions of the equation  $2 \sin 3x = -1$  for values of  $x$  from  $0^\circ$  to  $180^\circ$ .

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

Jodie takes part in a mathematics quiz. She is given the following clues to find an equation of a straight line.

The equation is of a straight line that:

- passes through the origin
- is not parallel to the  $x$ -axis
- is perpendicular to the straight line with equation  $4x + y - 3 = 0$
- intersects the  $y$ -axis only once

Find the equation for Jodie and clearly indicate which of the clues are essential in order to work out the answer.

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16. Prove that  $\frac{2x}{5} + \frac{x-1}{6} + \frac{3x+5}{10} \equiv \frac{13x+5}{15}$  .

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17. (a) Find  $\int \left( 3x^4 + \sqrt{x} + \frac{1}{x^2} \right) dx$ .

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(b) Showing all your working, evaluate  $\int_1^2 (x^3 + 2) dx$ .

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