Please check the examination deta	ils below before enterin	g your candidate information
Candidate surname	С	Other names
Pearson Edexcel International Advanced Level	Centre Number	Candidate Number
<b>Time</b> 1 hour 30 minutes	Paper reference	WMA12/01
Mathematics		
International Advanced Pure Mathematics P2	d Subsidiary/	Advanced Level
You must have: Mathematical Formulae and Stat	istical Tables (Yello	ow), calculator

Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

## **Instructions**

- Use black ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
   there may be more space than you need.
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Inexact answers should be given to three significant figures unless otherwise stated.

## Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 9 questions in this question paper. The total mark for this paper is 75.
- The marks for **each** question are shown in brackets
  - use this as a guide as to how much time to spend on each guestion.

## Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.
- Good luck with your examination.

Turn over ▶







1.	Adina is saving money to buy a new computer. She saves £5 in week 1, £5.25 in week 2,
	£5.50 in week 3 and so on until she has enough money, in total, to buy the computer.

She decides to model her savings using either an arithmetic series or a geometric series.

Using the information given,

- (a) (i) state with a reason whether an arithmetic series or a geometric series should be used,
  - (ii) write down an expression, in terms of n, for the amount, in pounds (£), saved in week n.

**(3)** 

Given that the computer Adina wants to buy costs £350

(b)	find the number	of weeks	it will	take fo	r Adina	to sa	ave enough	money to	buy	the
	computer.									

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Q1

(Total 7 marks)



2.

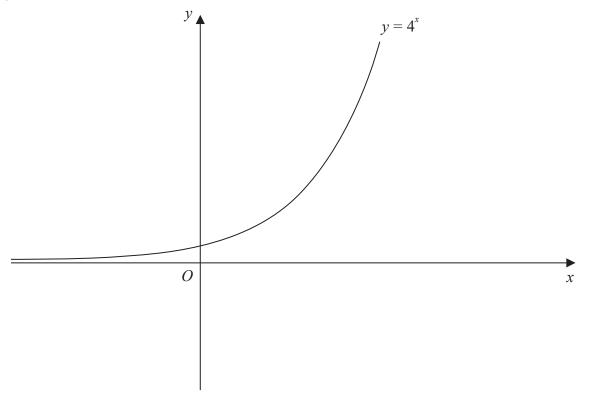


Figure 1

Figure 1 shows a sketch of the curve with equation  $y = 4^x$ 

A copy of Figure 1, labelled Diagram 1, is shown on the next page.

(a) On Diagram 1, sketch the curve with equation

(i) 
$$y = 2^x$$

(ii) 
$$y = 4^x - 6$$

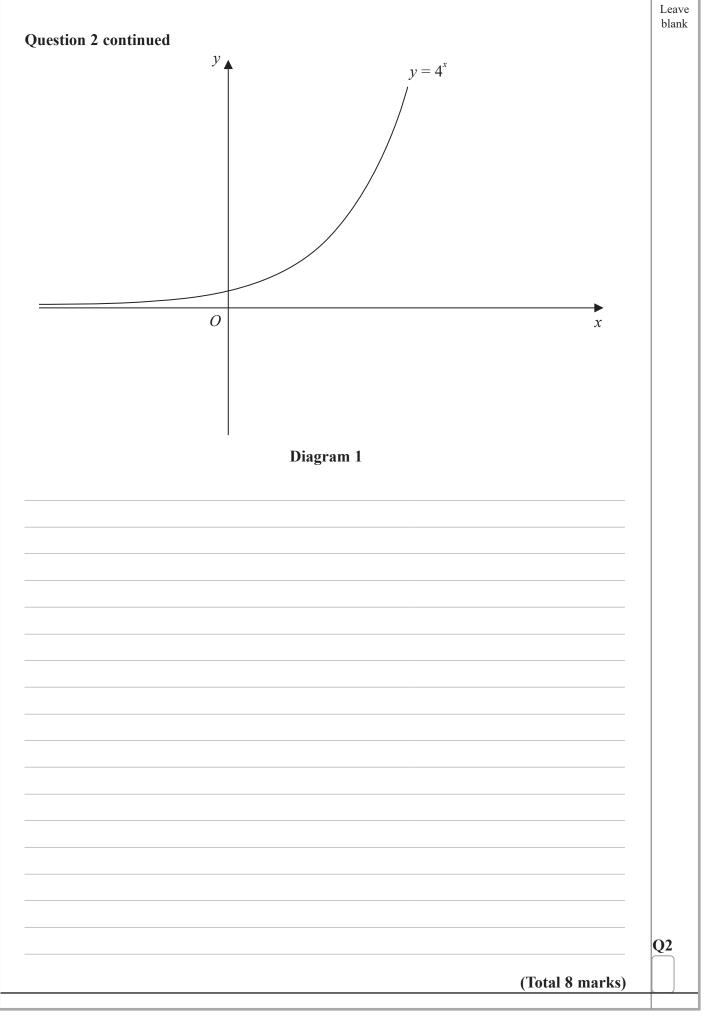
Label clearly the coordinates of any points of intersection with the coordinate axes.

**(4)** 

The curve with equation  $y = 2^x$  meets the curve with equation  $y = 4^x - 6$  at the point P.

(b) Using algebra, find the exact coordinates of P.

**(4)** 



$p^3 + p$ is a multiple of 10	(2
(ii) Show, using algebra, that for $n \in \mathbb{N}$	
$(n+1)^3 - n^3$ is not a multiple of 3	(3



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Question 3 continued	Dialik
Question 5 continued	



Question 3 continued	

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Question 3 continued	
	Q3
(Total 5 marks)	
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4. (a) Find, in ascending powers of x, up to and including the term in  $x^3$ , the binomial expansion of

$$\left(2+\frac{x}{8}\right)^{13}$$

fully simplifying each coefficient.

**(4)** 

(b) Use the answer to part (a) to find an approximation for 2.0125<sup>13</sup>

Give your answer to 3 decimal places.

(3)

Without calculating 2.0125<sup>13</sup>

(c) state, with a reason, whether the answer to part (b) is an overestimate or an underestimate.

**(1)** 

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Question 4 continued	



Question 4 continued		

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	Q4
(Total 8 marks)	



5.

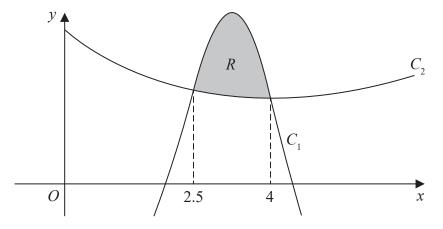


Figure 2

Figure 2 shows a sketch of part of the graph of the curves  $C_1$  and  $C_2$ 

The curves intersect when x = 2.5 and when x = 4

A table of values for some points on the curve  $C_1$  is shown below, with y values given to 3 decimal places as appropriate.

х	2.5	2.75	3	3.25	3.5	3.75	4
У	5.453	7.764	9.375	9.964	9.367	7.626	5

Using the trapezium rule with all the values of *y* in the table,

(a) find, to 2 decimal places, an estimate for the area bounded by the curve  $C_1$ , the line with equation x = 2.5, the x-axis and the line with equation x = 4 (4)

The curve  $C_2$  has equation

$$y = x^{\frac{3}{2}} - 3x + 9 \qquad x > 0$$

(b) Find 
$$\int \left(x^{\frac{3}{2}} - 3x + 9\right) dx$$
 (3)

The region R, shown shaded in Figure 2, is bounded by the curves  $C_{\scriptscriptstyle 1}$  and  $C_{\scriptscriptstyle 2}$ 

(c) Use the answers to part (a) and part (b) to find, to one decimal place, an estimate for the area of the region R.

(3)

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Question 5 continued	



Question 5 continued		



(Total 10 marks)

**6.** A circle has equation

$$x^2 - 6x + y^2 + 8y + k = 0$$

where k is a positive constant.

Given that the x-axis is a tangent to this circle,

(a) find the value of k.

**(3)** 

The circle meets the coordinate axes at the points R, S and T.

(b) Find the exact area of the triangle RST.

**(4)** 

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Question 6 continued	



Question 6 continued	

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	Q6
(Total 7 manulus)	
(Total 7 marks)	



(a) Given that

$$3\log_3(2x-1) = 2 + \log_3(14x-25)$$

show that

$$2x^3 - 3x^2 - 30x + 56 = 0$$

**(4)** 

(b) Show that -4 is a root of this cubic equation.

- **(2)**
- (c) Hence, using algebra and showing each step of your working, solve

$$3\log_3(2x-1) = 2 + \log_3(14x-25)$$

**(4)** 




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Question 7 continued	



Question 7 continued	1	



(Total 10 marks)

8. In this question you must show all stages of your working.

Solutions relying entirely on calculator technology are not acceptable.

(i) Solve, for  $0 < \theta < 360^{\circ}$ , the equation

$$3\sin(\theta + 30^\circ) = 7\cos(\theta + 30^\circ)$$

giving your answers to one decimal place.

**(4)** 

**(6)** 

(ii) (a) Show that the equation

$$3\sin^3 x = 5\sin x - 7\sin x\cos x$$

can be written in the form

$$\sin x(a\cos^2 x + b\cos x + c) = 0$$

where a, b and c are constants to be found.

(b) Hence solve for 
$$-\frac{\pi}{2} \leqslant x \leqslant \frac{\pi}{2}$$
 the equation

$$3\sin^3 x = 5\sin x - 7\sin x\cos x$$

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Question 8 continued	



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Question 8 continued	



(Total 10 marks)

9.

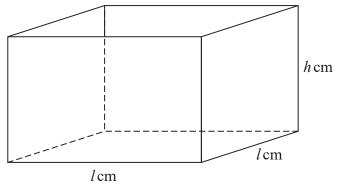


Figure 3

Figure 3 shows a sketch of a square based, open top box.

The height of the box is h cm, and the base edges each have length l cm.

Given that the volume of the box is 250 000 cm<sup>3</sup>

(a) show that the external surface area,  $S \text{ cm}^2$ , of the box is given by

$$S = \frac{250\,000}{h} + 2000\sqrt{h}$$

**(3)** 

(b) Use algebraic differentiation to show that S has a stationary point when  $h = 250^k$  where k is a rational constant to be found.

**(5)** 

(c) Justify by further differentiation that this value of h gives the minimum external surface area of the box.

**(2)** 



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Question 9 continued	

