Please check the examination details	below before ent	ering your candidate	information
Candidate surname		Other names	
Centre Number Candidate	e Number		
Pearson Edexcel Inte	ernation	al Advan	ced Level
<b>Time</b> 1 hour 30 minutes	Paper reference	WMA	12/01
Mathematics			0 0
<b>International Advanced</b>	Subsidiar	v/Advance	d Level
Pure Mathematics P2	Subsidiai	y/Advance	a Level
Pure Mathematics P2			
You must have: Mathematical Formulae and Statis	tical Tables (Ye	ellow), calculato	Total Marks

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 10 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 question.

## **Advice**

- Read each guestion 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.

Turn over ▶







1. The table below shows corresponding values of x and y for

$$y = 2^{5 - \sqrt{x}}$$

The values of *y* are given to 3 decimal places.

x	5	5.5	6	6.5	7
y	6.792	6.298	5.858	5.466	5.113

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

(a) obtain an estimate for

$$\int_{5}^{7} 2^{5-\sqrt{x}} \, \mathrm{d}x$$

giving your answer to 2 decimal places.

**(3)** 

(b) Using your answer to part (a) and making your method clear, estimate

$$(i) \quad \int_5^7 2^{6-\sqrt{x}} \, \mathrm{d}x$$

(ii) 
$$\int_{5}^{7} (3 + 2^{5 - \sqrt{x}}) dx$$

**(4)** 

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Question 1 continued	



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Question 1 continued	blank
(Total 7 marks)	Q1



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

Solutions relying entirely on calculator technology are not acceptable.

The curve C has equation

$$y = 27x^{\frac{1}{2}} - x^{\frac{3}{2}} - 20 \qquad x > 0$$

(a) Find  $\frac{dy}{dx}$ , giving each term in simplest form.

(2)

(b) Hence find the coordinates of the stationary point of C.

**(4)** 

(c) Find  $\frac{d^2y}{dx^2}$  and hence determine the nature of the stationary point of C.

**(2)** 

Question 2 continued	blank
	Q2
(Total 8 marks)	
(Total & marks)	



3. (a) Find the first 4 terms, in ascending powers of x, of the binomial expansion of

$$\left(2-\frac{kx}{4}\right)^8$$

where k is a non-zero constant. Give each term in simplest form.

**(4)** 

$$f(x) = (5 - 3x) \left(2 - \frac{kx}{4}\right)^8$$

In the expansion of f(x), the constant term is 3 times the coefficient of x.

(b) Find the value of k.

	(2)	
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Question 3 continued

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$$\log_3(32 - 12x) = 2\log_3(1 - x) + 3$$

151


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Question 4 continued	blank
	Q4
(Total 5 marks)	



5.  $f(x) = 3x^3 + Ax^2 + Bx - 10$ 

where A and B are integers.

Given that

- when f(x) is divided by (x-1) the remainder is k
- when f(x) is divided by (x + 1) the remainder is -10k
- *k* is a constant
- (a) show that

$$11A + 9B = 83$$

**(3)** 

Given also that (3x - 2) is a factor of f(x),

(b) find the value of A and the value of B.

(3)

(c) Hence find the quadratic expression g(x) such that

$$f(x) = (3x - 2)g(x)$$

**(2)** 

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Question 5 continued	



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**6.** 

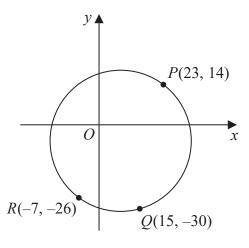


Figure 1

The points P(23, 14), Q(15, -30) and R(-7, -26) lie on the circle C, as shown in Figure 1.

(a) Show that angle  $PQR = 90^{\circ}$ 

**(2)** 

- (b) Hence, or otherwise, find
  - (i) the centre of C,
  - (ii) the radius of C.

**(3)** 

Given that the point S lies on C such that the distance QS is greatest,

(c) find an equation of the tangent to C at S, giving your answer in the form ax + by + c = 0, where a, b and c are integers to be found.

**(3)** 

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Question 6 continued	



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Question 6 continued	
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	<b>Q6</b>
(Total 8 marks)	



In this question you must show all stages of your working.
 Solutions relying entirely on calculator technology are not acceptable.

(i) Solve, for  $-90^{\circ} < x < 90^{\circ}$ , the equation

$$3\sin(2x-15^{\circ}) = \cos(2x-15^{\circ})$$

giving your answers to one decimal place.

**(4)** 

(ii) Solve, for  $0 < \theta < 2\pi$ , the equation

$$4\sin^2\theta + 8\cos\theta = 3$$

giving your answers to 3 significant figures.

**(4)** 


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Question 7 continued	

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	<b>Q7</b>
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**8.** A metal post is repeatedly hit in order to drive it into the ground.

Given that

- on the 1st hit, the post is driven 100 mm into the ground
- on the 2nd hit, the post is driven an **additional** 98 mm into the ground
- on the 3rd hit, the post is driven an **additional** 96 mm into the ground
- the **additional** distances the post travels on each subsequent hit form an arithmetic sequence
- (a) show that the post is driven an **additional** 62 mm into the ground with the 20th hit.

**(1)** 

(b) Find the **total distance** that the post has been driven into the ground after 20 hits.

**(2)** 

Given that for each subsequent hit after the 20th hit

- the **additional** distances the post travels form a geometric sequence with common ratio *r*
- on the 22nd hit, the post is driven an additional 60 mm into the ground
- (c) find the value of r, giving your answer to 3 decimal places.

**(2)** 

After a total of N hits, the post will have been driven more than 3 m into the ground.

(d) Find, showing all steps in your working, the smallest possible value of N.

**(4)** 


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9.

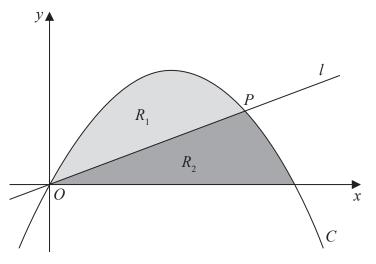


Figure 2

Figure 2 shows

- the curve C with equation  $y = x x^2$
- the line *l* with equation y = mx, where *m* is a constant and 0 < m < 1

The line and the curve intersect at the origin O and at the point P.

(a) Find, in terms of m, the coordinates of P.

**(2)** 

The region  $R_1$ , shown shaded in Figure 2, is bounded by C and l.

(b) Show that the area of  $R_1$  is

$$\frac{(1-m)^3}{6}$$

**(5)** 

The region  $R_2$ , also shown shaded in Figure 2, is bounded by C, the x-axis and l. Given that the area of  $R_1$  is equal to the area of  $R_2$ 

(c) find the exact value of m.

**(3)** 

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Question 9 continued	



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10. (i) Prove by counter example that the statement	
"if $p$ is a prime number then $2p + 1$ is also a prime number"	
is not true.	
	(1)
(ii) Use proof by exhaustion to prove that if $n$ is an integer then	
$5n^2 + n + 12$	
is always even.	(4)



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Question 10 continued	



	(Total 5 m	arks)

**Q10**