

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson Edexcel**  
**International**  
**Advanced Level**

Centre Number

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Candidate Number

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**Wednesday 6 November 2019**

Morning (Time: 1 hour 30 minutes)

Paper Reference **WMA12/01**

**Mathematics**

**International Advanced Subsidiary/Advanced Level**  
**Pure Mathematics P2**

**You must have:**

Mathematical Formulae and Statistical Tables (Lilac), calculator

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 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.

Turn over ►

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### Question 1 continued

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(Total 6 marks)

Q1



P 5 8 4 3 7 A 0 3 3 2

2. The adult population of a town at the start of 2019 is 25 000

A model predicts that the adult population will increase by 2% each year, so that the number of adults in the population at the start of each year following 2019 will form a geometric sequence.

(a) Find, according to the model, the adult population of the town at the start of 2032 **(3)**

It is also modelled that every member of the adult population gives £5 to local charity at the start of each year.

(b) Find, according to these models, the total amount of money that would be given to local charity by the adult population of the town from 2019 to 2032 inclusive. Give your answer to the nearest £1 000 **(3)**

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**Question 2 continued**

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Q2





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Question 3 continued

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Q3

(Total 6 marks)







Question 4 continued

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**Question 4 continued**

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**(Total 8 marks)**

**Q4**

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5. (a) Given  $0 < a < 1$ , sketch the curve with equation

$$y = a^x$$

showing the coordinates of the point at which the curve crosses the y-axis.

(2)

$x$	2	2.5	3	3.5	4
$y$	4.25	6.427	9.125	12.34	16.06

The table above shows corresponding values of  $x$  and  $y$  for  $y = x^2 + \left(\frac{1}{2}\right)^x$

The values of  $y$  are given to 4 significant figures as appropriate.

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

- (b) obtain an estimate for  $\int_2^4 \left( x^2 + \left(\frac{1}{2}\right)^x \right) dx$

(3)

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

- (c)  $\int_2^4 \left( x(x-3) + \left(\frac{1}{2}\right)^x \right) dx$

(2)



Question 5 continued

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6.

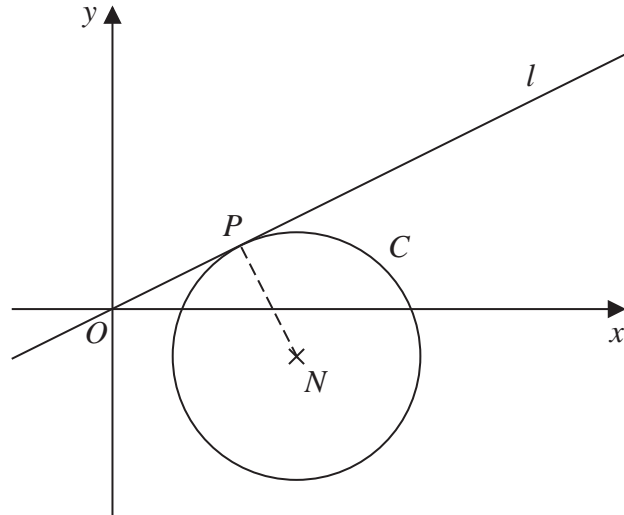


Figure 1

Figure 1 shows a sketch of a circle  $C$  with centre  $N(4, -1)$ .

The line  $l$  with equation  $y = \frac{1}{2}x$  is a tangent to  $C$  at the point  $P$ .

Find

(a) the equation of line  $PN$  in the form  $y = mx + c$ , where  $m$  and  $c$  are constants, (2)

(b) the equation of  $C$ . (5)

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Question 6 continued

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Question 6 continued

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(Total 7 marks)

Q6



7. Given  $\log_a b = k$ , find, in simplest form in terms of  $k$ ,

(i)  $\log_a \left( \frac{\sqrt{a}}{b} \right)$  (2)

(ii)  $\frac{\log_a a^2 b}{\log_a b^3}$  (2)

(iii)  $\sum_{n=1}^{50} (k + \log_a b^n)$  (3)

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8. Solutions relying on calculator technology are not acceptable in this question.

(i)

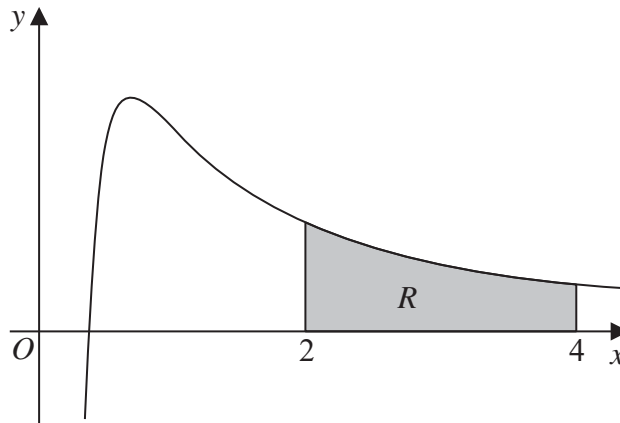


Figure 2

Figure 2 shows a sketch of part of a curve with equation

$$y = \frac{8\sqrt{x} - 5}{2x^2} \quad x > 0$$

The region  $R$ , shown shaded in Figure 2, is bounded by the curve, the line with equation  $x = 2$ , the  $x$ -axis and the line with equation  $x = 4$

Find the exact area of  $R$ .

(5)

(ii) Find the value of the constant  $k$  such that

$$\int_{-3}^6 \left( \frac{1}{2}x^2 + k \right) dx = 55$$

(4)

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Question 8 continued

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Question 8 continued

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(Total 9 marks)

Q8

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Question 9 continued

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Q9

(Total 12 marks)



10. The curve  $C$  has equation

$$y = ax^3 - 3x^2 + 3x + b$$

where  $a$  and  $b$  are constants.

Given that

- the point  $(2, 5)$  lies on  $C$
- the gradient of the curve at  $(2, 5)$  is  $7$

(a) find the value of  $a$  and the value of  $b$ . (4)

(b) Prove that  $C$  has no turning points. (3)

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**Question 10 continued**

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**(Total 7 marks)**

**Q10**

**END TOTAL FOR PAPER IS 75 MARKS**

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