

Write your name here

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Other names

**Pearson Edexcel**  
**Level 3 GCE**

Centre Number

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Candidate Number

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# Mathematics

**Advanced Subsidiary**

**Paper 1: Pure Mathematics**

Sample Assessment Material for first teaching September 2017

**Time: 2 hours**

Paper Reference

**8MA0/01**

**You must have:**

Mathematical Formulae and Statistical Tables, calculator

Total Marks

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**Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for algebraic 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** the 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.
- Answers should be given to three significant figures unless otherwise stated.

## Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 17 questions in this question paper. The total mark for this paper is 100.
- 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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**Answer ALL questions. Write your answers in the spaces provided.**

1. The line  $l$  passes through the points  $A(3, 1)$  and  $B(4, -2)$ .

Find an equation for  $l$ .

(3)

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**(Total for Question 1 is 3 marks)**







5. Given that

$$f(x) = 2x + 3 + \frac{12}{x^2}, \quad x > 0$$

show that  $\int_1^{2\sqrt{2}} f(x)dx = 16 + 3\sqrt{2}$

(5)

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**(Total for Question 5 is 5 marks)**



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

$$\left(2 - \frac{x}{2}\right)^7, \text{ giving each term in its simplest form.}$$

(4)

(b) Explain how you would use your expansion to give an estimate for the value of  $1.995^7$

(1)

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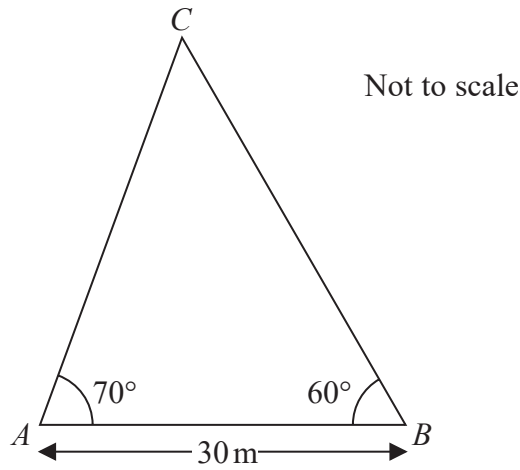


Figure 1

A triangular lawn is modelled by the triangle  $ABC$ , shown in Figure 1. The length  $AB$  is to be  $30\text{ m}$  long.

Given that angle  $BAC = 70^\circ$  and angle  $ABC = 60^\circ$ ,

(a) calculate the area of the lawn to 3 significant figures. (4)

(b) Why is your answer unlikely to be accurate to the nearest square metre? (1)

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9. Solve, for  $360^\circ \leq x < 540^\circ$ ,

$$12 \sin^2 x + 7 \cos x - 13 = 0$$

Give your answers to one decimal place.

*(Solutions based entirely on graphical or numerical methods are not acceptable.)*

(5)

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10. The equation  $kx^2 + 4kx + 3 = 0$ , where  $k$  is a constant, has no real roots.

Prove that

$$0 \leq k < \frac{3}{4} \quad (4)$$

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**(Total for Question 10 is 4 marks)**

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11. (a) Prove that for all positive values of  $x$  and  $y$

$$\sqrt{xy} \leq \frac{x+y}{2} \quad (2)$$

(b) Prove by counter example that this is not true when  $x$  and  $y$  are both negative. (1)

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**(Total for Question 11 is 3 marks)**

12. A student was asked to give the exact solution to the equation

$$2^{2x+4} - 9(2^x) = 0$$

The student's attempt is shown below:

$$2^{2x+4} - 9(2^x) = 0$$

$$2^{2x} + 2^4 - 9(2^x) = 0$$

$$\text{Let } 2^x = y$$

$$y^2 - 9y + 8 = 0$$

$$(y - 8)(y - 1) = 0$$

$$y = 8 \text{ or } y = 1$$

$$\text{So } x = 3 \text{ or } x = 0$$

(a) Identify the two errors made by the student.

(2)

(b) Find the exact solution to the equation.

(2)

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**(Total for Question 12 is 4 marks)**





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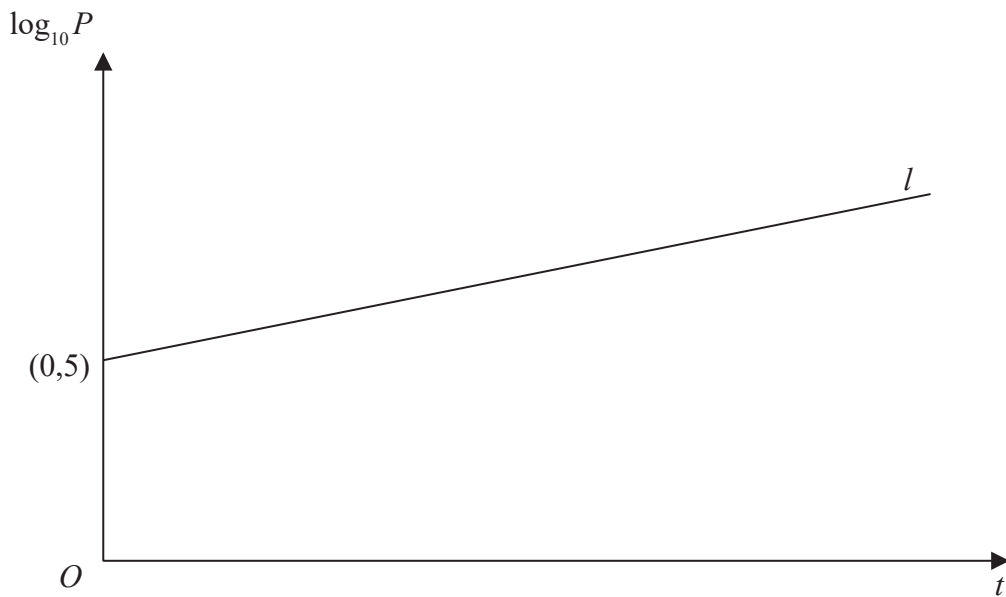


Figure 2

A town's population,  $P$ , is modelled by the equation  $P = ab^t$ , where  $a$  and  $b$  are constants and  $t$  is the number of years since the population was first recorded.

The line  $l$  shown in Figure 2 illustrates the linear relationship between  $t$  and  $\log_{10} P$  for the population over a period of 100 years.

The line  $l$  meets the vertical axis at  $(0, 5)$  as shown. The gradient of  $l$  is  $\frac{1}{200}$ .

- (a) Write down an equation for  $l$ . (2)
- (b) Find the value of  $a$  and the value of  $b$ . (4)
- (c) With reference to the model interpret
- (i) the value of the constant  $a$ ,
  - (ii) the value of the constant  $b$ . (2)
- (d) Find
- (i) the population predicted by the model when  $t = 100$ , giving your answer to the nearest hundred thousand,
  - (ii) the number of years it takes the population to reach 200 000, according to the model. (3)
- (e) State two reasons why this may not be a realistic population model. (2)



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15.

Diagram not drawn to scale

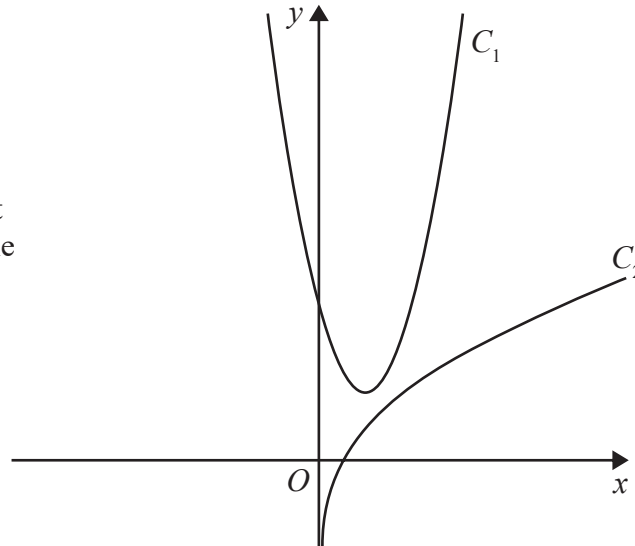


Figure 3

The curve  $C_1$ , shown in Figure 3, has equation  $y = 4x^2 - 6x + 4$ .

The point  $P\left(\frac{1}{2}, 2\right)$  lies on  $C_1$ .

The curve  $C_2$ , also shown in Figure 3, has equation  $y = \frac{1}{2}x + \ln(2x)$ .

The normal to  $C_1$  at the point  $P$  meets  $C_2$  at the point  $Q$ .

Find the exact coordinates of  $Q$ .

(Solutions based entirely on graphical or numerical methods are not acceptable.)

(8)



16.

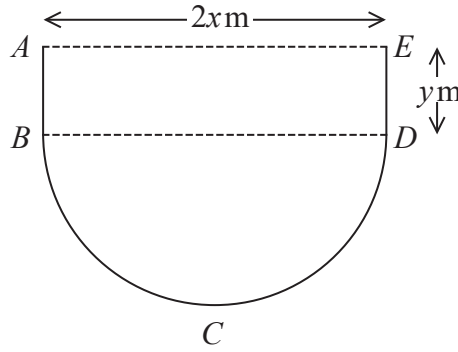


Figure 4

Figure 4 shows the plan view of the design for a swimming pool.

The shape of this pool  $ABCDEA$  consists of a rectangular section  $ABDE$  joined to a semicircular section  $BCD$  as shown in Figure 4.

Given that  $AE = 2x$  metres,  $ED = y$  metres and the area of the pool is  $250\text{ m}^2$ ,

(a) show that the perimeter,  $P$  metres, of the pool is given by

$$P = 2x + \frac{250}{x} + \frac{\pi x}{2} \quad (4)$$

(b) Explain why  $0 < x < \sqrt{\frac{500}{\pi}}$  (2)

(c) Find the minimum perimeter of the pool, giving your answer to 3 significant figures. (4)

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**Question 16 continued**

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**Question 17 continued**

Lined area for writing the answer to Question 17.

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