

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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**Tuesday 8 January 2019**

Morning (Time: 1 hour 30 minutes)

Paper Reference **WMA11/01**

**Mathematics**  
**Advanced Subsidiary**  
**Pure Mathematics P1**

**You must have:**

Mathematical Formulae and Statistical Tables (Lilac), calculator

Total Marks

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**Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. 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 12 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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Pearson

Answer ALL questions. Write your answers in the spaces provided.

1. Find

$$\int \left( \frac{2}{3}x^3 - \frac{1}{2x^3} + 5 \right) dx$$

simplifying your answer.

(4)

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2. Given

$$\frac{3^x}{3^{4y}} = 27\sqrt{3}$$

find  $y$  as a simplified function of  $x$ .

(3)

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**Question 2 continued**

Lined writing area for the answer to Question 2.

**(Total 3 marks)**

**Q2**



3. The line  $l_1$  has equation  $3x + 5y - 7 = 0$

(a) Find the gradient of  $l_1$  (2)

The line  $l_2$  is perpendicular to  $l_1$  and passes through the point  $(6, -2)$ .

(b) Find the equation of  $l_2$  in the form  $y = mx + c$ , where  $m$  and  $c$  are constants. (3)

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Q3

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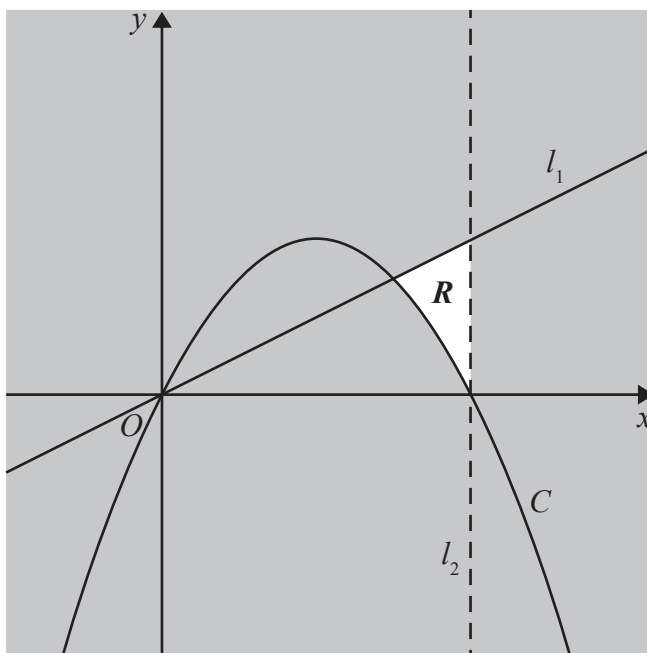


Figure 1

Figure 1 shows a line  $l_1$  with equation  $2y = x$  and a curve  $C$  with equation  $y = 2x - \frac{1}{8}x^2$

The region  $R$ , shown unshaded in Figure 1, is bounded by the line  $l_1$ , the curve  $C$  and a line  $l_2$

Given that  $l_2$  is parallel to the  $y$ -axis and passes through the intercept of  $C$  with the positive  $x$ -axis, identify the inequalities that define  $R$ .

(3)

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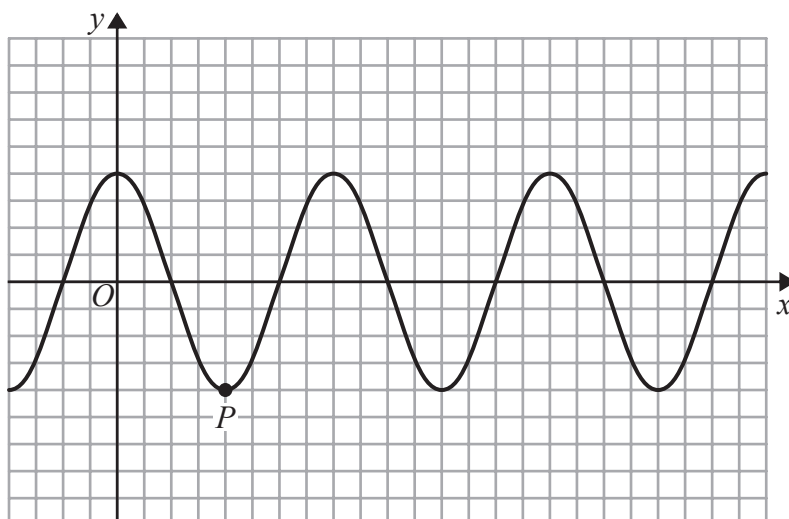


Figure 2

Figure 2 shows a plot of part of the curve with equation  $y = \cos 2x$  with  $x$  being measured in radians.

The point  $P$ , shown on Figure 2, is a minimum point on the curve.

(a) State the coordinates of  $P$ . (2)

A copy of Figure 2, called Diagram 1, is shown at the top of the next page.

(b) Sketch, on Diagram 1, the curve with equation  $y = \sin x$  (2)

(c) Hence, or otherwise, deduce the number of solutions of the equation

(i)  $\cos 2x = \sin x$  that lie in the region  $0 \leq x \leq 20\pi$

(ii)  $\cos 2x = \sin x$  that lie in the region  $0 \leq x \leq 21\pi$  (2)

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Question 5 continued

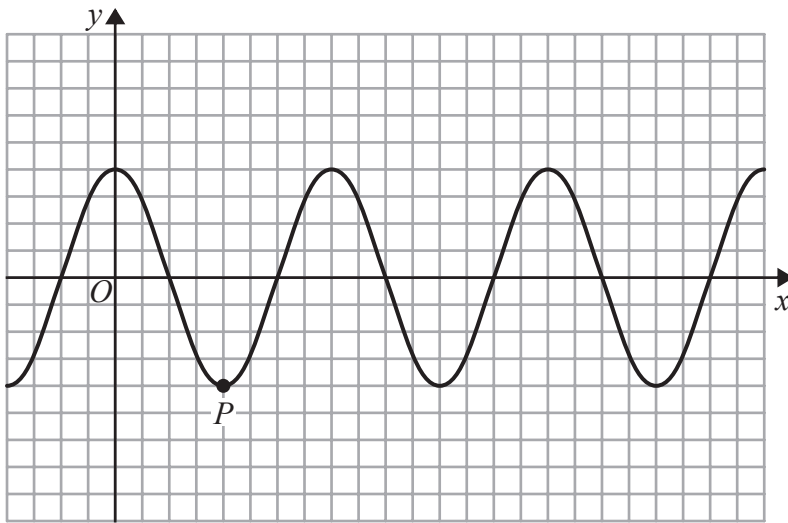


Diagram 1

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(Total 6 marks)

Q5

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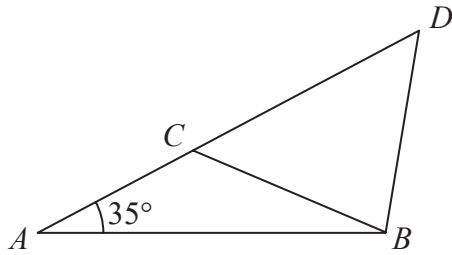
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Not to scale

**Figure 3**

Figure 3 shows the design for a structure used to support a roof.

The structure consists of four wooden beams,  $AB$ ,  $BD$ ,  $BC$  and  $AD$ .

Given  $AB = 6.5 \text{ m}$ ,  $BC = BD = 4.7 \text{ m}$  and angle  $BAC = 35^\circ$

(a) find, to one decimal place, the size of angle  $ACB$ , (3)

(b) find, to the nearest metre, the total length of wood required to make this structure. (3)

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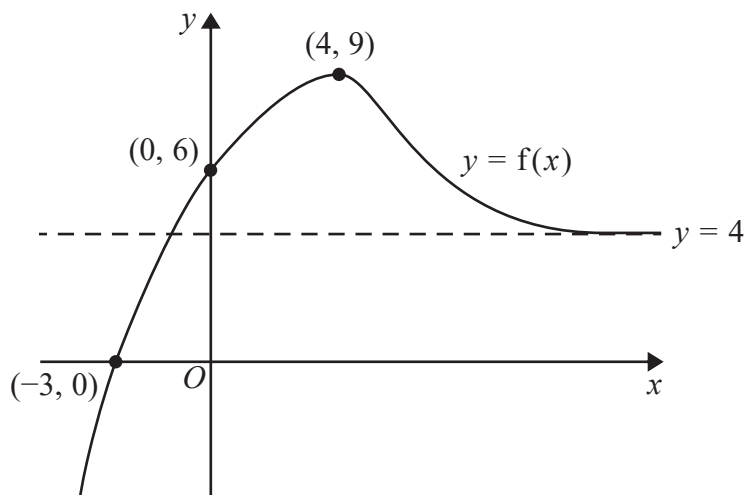


Figure 4

The curve  $C$  with equation  $y = f(x)$  is shown in Figure 4.

The curve  $C$

- has a single turning point, a maximum at  $(4, 9)$
- crosses the coordinate axes at only two places,  $(-3, 0)$  and  $(0, 6)$
- has a single asymptote with equation  $y = 4$

as shown in Figure 4.

(a) State the equation of the asymptote to the curve with equation  $y = f(-x)$ . (1)

(b) State the coordinates of the turning point on the curve with equation  $y = f\left(\frac{1}{4}x\right)$ . (1)

Given that the line with equation  $y = k$ , where  $k$  is a constant, intersects  $C$  at exactly one point,

(c) state the possible values for  $k$ . (2)

The curve  $C$  is transformed to a new curve that passes through the origin.

- (d) (i) Given that the new curve has equation  $y = f(x) - a$ , state the value of the constant  $a$ . (2)
- (ii) Write down an equation for another single transformation of  $C$  that also passes through the origin. (2)

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9. The equation

$$\frac{3}{x} + 5 = -2x + c$$

where  $c$  is a constant, has no real roots.

Find the range of possible values of  $c$ .

(7)

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10. A sector  $AOB$ , of a circle centre  $O$ , has radius  $r$  cm and angle  $\theta$  radians.

Given that the area of the sector is  $6 \text{ cm}^2$  and that the perimeter of the sector is 10 cm,

(a) show that

$$3\theta^2 - 13\theta + 12 = 0 \quad (4)$$

(b) Hence find possible values of  $r$  and  $\theta$ . (3)

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Question 11 continued

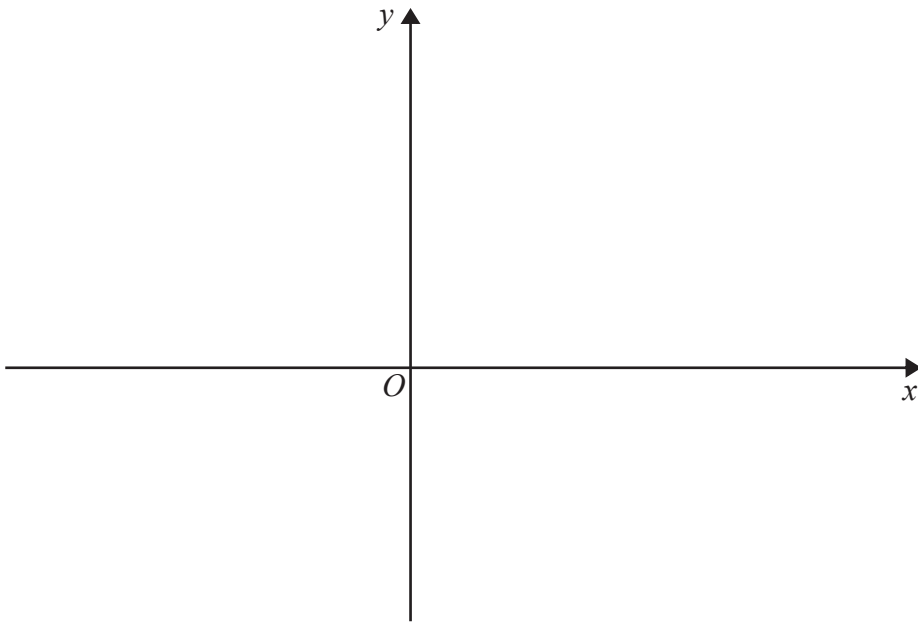


Diagram 1

Below the diagram, there are 18 horizontal lines provided for writing the student's answer.

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12. The curve with equation  $y = f(x)$ ,  $x > 0$ , passes through the point  $P(4, -2)$ .

Given that

$$\frac{dy}{dx} = 3x\sqrt{x} - 10x^{-\frac{1}{2}}$$

(a) find the equation of the tangent to the curve at  $P$ , writing your answer in the form  $y = mx + c$ , where  $m$  and  $c$  are integers to be found.

(4)

(b) Find  $f(x)$ .

(5)

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