

Write your name here

Surname	Other names
---------	-------------

Pearson Edexcel
International
Advanced Level

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--

Core Mathematics C12

Advanced Subsidiary

Monday 13 January 2014 – Morning
Time: 2 hours 30 minutes

Paper Reference
WMA01/01

You must have:
Mathematical Formulae and Statistical Tables (Blue)

Total Marks

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). Coloured pencils and highlighter pens must not be used.
- **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.
- When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information

- The total mark for this paper is 125.
- 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.

Turn over ►

P43231A

©2014 Pearson Education Ltd.

5/5/5/



PEARSON

Leave blank

2.

$$f(x) = \frac{8}{x^2} - 4\sqrt{x} + 3x - 1, \quad x > 0$$

Giving your answers in their simplest form, find

(a) $f'(x)$

(3)

(b) $\int f(x) dx$

(4)



Leave blank

Question 2 continued

Lined area for writing answers.

(Total 7 marks)

Q2



3.

$$f(x) = 10x^3 + 27x^2 - 13x - 12$$

(a) Find the remainder when $f(x)$ is divided by

(i) $x - 2$

(ii) $x + 3$

(3)

(b) Hence factorise $f(x)$ completely.

(4)



6. Given that a and b are positive constants, solve the simultaneous equations

$$ab = 25$$

$$\log_4 a - \log_4 b = 3$$

Show each step of your working, giving exact values for a and b .

(6)



Leave
blank

7. (a) Show that

$$12\sin^2x - \cos x - 11 = 0$$

may be expressed in the form

$$12\cos^2x + \cos x - 1 = 0$$

(1)

(b) Hence, using trigonometry, find all the solutions in the interval $0 \leq x \leq 360^\circ$ of

$$12\sin^2x - \cos x - 11 = 0$$

Give each solution, in degrees, to 1 decimal place.

(4)



Leave
blank

Question 7 continued

Lined area for writing the answer to Question 7 continued.

Q7

(Total 5 marks)



P 4 3 2 3 1 A 0 1 5 4 4

8. Find the range of values of k for which the quadratic equation

$$kx^2 + 8x + 2(k + 7) = 0$$

has no real roots.

(7)



Leave
blank

Question 8 continued

Lined area for writing the answer to Question 8.

(Total 7 marks)

Q8



Leave
blank

9. In the first month after opening, a mobile phone shop sold 300 phones. A model for future sales assumes that the number of phones sold will increase by 5% per month, so that 300×1.05 will be sold in the second month, 300×1.05^2 in the third month, and so on.

Using this model, calculate

- (a) the number of phones sold in the 24th month, (2)

- (b) the total number of phones sold over the whole 24 months. (2)

This model predicts that, in the N th month, the number of phones sold in that month exceeds 3000 for the first time.

- (c) Find the value of N . (3)



Leave
blank

Question 9 continued

Lined area for writing the answer to Question 9.



Leave
blank

Question 9 continued

Lined writing area for the answer to Question 9.

(Total 7 marks)

Q9



10. The curve C has equation $y = \cos\left(x - \frac{\pi}{3}\right)$, $0 \leq x \leq 2\pi$

(a) In the space below, sketch the curve C .

(2)

(b) Write down the exact coordinates of the points at which C meets the coordinate axes.

(3)

(c) Solve, for x in the interval $0 \leq x \leq 2\pi$,

$$\cos\left(x - \frac{\pi}{3}\right) = \frac{1}{\sqrt{2}}$$

giving your answers in the form $k\pi$, where k is a rational number.

(4)



Leave
blank

Question 10 continued

A large rectangular area containing numerous horizontal lines for writing.



11. The first three terms of an arithmetic series are 60 , $4p$ and $2p - 6$ respectively.

(a) Show that $p = 9$ **(2)**

(b) Find the value of the 20th term of this series. **(3)**

(c) Prove that the sum of the first n terms of this series is given by the expression $12n(6 - n)$ **(3)**



Leave
blank

Question 11 continued

Lined area for writing the answer to Question 11.

(Total 8 marks)

Q11



12.

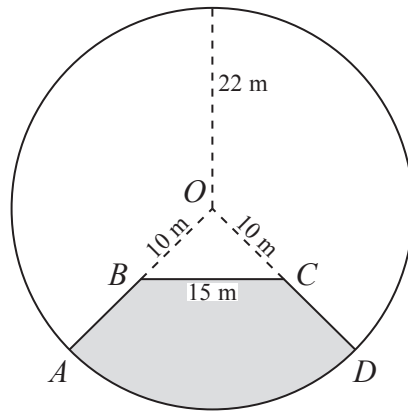


Diagram NOT
drawn to scale

Figure 1

Figure 1 shows the plan for a pond and platform. The platform is shown shaded in the figure and is labelled $ABCD$.

The pond and platform together form a circle of radius 22 m with centre O .

OA and OD are radii of the circle. Point B lies on OA such that the length of OB is 10 m and point C lies on OD such that the length of OC is 10 m. The length of BC is 15 m.

The platform is bounded by the arc AD of the circle, and the straight lines AB , BC and CD .

Find

(a) the size of the angle BOC , giving your answer in radians to 3 decimal places, (3)

(b) the perimeter of the platform to 3 significant figures, (4)

(c) the area of the platform to 3 significant figures. (4)

Leave
blank

13. The curve C has equation

$$y = \frac{(x - 3)(3x - 25)}{x}, \quad x > 0$$

(a) Find $\frac{dy}{dx}$ in a fully simplified form. (3)

(b) Hence find the coordinates of the turning point on the curve C . (4)

(c) Determine whether this turning point is a minimum or maximum, justifying your answer. (2)

The point P , with x coordinate $2\frac{1}{2}$, lies on the curve C .

(d) Find the equation of the normal at P , in the form $ax + by + c = 0$, where a , b and c are integers. (5)



Leave
blank

Question 13 continued

Handwriting lines for question 13 continued.

Q13

Grade boxes for Q13.

(Total 14 marks)



14.

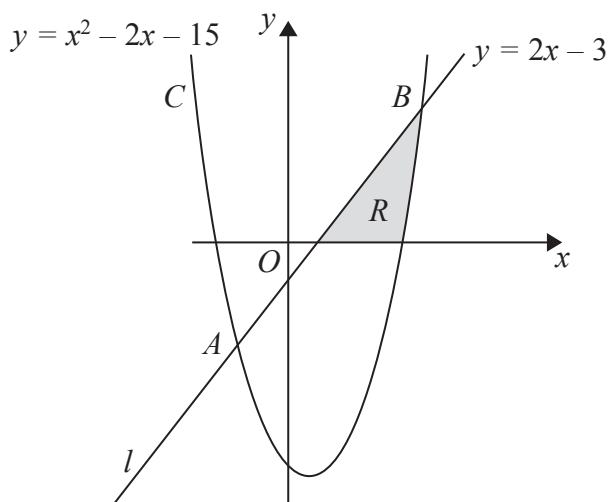


Diagram NOT drawn to scale

Figure 2

Figure 2 shows part of the line l with equation $y = 2x - 3$ and part of the curve C with equation $y = x^2 - 2x - 15$

The line l and the curve C intersect at the points A and B as shown.

- (a) Use algebra to find the coordinates of A and the coordinates of B . (5)

In Figure 2, the shaded region R is bounded by the line l , the curve C and the positive x -axis.

- (b) Use integration to calculate an exact value for the area of R . (7)



Leave blank

Question 14 continued

Series of horizontal lines for writing the answer.

(Total 12 marks)

Q14

--	--



15.

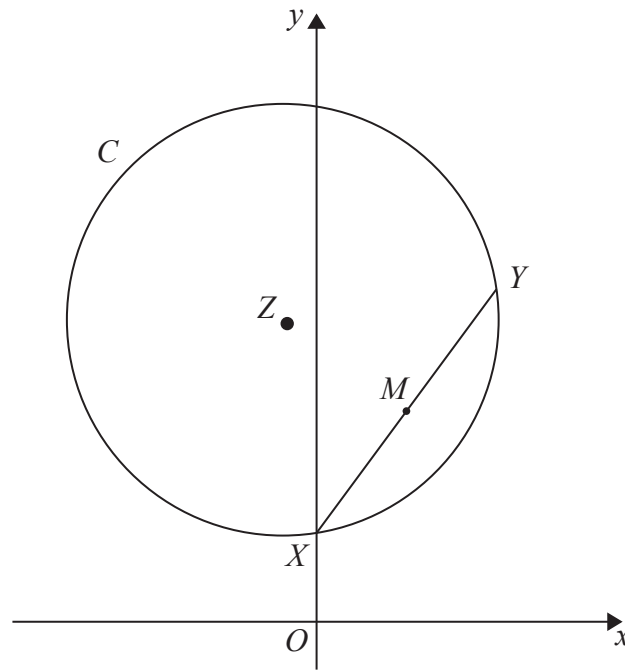


Diagram NOT drawn to scale

Figure 3

The points X and Y have coordinates $(0, 3)$ and $(6, 11)$ respectively. XY is a chord of a circle C with centre Z , as shown in Figure 3.

- (a) Find the gradient of XY . (2)

The point M is the midpoint of XY .

- (b) Find an equation for the line which passes through Z and M . (5)

Given that the y coordinate of Z is 10,

- (c) find the x coordinate of Z , (2)

- (d) find the equation of the circle C , giving your answer in the form

$$x^2 + y^2 + ax + by + c = 0$$

where a , b and c are constants. (5)



Leave
blank

Question 15 continued

A large area of the page is filled with horizontal lines for writing, starting below the question title and ending above the final marks box.

Q15

--	--

(Total 14 marks)

TOTAL FOR PAPER: 125 MARKS

END

