		g your candidate information
Candidate surname	0	ther names
Pearson Edexcel International GCSE Friday 10 Jai	Centre Number	Candidate Number
Morning (Time: 2 hours)	Paper Refe	rence 4PM1/01
Eurthan Duna N		
Level 2 Paper 1	/lathemati	CS

Instructions

- Use **black** ink or ball-point pen.
- Fill in the boxes at the top of this page with your name, centre number and candidate number.
- Answer all questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
 - there may be more space than you need.
- You must **NOT** write anything on the formulae page. Anything you write on the formulae page will gain NO credit.

Information

- 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.
- Check your answers if you have time at the end.

Turn over ▶





International GCSE in Further Pure Mathematics Formulae sheet

Mensuration

Surface area of sphere = $4\pi r^2$

Curved surface area of cone = $\pi r \times \text{slant height}$

Volume of sphere = $\frac{4}{3}\pi r^3$

Series

Arithmetic series

Sum to *n* terms, $S_n = \frac{n}{2} [2a + (n-1)d]$

Geometric series

Sum to *n* terms,
$$S_n = \frac{a(1-r^n)}{(1-r)}$$

Sum to infinity, $S_{\infty} = \frac{a}{1-r} |r| < 1$

Binomial series

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \dots + \frac{n(n-1)\dots(n-r+1)}{r!}x^r + \dots$$
 for $|x| < 1, n \in \mathbb{Q}$

Calculus

Quotient rule (differentiation)

$$\frac{\mathrm{d}}{\mathrm{d}x} \left(\frac{\mathrm{f}(x)}{\mathrm{g}(x)} \right) = \frac{\mathrm{f}'(x)\mathrm{g}(x) - \mathrm{f}(x)\mathrm{g}'(x)}{\left[\mathrm{g}(x)\right]^2}$$

Trigonometry

Cosine rule

In triangle ABC: $a^2 = b^2 + c^2 - 2bc \cos A$

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\sin(A+B) = \sin A \cos B + \cos A \sin B$$

$$\sin(A - B) = \sin A \cos B - \cos A \sin B$$

$$\cos(A+B) = \cos A \cos B - \sin A \sin B$$

$$\cos(A - B) = \cos A \cos B + \sin A \sin B$$

$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

Logarithms

$$\log_a x = \frac{\log_b x}{\log_b a}$$



Answer all ELEVEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 The *n*th term of an arithmetic series is t_n and the common difference of the series is d.

Given that $t_2 + t_9 = 0$ and that $t_4 + t_6 + t_{10} = 14$

- (a) (i) show that d = 4
 - (ii) find the first term of this series.

(4)

A different arithmetic series A has first term 24 and common difference 6 For series A, the sum of the first 2n terms is 3 times the sum of the first n terms.

(b) Find the value of n.

(5)

Question 1 continued	



(a) On the grid below, draw the line with equation

(i)
$$5x + 2y = 10$$
 (ii) $y = x$

ii)
$$v = x$$

(2)

(b) Show, by shading on the grid, the region R defined by the inequalities

$$y \leqslant x$$

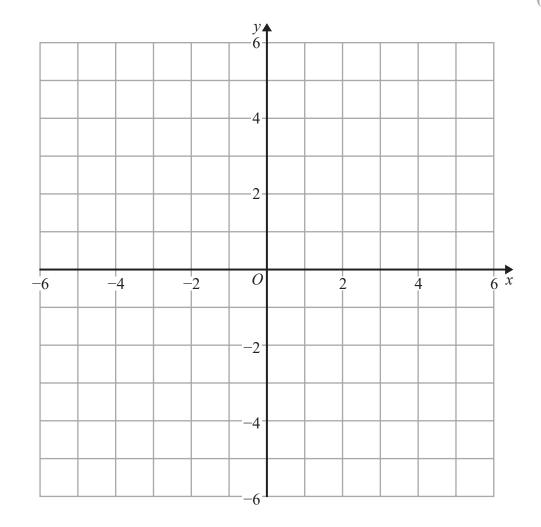
$$y \leqslant x \qquad 5x + 2y \leqslant 10$$

$$y \geqslant -2$$

$$x \geqslant 1$$

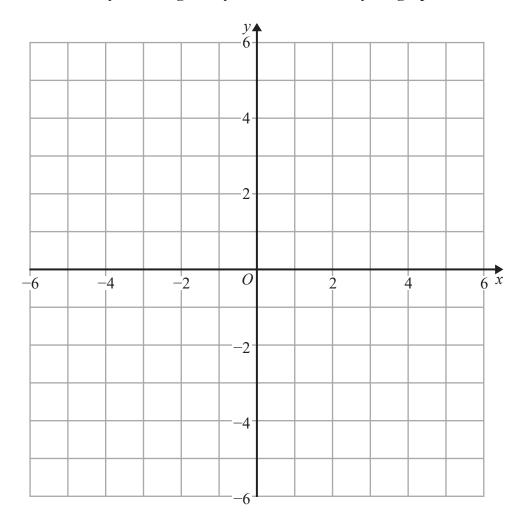
Label the region R.

(2)



Question 2 continued

Only use this grid if you need to redraw your graph.





(Total for Question 2 is 4 marks)

3	Given that $(x-4)$ is a factor of $px^3 - 31x^2 + 25x + 12$ where p is a constant,							
	(a) show that $p = 6$							
		(2)						
	(b) Solve the equation $6x^3 - 31x^2 + 25x + 12 = 0$							
	Show clear algebraic working.	(4)						
		(4)						



(6)

Diagram **NOT** accurately drawn

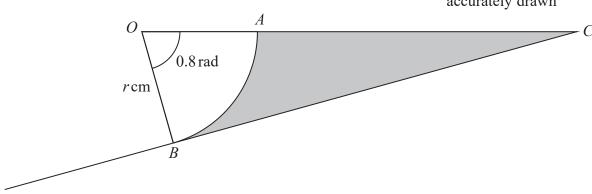


Figure 1

Figure 1 shows a sector AOB of a circle with centre O and radius r cm and a triangle BOC. The angle of sector AOB is 0.8 radians.

The points O, A and C lie on a straight line so that CB is the tangent to the circle at B.

Given that the area of the shaded region in Figure 1 is $101 \,\mathrm{cm^2}$, find the value of r. Give your answer correct to 3 significant figures.

4



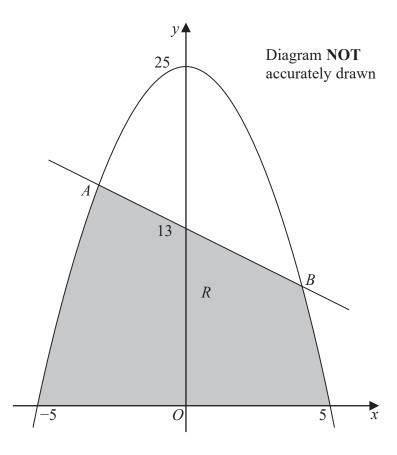


Figure 2

Figure 2 shows part of the curve with equation $y = 25 - x^2$ and part of the line with equation y + x = 13

The curve and the line intersect at the points A and B.

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

(4)

The region R, shown shaded in Figure 2, is bounded by the curve, the straight line and the x-axis.

(b) Use algebraic integration to find the area of R.

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Question 5 continued



6	The point A has coordinates $(3, 0)$ and the point B has coordinates $(2, 2)$. The line L_1 passes through B and is perpendicular to AB .
	(a) Find an equation of L_1

Give your answer in the form ax + by + c = 0 (5)

The line L_2 with equation x - 7y - 3 = 0 intersects the line L_1 at the point C. The midpoint of AC is M.

(b) Find the coordinates of M.

(5)

(c) Find the area of the triangle ABM.

(4)



Question 6 continued	



7	Solve the equation		
		$\log_7(8x^2 - 6x + 3) - \log_{49}x^2 = 3\log_7 2$	
			(5)



8 (a) Solve, to the nearest integer, the equation

$$\sin(2x - 75)^\circ = -0.515$$
 for $0 \le x < 180$

(3)

(b) Giving your solutions to one decimal place, where appropriate, solve the equation

$$2\tan y^{\circ} + 5\sin y^{\circ} = 0$$
 for $0 \leqslant y \leqslant 180$

(4)

(c) Explain mathematically why there are no values of θ that satisfy the equation

$$3\cos^2\theta^{\circ} - 3\sin^2\theta^{\circ} + \sin\theta^{\circ} + 12 = 0$$

(4)

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Question 8 continued	



9	(a)	Expand $\sqrt{1-4x}$ in ascending powers of x up to and including the term in x^3 , giving each coefficient as an integer.	(2)		
	(b)	Use your expansion with a suitable value for x to obtain an estimate of $\sqrt{0.76}$	(3)		
	<i>(</i>)	Give your answer correct to 4 decimal places.	(3)		
	(c)	Hence find, to 3 decimal places, an estimate of $\sqrt{19}$	(2)		



Question 9 continued



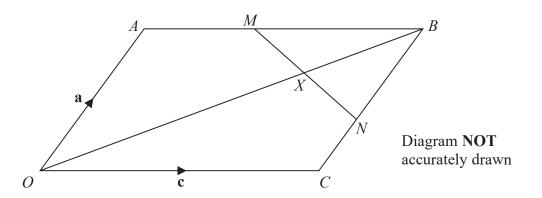


Figure 3

Figure 3 shows the parallelogram *OABC*

$$\overrightarrow{OA} = \mathbf{a}$$
 $\overrightarrow{OC} = \mathbf{c}$

The midpoint of AB is M and the midpoint of BC is N.

The line OB intersects MN at the point X.

- (a) Find in terms of a and c,
 - (i) \overrightarrow{OB}
 - (ii) \overrightarrow{MN}

(2)

Given $\overrightarrow{MX} = \lambda \overrightarrow{MN}$ and that $\overrightarrow{OX} = \mu \overrightarrow{OB}$,

(b) use a vector method to find the value of λ and the value of μ .

(8)

(c) Hence find, in its simplest form, the ratio

Area of quadrilateral OXNC: Area of parallelogram OABC.

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(3)

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Question 10 continued	



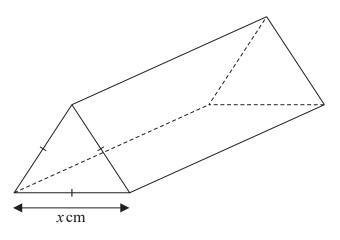


Diagram **NOT** accurately drawn

Figure 4

A company manufactures chocolate bars that are inside packaging that is in the shape of a right triangular prism.

The cross section of the prism is an equilateral triangle with sides of length x cm, as shown in Figure 4.

The volume of the prism is 72 cm³

The total surface area of the prism is Scm²

(a) Show that

$$S = \frac{\sqrt{3}x^2}{2} + \frac{288\sqrt{3}}{x}$$

(6)

Given that x can vary,

(b) use calculus to find, to 4 significant figures, the value of x for which S is a minimum, justifying that this value gives a minimum value of S.

(5)

(c) Find, to 3 significant figures, the minimum value of *S*.

(2)

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Question 11 continued	
	(Total for Question 11 is 13 marks)
,	TOTAL FOR PAPER IS 100 MARKS

