Surname	Other na	mes
Edexcel International GCSE	Centre Number	Candidate Number
Further Pu Paper 1	ure Math	ematics
I		
Wednesday 22 May 2013 - Time: 2 hours	– Afternoon	Paper Reference 4PM0/01

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.

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.

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Turn over ▶

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Answer all ELEVEN questions.

Write your answers in the spaces provided.

	You must write down all stages in your working.		
1	A circle has centre O and radius 12 cm. The sector AOB of the circle has area 126 cm ² . Find the length of the arc AB .		
	, and the second		(4)
		(Total for Question 1 is 4 man	·ks)



2 Find the set of values of x for which		
$3(x+1)^2 < 9-x$		
		(4)
		(Total for Question 2 is 4 marks)



3

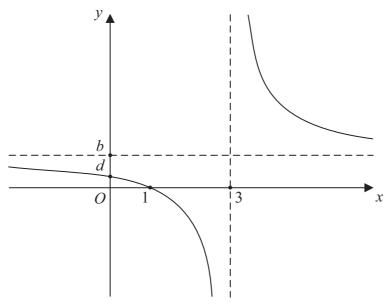


Figure 1

Figure 1 shows a sketch of the curve with equation $y = 1 + \frac{c}{x+a}$, where a and c are integers.

The equations of the asymptotes to the curve are x = 3 and y = b.

(a) Find the value of a and the value of b.

(2)

The curve crosses the x-axis at (1, 0) and the y-axis at (0, d).

(b) Find the value of c and the value of d.

(4)

Question 3 continued	
	(Total for Question 3 is 6 marks)



4 Solve, for $-90 < x \le 90$, the equation		
	$6\sin^2 x^\circ - \cos x^\circ - 4 = 0$	(6)
		(6)
	(Total for Question	n 4 is 6 marks)
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5	The volume of liquid in a container is $V \text{cm}^3$ when the depth of the liquid is $h \text{cm}$. Liquid is added to the container at a rate of 36 cm ³ /s. Given that $V = 4h^3$, find the rate at which the depth of the liquid is increasing when $V = 500$	
	the depth of the fiquid is increasing when $r = 300$	(7)
	(Total for Question 5 is 7	marks)



6	The equation $x^2 + px + 1 = 0$ has roots α and β	
	(a) Find, in terms of p , an expression for	
	(i) $\alpha + \beta$	
	(ii) $\alpha^2 + \beta^2$	
	(iii) $\alpha^3 + \beta^3$	
		(6)
	(b) Find a quadratic equation, with coefficients expressed in terms of p , which has roots	
	$lpha^3$ and eta^3	(2)

Question 6 continued	
	(Total for Question 6 is 8 marks)



An arithmetic series has first term a and common difference d. The nth term of the series is t_n and the sum of the first n terms of the series is S_n (a) Write down an expression in terms of a and d for (i) t_{58} (ii) S_{13} **(2)** Given that $t_{58} = S_{13}$ (b) show that $d = -\frac{4}{7}a$ **(2)** (c) show that $t_{176} = S_{21}$ **(4)** (d) find the value of r when $t_r = 5t_9$ (3)

Question 7 continued	



Question 7 continued	



(Total for Question 7 is 11 man	rlza)



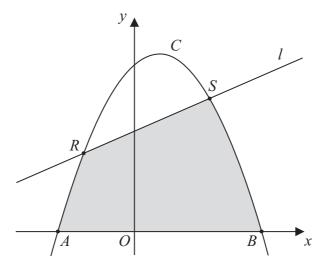


Figure 2

Figure 2 shows the curve C with equation $y = 15 + 2x - x^2$

The curve crosses the x-axis at the points A and B.

(a) Find the x-coordinate of A and the x-coordinate of B.

(3)

(b) Use calculus to find the area of the finite region bounded by C and the x-axis.

(4)

The line *l* with equation y = x + 9 intersects *C* at the points *R* and *S*.

(c) Find the *x*-coordinate of *R* and the *x*-coordinate of *S*.

(3)

(d) Use calculus to find the area of the region bounded by C, the line l and the x-axis, shown shaded in Figure 2.

(4)

Question 8 continued	



Question 8 continued		

Question 8 continued	
	(Total for Question 8 is 14 marks)



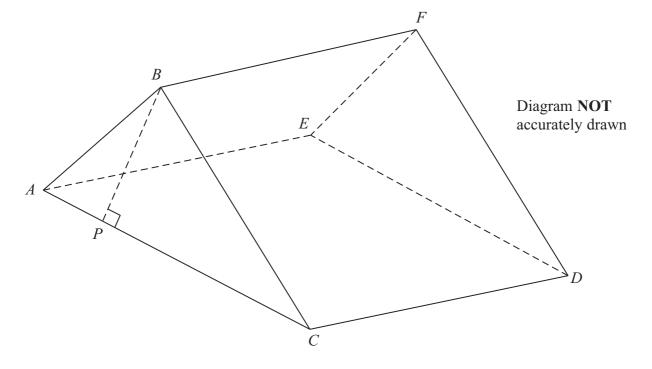


Figure 3

Figure 3 shows a triangular prism ABCDEF.

ACDE is a rectangle. In triangle ABC, AC = 12 cm, $\angle BAC = 60^{\circ}$ and $\angle BCA = 30^{\circ}$

(a) Find the exact length of BC.

(3)

The point P lies on the line AC and $\angle BPC = 90^{\circ}$

(b) Show that $BP = 3\sqrt{3}$ cm.

(2)

The angle between the plane AFC and the plane ACDE is 25°

(c) Find, to 3 significant figures, the length of BF.

(3)

(d) Find the size of the angle between the line *BD* and the plane *ACDE*, giving your answer in degrees to 1 decimal place.

(4)

(e) Find, to 3 significant figures, the volume of the prism ABCDEF.

(2)

Question 9 continued	



Question 9 continued	

Question 9 continued	
	(Total for Question 9 is 14 marks)



10	The curve C has equation $y = x^4 - 4x^3 - 2x^2 + 13x + 5$ and the line l_1 is the tangent to C at the point $R(1, 13)$.	at
	(a) Find an equation for l_1	(4)
	The points P and Q lie on C . The x -coordinates of P and Q are p and q respectively, where $p < q$. The tangent to C at P is parallel to l_1 and the tangent to C at Q is parallel to l_1	
	(b) Find the coordinates of P and the coordinates of Q .	(4)
	The line l_2 passes through P and Q .	
	(c) Find an equation for l_2	(2)
	(d) Show that l_2 is a tangent to C at P and a tangent to C at Q .	
		(1)
	The normal to C at $R(1, 13)$ intersects l_2 at the point S .	
	(e) Find the exact length of RS.	
	(A. F. 1.1. A. A. A. A. D.	(5)
	(f) Find the area of the triangle PQR .	(2)

Question 10 continued		



Question 10 continued		



Question 10 continued	
	(Total for Question 10 is 18 marks)



11 O, A, B and C are fixed points such that $\overrightarrow{OA} = \mathbf{p} + \mathbf{q}$ $\overrightarrow{OB} = 3\mathbf{p} - \mathbf{q}$ $\overrightarrow{OC} = 6\mathbf{p} - 4\mathbf{q}$ (a) Find \overrightarrow{AB} in terms of **p** and **q**. (1) (b) Show that the points A, B and C are collinear. (2) (c) Find the ratio AB : BC(1) The point D lies on AC produced such that AC = 2CD(d) Find \overrightarrow{OD} in terms of \mathbf{p} and \mathbf{q} , simplifying your answer. **(4)**

Question 11 continued	



Question 11 continued	
	(Total for Question 11 is 8 marks)
	TOTAL FOR PAPER IS 100 MARKS