Write your name here Surname	Other n	ames
Pearson Edexcel International GCSE	Centre Number	Candidate Number
<b>Further Pu</b>	re Math	ematics
Paper 1		
Paper 1  Monday 19 January 2015 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.

P 4 4 0 2 9 A 0 1 3 2

Turn over ▶

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# Answer all TEN questions.

# Write your answers in the spaces provided.

# You must write down all stages in your working.

**(2)** 

1	An equilateral	triangle has	sides	of length x	cm.
	7 III equilateral	triangle mas	bracb	or rengui x	CIII.

(a) Show that the area of the triangle is 
$$\frac{\sqrt{3}}{4}x^2$$
 cm<sup>2</sup>

The length of each side of the equilateral triangle is increasing at a rate of 0.1 cm/s.

(b) Find the length of each side of the triangle when the area of the triangle is increasing  $\sqrt{3}$ 

at a rate of  $\frac{\sqrt{3}}{10}$  cm<sup>2</sup>/s. (4)


Question 1 continued	
	(Total for Question 1 is 6 marks)



2	A small stone is thrown vertically upwards from a point $A$ above the ground. At time $t$ seconds after being thrown from $A$ , the height of the stone above the ground is $s$ metres. Until the stone hits the ground, $s = 1.4 + 19.6t - 4.9t^2$		
	(a) Write down the height of A above the ground.	(1)	
	(b) Find the speed with which the stone was thrown from A.	(2)	
	(c) Find the acceleration of the stone until it hits the ground.	(1)	
	(d) Find the greatest height of the stone above the ground.	(3)	

Question 2 continued	
(Total for Question 2 is 7	marks)



3

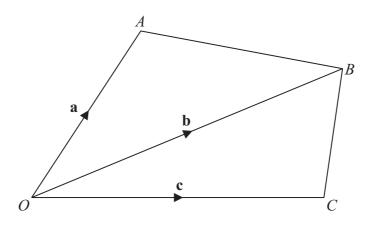


Figure 1

Figure 1 shows the quadrilateral OABC.

$$\overrightarrow{OA} = \mathbf{a}, \overrightarrow{OB} = \mathbf{b} \text{ and } \overrightarrow{OC} = \mathbf{c}$$

(a) Find, in terms of **a** and **b**,  $\overrightarrow{AB}$ .

(1)

The midpoint of OA is P and the midpoint of AB is Q.

(b) Show that  $\overrightarrow{PQ} = \mu \mathbf{b}$ , where  $\mu$  is a scalar, stating the value of  $\mu$ .

(2)

The point S lies on OC and the point R lies on BC such that  $\overrightarrow{OS} = \lambda \overrightarrow{OC}$  and  $\overrightarrow{BR} = \lambda \overrightarrow{BC}$ .

(c) Show that *PQ* is parallel to *SR*.

(4)

Given that  $\overrightarrow{PQ} = \frac{3}{2}\overrightarrow{SR}$ ,

(d) find the value of  $\lambda$ .

(2)

Question 3 continued		



Question 3 continued	
	(Total for Question 3 is 9 marks)

Diagram NOT 4 accurately drawn 1.8 radians В Figure 2 Figure 2 shows the sector AOB of a circle of radius 5 cm. The centre of the circle is O and the angle AOB is 1.8 radians. (a) Find the length of the arc AB. (1) (b) Find the area of the sector AOB. (2)

(Total for Question 4 is 3 marks)

5	(a) On the axes opposite, draw the lines with equations	
	(i) $y = -x - 1$ (ii) $y = 3x - 9$ (iii) $2y = x + 7$	(4)
		(4)
	(b) Show, by shading, the region <i>R</i> defined by the inequalities	
	$y \geqslant -x-1$ , $y \geqslant 3x-9$ and $2y \leqslant x+7$	(1)
	For all points in $R$ , with coordinates $(x, y)$ ,	,
	P = y - 2x	
	(c) Find (i) the greatest value of <i>P</i> ,	
	(ii) the least value of <i>P</i> .	
		(4)

# **Question 5 continued** -2 0 (Total for Question 5 is 9 marks)



6	(a) Solve, giving your answer to 3 significant figures,	
	$3^z - 4 = 0$	
	Solve, giving your answers to 3 significant figures where appropriate,	(3)
	(b) $9^y - 13(3^y) + 36 = 0$	
		(4)
	(c) $6^x - 4(2^x) - 3^x + 4 = 0$	(5)

Question 6 continued	



Question 6 continued	

Question 6 continued	
	(Total for Question 6 is 12 marks)



7 The curve C has equation  $y = x^2 + 3$ 

The point A with coordinates (0, 3) and the point B with coordinates (4, 19) lie on C, as shown below in Figure 3.

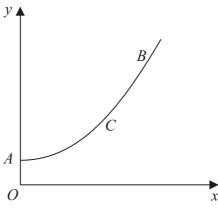


Figure 3

The finite area enclosed by the arc AB of curve C, the axes and the line with equation x = 4 is rotated through  $360^{\circ}$  about the x-axis.

(a) Using algebraic integration, calculate, to 1 decimal place, the volume of the solid generated.

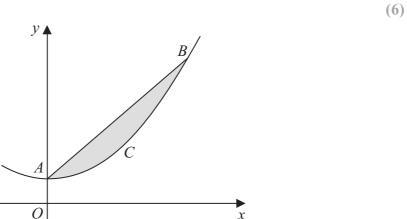


Figure 4

(b) Using algebraic integration, calculate the area of the region between the chord AB and the arc AB of C, shown shaded in Figure 4.

(6)

Question 7 continued	



Question 7 continued	

Question 7 continued	
	(Total for Question 7 is 12 marks)



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

(a) Using the above identity, show that  $1 + \tan^2 \theta = \frac{1}{\cos^2 \theta}$ 

(3)

(b) Show that  $\frac{1 + \sin\theta\cos\theta + \sin^2\theta}{\cos^2\theta} = 1 + \tan\theta + 2\tan^2\theta$ 

(3)

(c) Solve the equation  $1 + \sin \theta \cos \theta + \sin^2 \theta = 4\cos^2 \theta$  for  $0 \le \theta \le 180^\circ$ . Give your answers to 1 decimal place, where appropriate.

**(6)** 


Question 8 continued	



Question 8 continued	



Question 8 continued	
	(Total for Question 8 is 12 marks)



The remainder when f(x) is divided by (x - 1) is -12

The remainder when f(x) is divided by (x + 1) is 48

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

(6)

(b) Show that  $f\left(\frac{1}{2}\right) = 0$ 

(1)

(c) Express f(x) as a product of linear factors.

(4)

(d) Solve the equation f(x) = 0

(1)

Question 9 continued	



Question 9 continued	



Question 9 continued	
	(Total for Question 9 is 12 marks)



10	The points $A$ , $B$ and $C$ have coordinates $(-2, 3)$ , $(2, 5)$ and $(4, 1)$ respectively.	
	(a) Show, by calculation, that $AB$ is perpendicular to $BC$ .	(3)
	(b) Show that the length of $AB$ = the length of $BC$ .	(3)
	The midpoint of $AC$ is $M$ .	
	(c) Find the coordinates of $M$ .	(1)
	(d) Find the exact length of the radius of the circle which passes through the points <i>A</i> , <i>B</i> and <i>C</i> .	
	The point $P$ lies on $BM$ such that $BP : PM = 2 : 1$	(3)
	(e) Find the coordinates of <i>P</i> .	
	The point Q lies on AP produced such that $AP : PQ = 2 : 1$	(2)
	(f) Find the coordinates of $Q$ .	(3)
	(g) Show that $Q$ lies on $BC$ .	
		(3)

Question 10 continued	



Question 10 continued	



Question 10 continued		



(Total for Question 10 is 18 mar
TOTAL FOR PAPER IS 100 MAR