Tuesday 14 June 2016 – N	lorning	Paper Reference
raperi		
Paper 1		
Further Pu	ure Matł	nematics
nternational GCSE		
Pearson Edexcel	Centre Number	Candidate Number
	Other	names

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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Answer all TEN questions.	
Write your answers in the spaces provided.	
You must write down all the stages in your working.	
$\mathbf{f}(x) = x^3 - 7x + 6$	
(a) Show that $(x - 2)$ is a factor of $f(x)$	(2)
(b) Hence, or otherwise, factorise $f(x)$ completely.	
	(3)

	Question 1 continued
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	(Total for Question 1 is 5 marks)

2 (a) Expand $(1+3x^2)^{-\frac{1}{3}}$, $3x^2 < 1$, in ascending powers of x, up to and including the term in x^6 , simplifying each term as far as possible.

$$f(x) = \frac{1 - kx^2}{\left(1 + 3x^2\right)^{\frac{1}{3}}}$$
 where k is a constant

(b) Obtain a series expansion for f(x) in ascending powers of x up to and including the term in x^4 .

Given that the coefficient of x^2 in the expansion of f(x) is -5

(c) find the value of *k*.

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



(a) Find to 3 sign	ificant figures, the length of AE.	
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	es to the nearest degree, the size of the angle betw	ween the plane ABE
and the base A	IBCD.	(3)

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



4	The <i>n</i> th term of an arithmetic series is t_n and the sum of the first <i>n</i> terms of the series is S_n	
	Given that $S_2 = \frac{2}{3}t_5$ and that $S_4 = t_{10} + 3$	
	(a) find	Ň
	(i) the common difference of the series,	OT
	(ii) the first term of the series.	NRIT
		5)
	Given also that $S_{p+2} - S_p = 110$	5) 3)
	(b) find the value of <i>p</i> .	SAF
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	(Total for Question 4 is 8 marks)

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5	Using the identities

 $\sin(A+B) = \sin A \cos B + \cos A \sin B$ $\tan A = \frac{\sin A}{\cos A}$

(a) show that the equation

$$3\sin\left(x+\alpha\right) = 5\sin\left(x-\alpha\right)$$

can be written in the form $\tan x = 4 \tan \alpha$

(b) Hence solve, to the nearest integer, the equation

 $3\sin(2y+30)^\circ = 5\sin(2y-30)^\circ$ for $90 \le y < 180$

Question 5 continued		
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Question 5 continued	
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Question 5 continued
(Total for Question 5 is 9 marks)

Solve	
(a) $\log_x 1024 = 5$	(2)
(b) $\log_3(7y - 3) = 4$	(2)
(c) $\log_a 25 + 2\log_a 625 = 10$	(2)
	(3)
(d) $\log_b 7 - 2\log_7 b + 1 = 0$	(5)

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•	Question 6 continued
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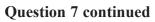


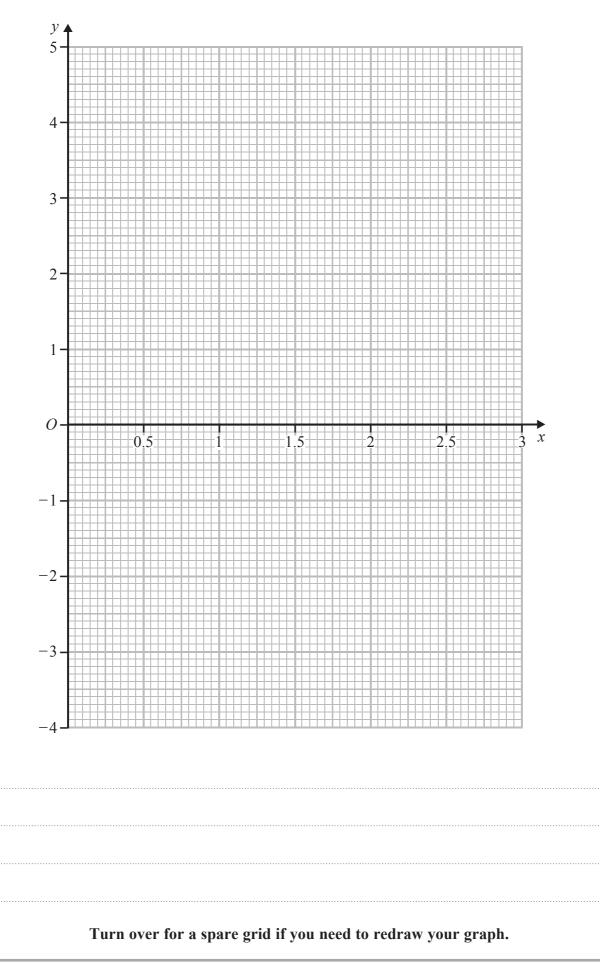
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								(2)
				0		<i>.</i>		(2)
b) On the	e grid oppo	osite, draw t	the graph of	$f y = 2^x - 2$	For $0 \leq x$	≤ 3		(2)
c) Use v	our graph t	to obtain an	estimate to	o one decin	nal place o	of the value	of log 7	
		w you used			ini price, e		0110821	
								(3)
		aight line o quation 2^x -					mal place of	f
the ro		quation 2			$10 \leq x \leq$	5		(4)







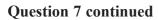
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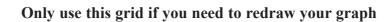


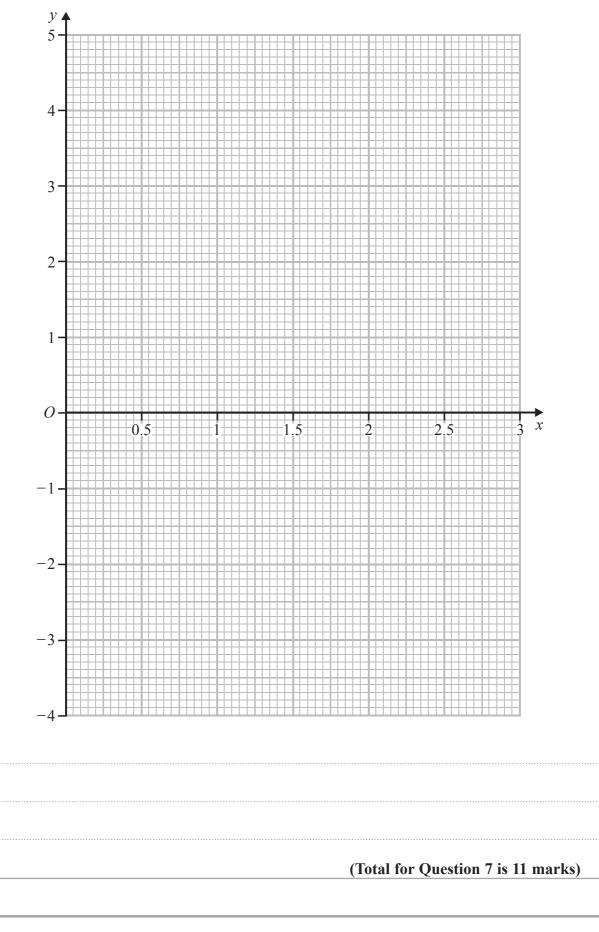


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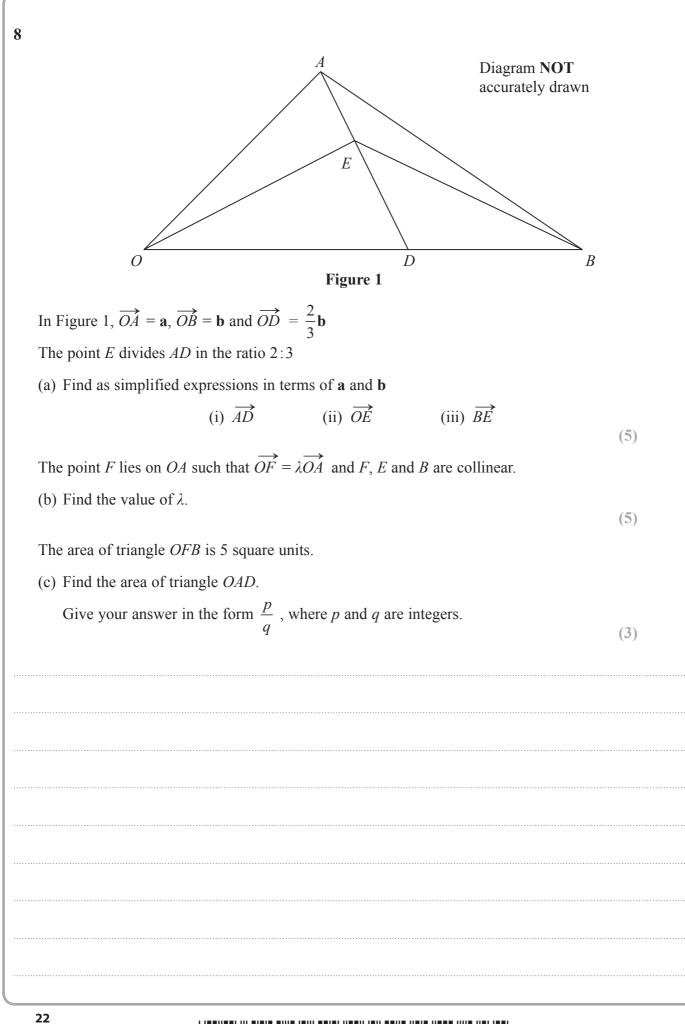
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Question 8	continued	



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 $f(x) = 3x^2 - 5x - 4$

The roots of the equation f(x) = 0 are α and β

(a) Without solving the equation f(x) = 0, form an equation, with integer coefficients, which has

(i) roots
$$\frac{\alpha}{\beta}$$
 and $\frac{\beta}{\alpha}$ (6)

(ii) roots $2\alpha + \beta$ and $\alpha + 2\beta$

9

(b) Express f(x) in the form $A(x + B)^2 + C$, stating the values of the constants A, B and C.

(c) Hence, or otherwise, show that the equation f(x) = -8 has no real roots.

(2)

(3)

(5)





Question 9 continued	



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	(Total for Question 9 is 16 marks)

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10 The points <i>A</i> and <i>B</i> have coordinates $(2, 4)$ and $(5, -2)$ respectively. The point <i>C</i> divides <i>AB</i> in the ratio 1:2	
(a) Find the coordinates of <i>C</i> .	
The main D has a scaling term $(1, 1)$	(2)
The point D has coordinates $(1, 1)$	
(b) Show that DC is perpendicular to AB .	(2) (3) (2)
(c) Find the equation of <i>DC</i> in the form $py = x + q$	(2)
The point <i>E</i> is such that <i>DCE</i> is a straight line and $DC = CE$.	
(d) Find the coordinates of <i>E</i> .	
	(2)
(e) Calculate the area of quadrilateral <i>ADBE</i> .	
	(4)
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Question 10 continued



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