

Write your name here

Surname

Other names

Edexcel**International GCSE**

Centre Number

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Candidate Number

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Further Pure Mathematics

Paper 2

Friday 24 May 2013 – Afternoon
Time: 2 hours

Paper Reference

4PM0/02**Calculators may be used.**

Total Marks

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.

Turn over ►

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**PEARSON**

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2 Given that $2\log_4 x - \log_2 y = 3$

(a) show that $x = 8y$

(4)

Given also that $\log_5(3x + y) = 4$

(b) find the value of x and the value of y

(3)



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3

(a) (i) Find $\int \left(1 + 3x - \frac{2}{x^2}\right) dx$

(ii) Hence show that $\int_1^2 \left(1 + 3x - \frac{2}{x^2}\right) dx = 4\frac{1}{2}$ (4)

(b) (i) Find $\int 3 \sin 2x \, dx$

(ii) Hence show that $\int_0^{\frac{\pi}{6}} 3 \sin 2x \, dx = \frac{3}{4}$ (4)

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(continued from page 10)



- 4** The n th term of a geometric series is t_n and the common ratio is r , where $r > 0$

Given that $t_1 = 1$

- (a) write down an expression in terms of r and n for t_n

(1)

Given also that $t_n + t_{n+1} = t_{n+2}$

- (b) show that $r = \frac{1 + \sqrt{5}}{2}$

(4)

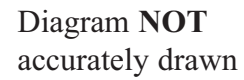
- (c) find the exact value of t_4 giving your answer in the form $f + g\sqrt{h}$, where f , g and h are integers.

(3)

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(7)

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Question 5 continued

(Total for Question 5 is 11 marks)



6

$$p(x) = 2x^3 + 13x^2 - 17x - 70$$

- (a) Show that $p(-2) = 0$ (2)

- (b) Solve the equation $p(x) = 0$ (4)

(Total for Question 6 is 6 marks)



- 7 (a) Complete the table of values for $y = 5 \log_{10}(x + 2) - x$, giving your answers to 2 decimal places.

x	-1	0	1	2	3	4	5
y	1	1.51	1.39				-0.77

(2)

- (b) On the grid opposite, draw the graph of $y = 5 \log_{10}(x + 2) - x$ for $-1 \leq x \leq 5$

(2)

- (c) Use your graph to obtain an estimate, to 1 decimal place, of the root of the equation $10\log_{10}(x+2) - 2x = 1\frac{1}{2}$ in the interval $-1 \leq x \leq 5$

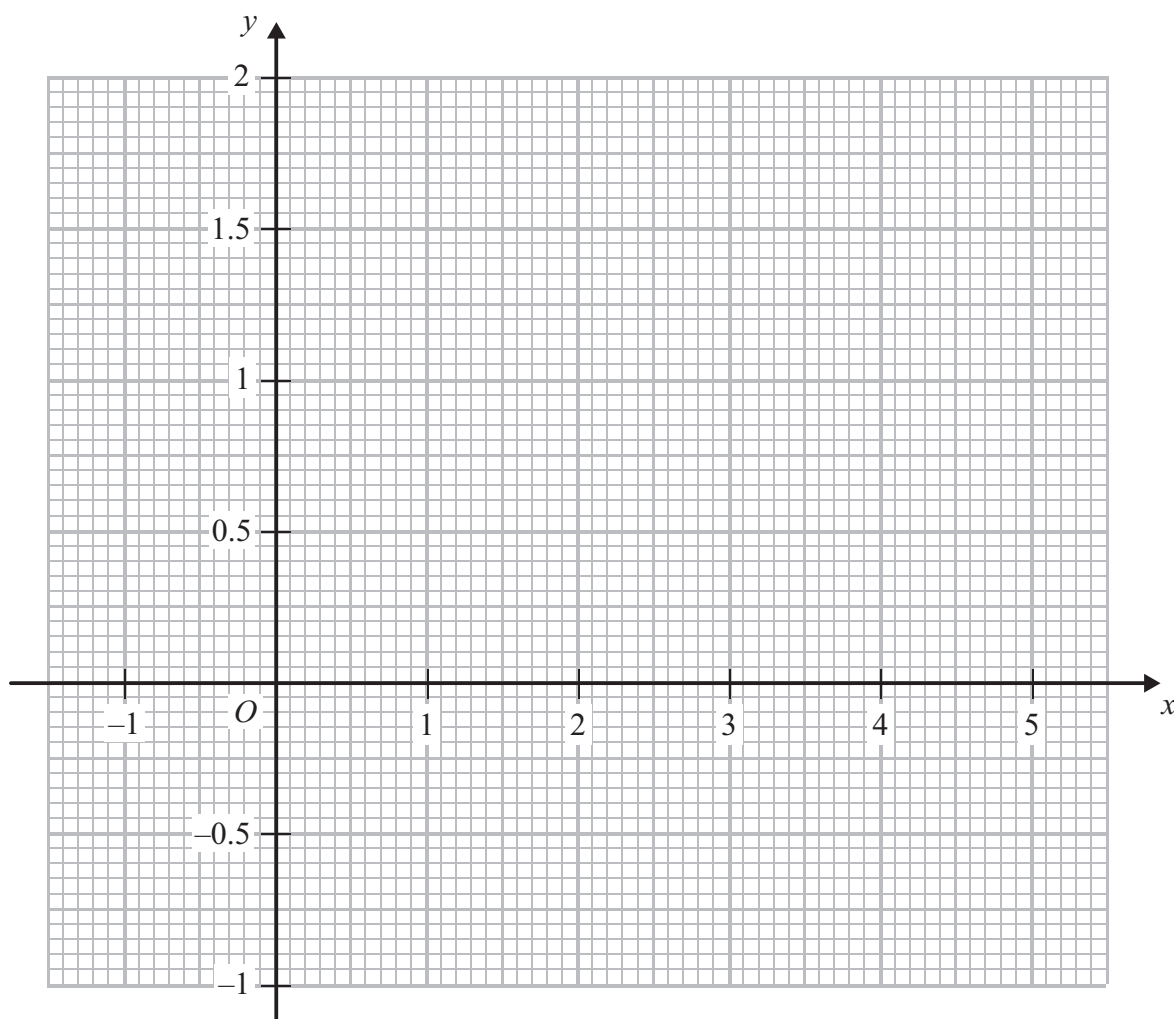
(2)

- (d) By drawing an appropriate straight line on your graph, obtain an estimate, to 1 decimal place, of the root of the equation $x = 10^{\frac{1}{2}x} - 2$ in the interval $-1 \leq x \leq 5$

(4)

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Question 7 continued



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Turn over for a spare grid if you need to redraw your graph.



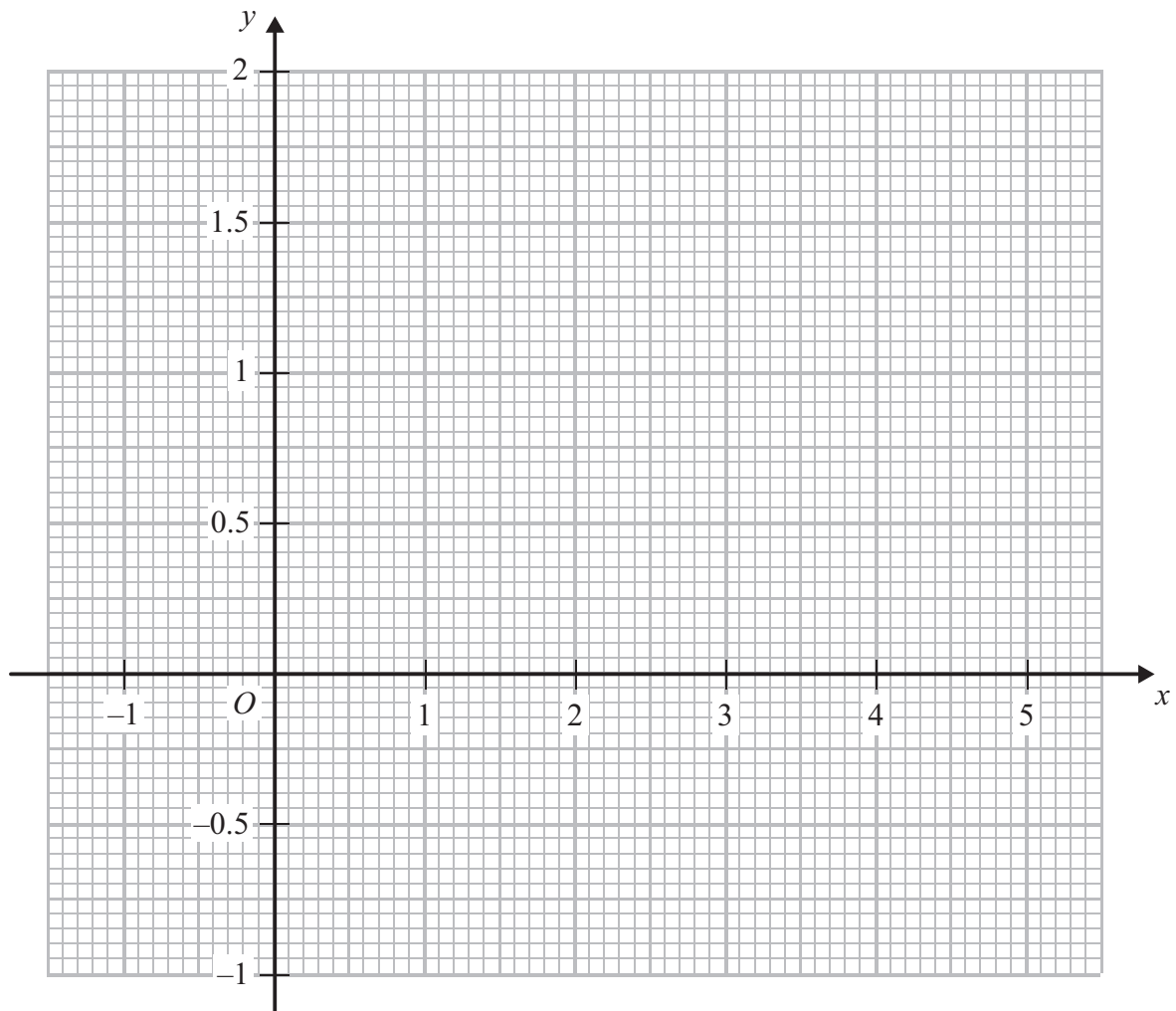
Question 7 continued

Handwriting practice area with 20 horizontal dotted lines.



Question 7 continued

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



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(Total for Question 7 is 10 marks)



8 The equation of line l_1 is $2x + 3y + 6 = 0$

(a) Find the gradient of l_1

(1)

The line l_2 is perpendicular to l_1 and passes through the point P with coordinates $(7, 2)$.

(b) Find an equation for l_2

(3)

The lines l_1 and l_2 intersect at the point Q .

(c) Find the coordinates of Q .

(3)

The line l_3 is parallel to l_1 and passes through the point P .

(d) Find an equation for l_3

(2)

The line l_1 crosses the x -axis at the point R .

(e) Show that $PQ = QR$.

(3)

The point S lies on l_3

The line PR is perpendicular to QS .

(f) Find the exact area of the quadrilateral $PQRS$.

(3)





[illegible]



- 9 (a) Expand, in ascending powers of x up to and including the term in x^3 , simplifying each term as far as possible,

(i) $(1+x)^{-1}$

(ii) $(1 - 2x)^{-1}$

(4)

Given that $\frac{2}{1-2x} + \frac{1}{1+x} = \frac{Ax+B}{(1-2x)(1+x)}$

- (b) find the value of A and the value of B .

(2)

- (c) (i) Obtain a series expansion for $\frac{1}{(1-2x)(1+x)}$ in ascending powers of x up to and including the term in x^2

- (ii) State the range of values of x for which this expansion is valid.

(4)

- (d) Use your series expansion from part (c) to obtain an estimate, to 3 decimal places,

$$\text{of } \int_{0.1}^{0.2} \frac{1}{(1-2x)(1+x)} dx$$

(4)





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10

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

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

A particle P is moving along a straight line. At time t seconds ($t \geq 0$) the displacement, s metres, of P from a fixed point O on the line is given by $s = \sqrt{3} \sin \frac{1}{2}t + \cos \frac{1}{2}t$

(a) Find the exact value of s when $t = \frac{\pi}{3}$ (2)

(b) Find the exact value of t when P first passes through O . (4)

The velocity of P at time t seconds is v m/s.

(c) Find an expression for v in terms of t . (2)

(d) Show that $v = \cos\left(\frac{\pi}{6} + \frac{1}{2}t\right)$ (2)

(e) Find the exact value of t for which $v = \frac{1}{2}$ when

(i) $0 \leq t < 2\pi$

(ii) $2\pi \leq t < 4\pi$

(4)





Question 10 continued

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(Total for Question 10 is 14 marks)

TOTAL FOR PAPER IS 100 MARKS

