Write your name here

Surname	Other names

Edexcel International GCSE

Centre Number | Candidate Number

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 ▶

6/5/6/6/6/

PEARSON

Answer all TEN questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1

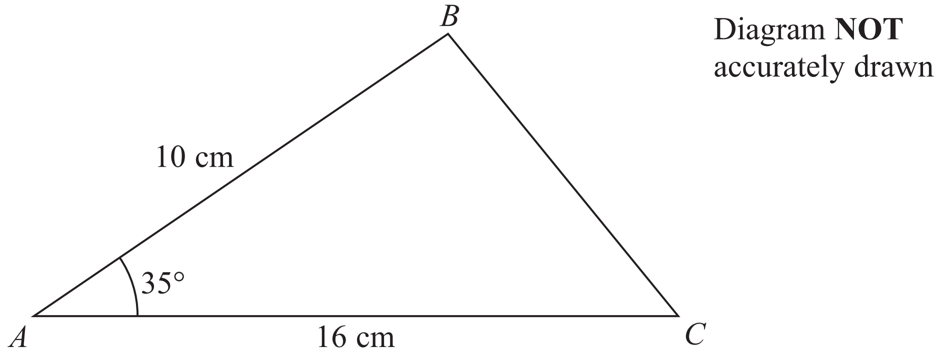


Figure 1

In triangle ABC, $AB = 10$ cm, $AC = 16$ cm and $\angle BAC = 35°$, as shown in Figure 1.

(a) Find, to 3 significant figures, the area of the triangle ABC.

(2)

(b) Find, in degrees to the nearest 0.1°, the size of the angle ABC.

(5)

Question 1 continued

(Total for Question 1 is 7 marks)

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)

Question 2 continued

(Total for Question 2 is 7 marks)

3

(a) (i) Find $\int \left(1 + 3x - \dfrac{2}{x^2}\right) \mathrm{d}x$

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

(4)

(b) (i) Find $\int 3\sin 2x \, \mathrm{d}x$

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

(4)

Question 3 continued

(Total for Question 3 is 8 marks)

4 The nth 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 $r = \dfrac{1 + \sqrt{5}}{2}$

(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)

Question 4 continued

(Total for Question 4 is 8 marks)

5

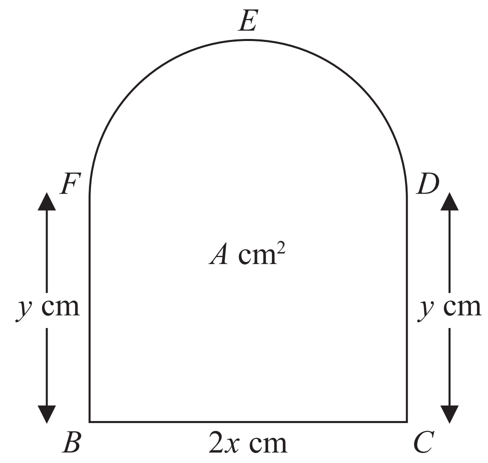


Diagram **NOT** accurately drawn

Figure 2

Figure 2 shows a shape $BCDEF$ of area A cm^2. In the shape, $BCDF$ is a rectangle and DEF is a semicircle with FD as diameter.

$BF = CD = y$ cm and $BC = FD = 2x$ cm. The perimeter of the shape $BCDEF$ is 30 cm.

(a) Find an expression for y in terms of x.

(2)

(b) Show that $A = 30x - 2x^2 - \frac{1}{2}\pi x^2$

(2)

(c) Find, to 2 significant figures, the maximum value of A, justifying that the value you have found is a maximum.

(7)

Question 5 continued

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 $-1 \leqslant x \leqslant 5$

(2)

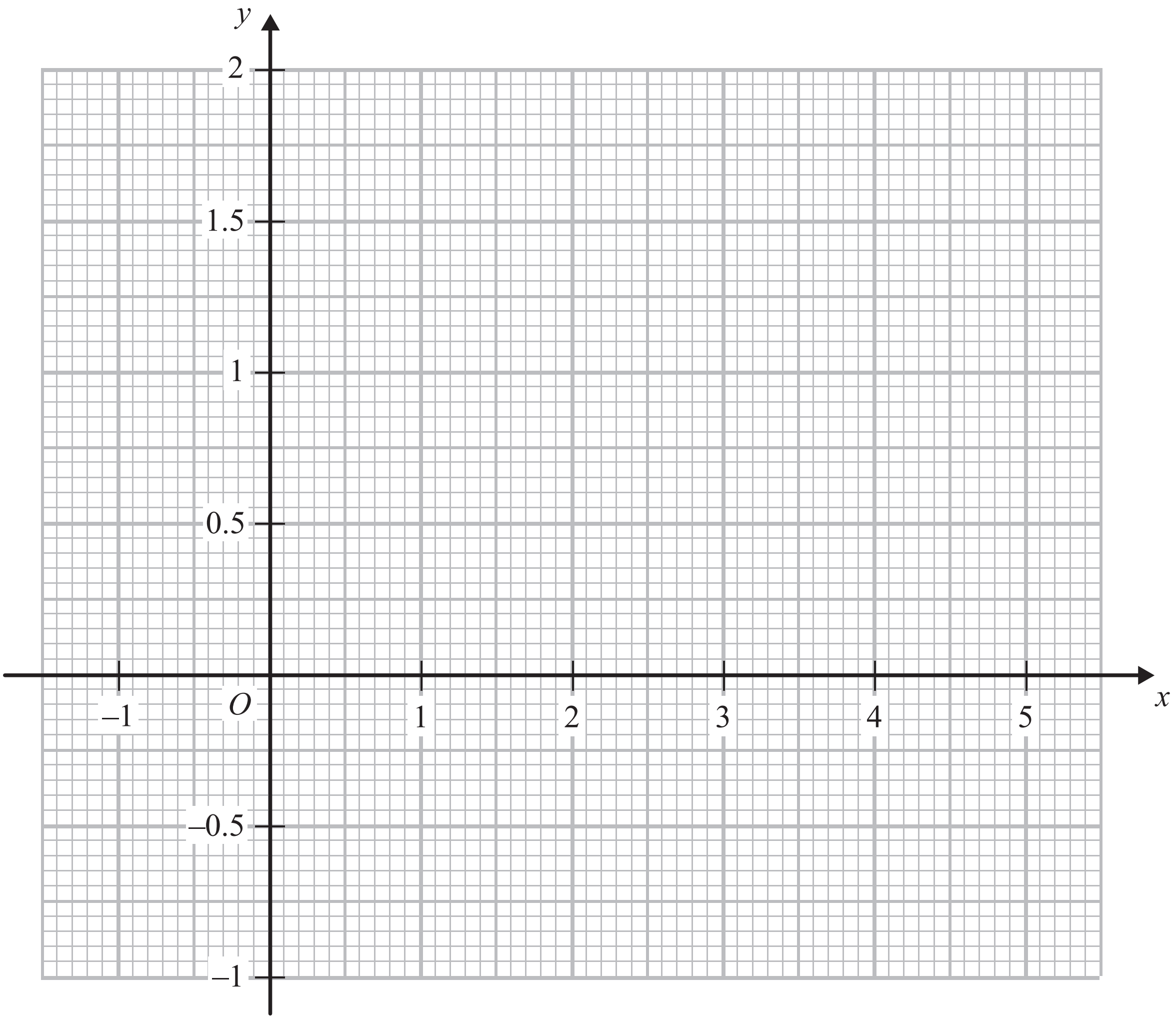
(c) Use your graph to obtain an estimate, to 1 decimal place, of the root of the equation $10\log_{10}(x + 2) - 2x = 1\frac{1}{2}$ in the interval $-1 \leqslant x \leqslant 5$

(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 $-1 \leqslant x \leqslant 5$

(4)

Question 7 continued

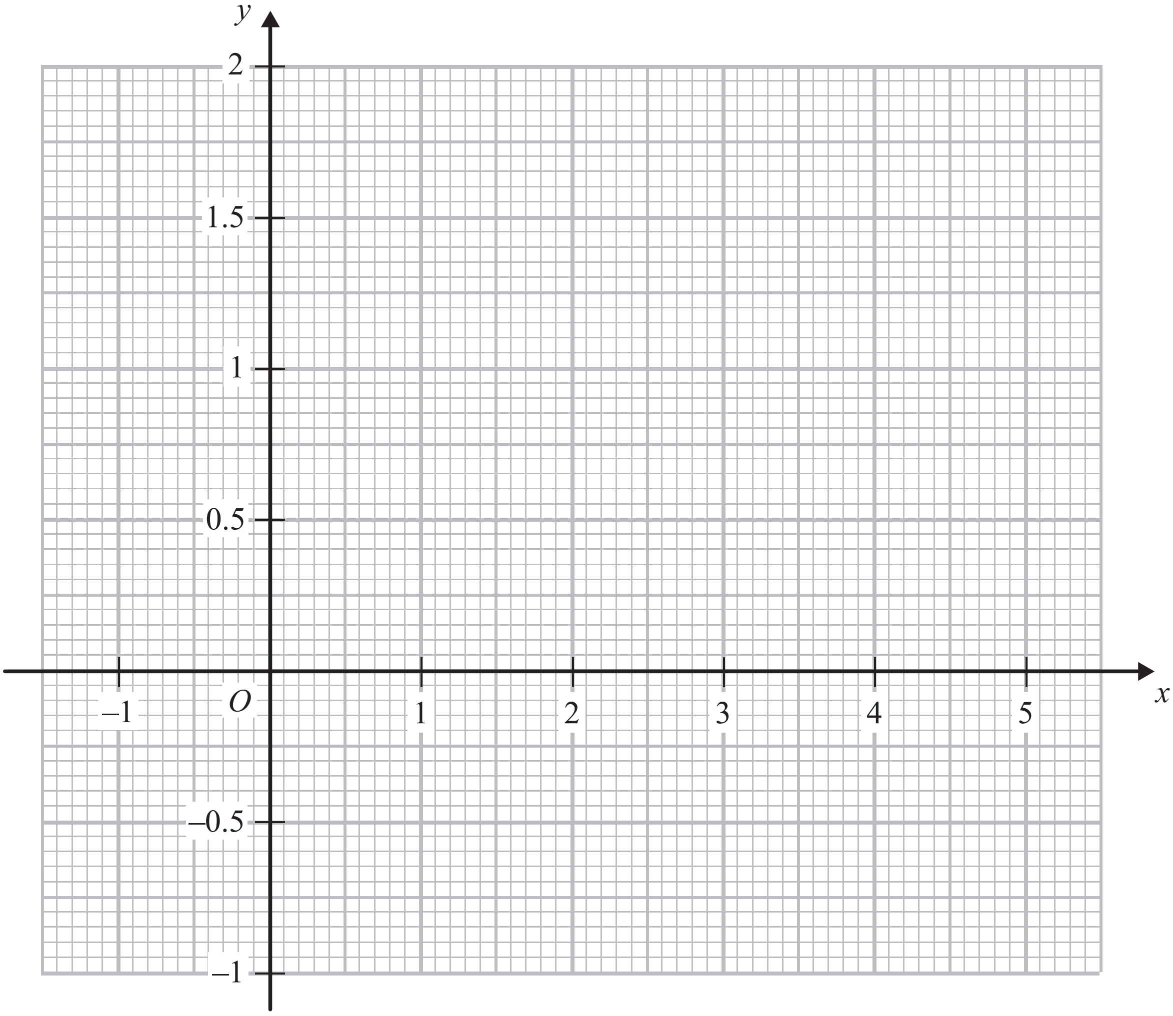


Turn over for a spare grid if you need to redraw your graph.

Question 7 continued

Question 7 continued

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



(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)

Question 8 continued

Question 8 continued

Question 8 continued

(Total for Question 8 is 15 marks)

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 $\dfrac{2}{1-2x} + \dfrac{1}{1+x} = \dfrac{Ax + B}{(1-2x)(1+x)}$

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

(2)

(c) (i) Obtain a series expansion for $\dfrac{1}{(1-2x)(1+x)}$ 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, of $\displaystyle\int_{0.1}^{0.2} \frac{1}{(1-2x)(1+x)}\,\mathrm{d}x$

(4)

Question 9 continued

Question 9 continued

Question 9 continued

(Total for Question 9 is 14 marks)

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 ($t \geqslant 0$) 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) $0 \leqslant t < 2\pi$

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

(4)

Question 10 continued

Question 10 continued

(Total for Question 10 is 14 marks)

TOTAL FOR PAPER IS 100 MARKS