Write your name here

Surname	Other names

Pearson Edexcel
International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Further Pure Mathematics

Paper 1

Monday 20 January 2014 – Morning
Time: 2 hours

Paper Reference
4PM0/01

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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P 4 2 9 5 0 A 0 1 3 2

PEARSON

Answer all ELEVEN questions

Write your answers in the spaces provided

You must write down all stages in your working

1 Find $\sum_{r=4}^{40}(7r-2)$

(4)

(Total for Question 1 is 4 marks)

2 $f(x) = 2x^2 - 8x + 5$

Given that $f(x)$ can be written in the form $a(x - b)^2 + c$

(a) find the value of a, the value of b and the value of c.

(3)

(b) Write down

(i) the minimum value of $f(x)$,

(ii) the value of x at which this minimum occurs.

(2)

(Total for Question 2 is 5 marks)

3 Differentiate with respect to x

(a) $e^{3x}(5x-7)^2$

(3)

(b) $\dfrac{\cos 2x}{x+9}$

(3)

Question 3 continued

(Total for Question 3 is 6 marks)

4 The sum of the first n terms of an arithmetic series is $2n(n + 3)$

Find

(a) the first term of the series,

(1)

(b) the common difference of the series,

(3)

(c) the 25th term of the series.

(2)

Question 4 continued

(Total for Question 4 is 6 marks)

5 (a) Solve the equation $\log_7(2x - 3) = 2$

(2)

(b) (i) Factorise $2x\ln 3x - 4x - 4\ln 3x + 8$

(ii) Hence find the exact roots of the equation $2x\ln 3x - 4x - 4\ln 3x + 8 = 0$

(5)

Question 5 continued

(Total for Question 5 is 7 marks)

6 In triangle ABC, $AB = x$ cm, $BC = 7$ cm, $AC = (5x - 6)$ cm and $\angle BAC = 60°$

(a) Find, to 3 significant figures, the value of x.

(5)

Using your value of x

(b) find, in degrees to 1 decimal place, the size of $\angle ACB$.

(3)

Question 6 continued

(Total for Question 6 is 8 marks)

7 (a) Complete the table of values for $y = 2x - 4 + \frac{5}{x^2}$, giving your answers to 2 decimal places where appropriate.

x	0.8	1	1.5	1.7	2	2.5	3	4
y	5.41		1.22			1.8		4.31

(2)

(b) On the grid opposite, draw the graph of $y = 2x - 4 + \frac{5}{x^2}$ for $0.8 \leqslant x \leqslant 4$

(2)

(c) Use your graph to obtain estimates, to 1 decimal place, of the roots of the equation

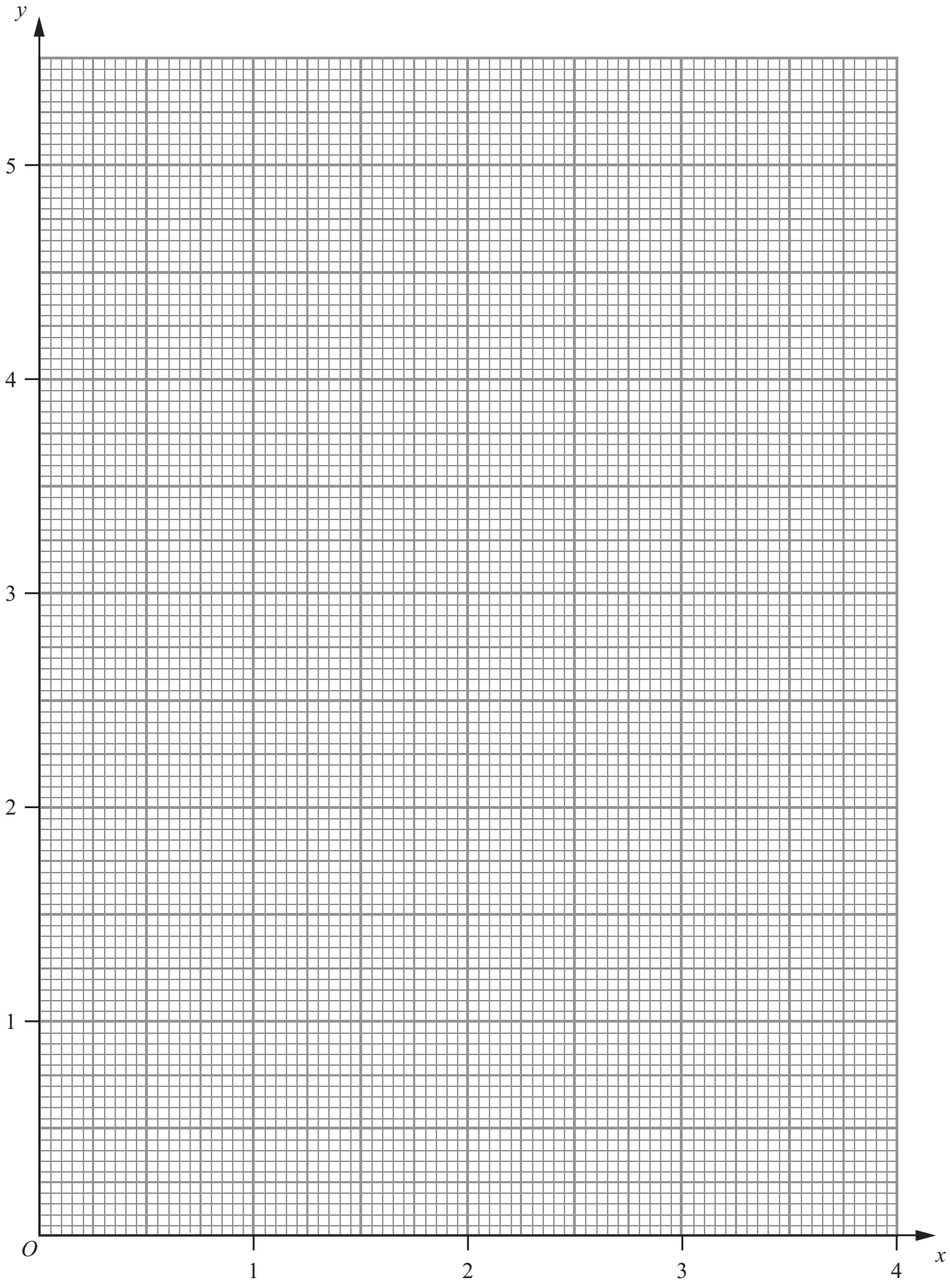
$2x + \frac{5}{x^2} = 6$ in the interval $0.8 \leqslant x \leqslant 4$

(2)

(d) By drawing a straight line on your graph obtain an estimate, to 1 decimal place, of the root of the equation $4x + \frac{5}{x^2} = 12$ in the interval $0.8 \leqslant x \leqslant 4$

(4)

Question 7 continued

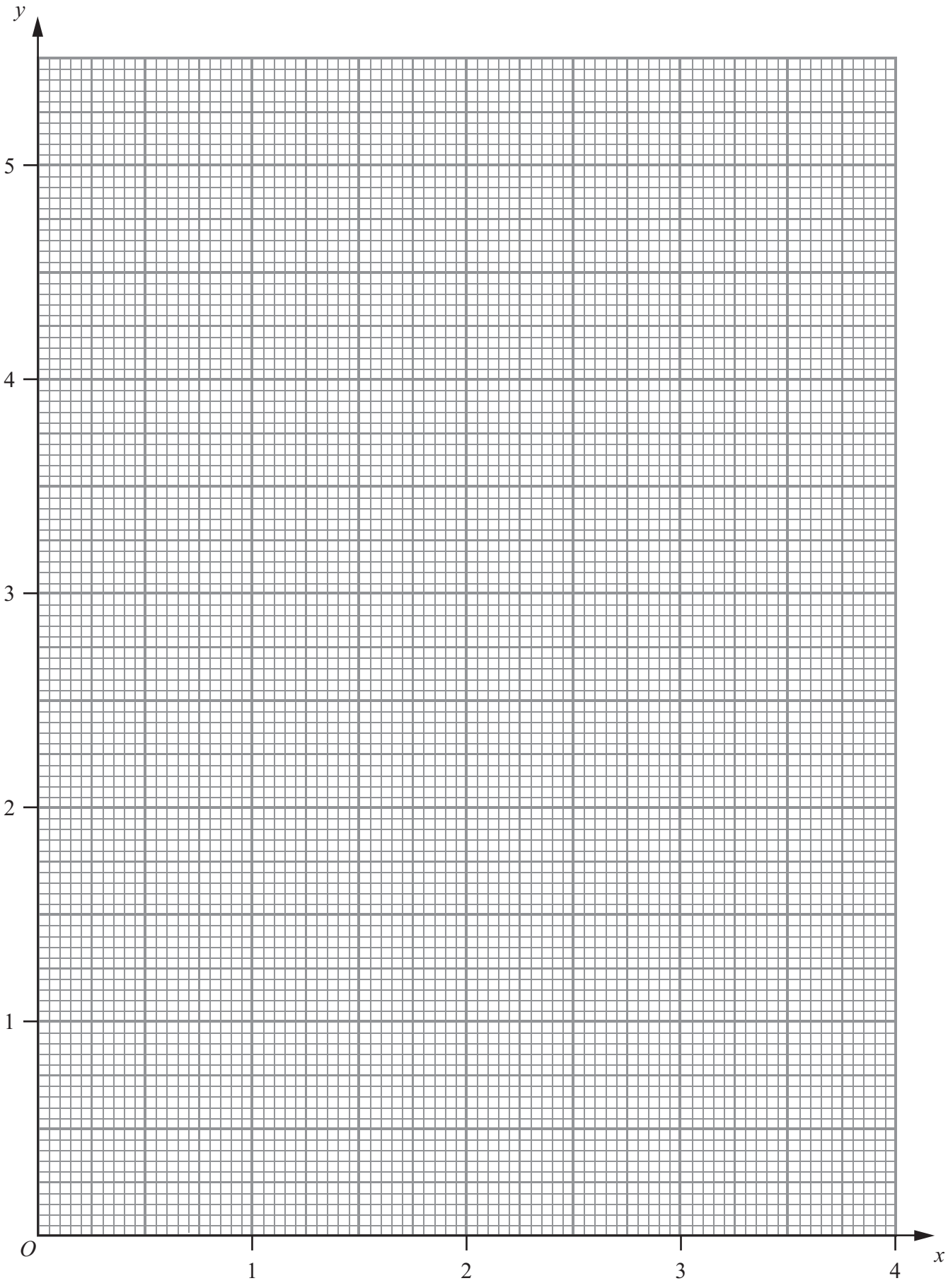


Use the grid on page 15 if you need to redraw your graph.

Question 7 continued

Question 7 continued

Use this page if you need to redraw your graph.



(Total for Question 7 is 10 marks)

8 $\sin(A + B) = \sin A \cos B + \cos A \sin B$

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

(a) Show that the equation

$$4\sin(x + \alpha) = 7\sin(x - \alpha)$$

can be written in the form

$$3\tan x = 11\tan \alpha$$

(5)

(b) Hence solve, to 1 decimal place,

$$4\sin(3y + 45)° = 7\sin(3y - 45)° \text{ for } 0 \leqslant y \leqslant 180$$

(6)

Question 8 continued

Question 8 continued

Question 8 continued

(Total for Question 8 is 11 marks)

9 A particle P moves in a straight line such that, at time t seconds, its displacement, s metres, from a fixed point O of the line is given by $s = t^3 - 6t^2 + 5t$

Find

(a) the values of t for which P passes through O

(3)

(b) the speed of P each time it passes through O

(5)

(c) the greatest speed of P in the interval $0 \leqslant t \leqslant 5$

(4)

Question 9 continued

Question 9 continued

Question 9 continued

(Total for Question 9 is 12 marks)

10 $f(x) = x^2 + (k - 3)x + 4$

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

(a) Find, in terms of k, the value of $\alpha^2 + \beta^2$

(3)

Given that $4(\alpha^2 + \beta^2) = 7\alpha^2\beta^2$

(b) without solving the equation $f(x) = 0$, form a quadratic equation, with integer coefficients, which has roots $\frac{1}{\alpha^2}$ and $\frac{1}{\beta^2}$

(5)

(c) find the possible values of k.

(5)

Question 10 continued

Question 10 continued

Question 10 continued

(Total for Question 10 is 13 marks)

11 The curve C has equation $5y = 4(x^2 + 1)$. The coordinates of the point P on the curve are $(p, 8)$, $p > 0$

The line l with equation $5y - 24x + q = 0$ is the tangent to C at P.

(a) (i) Show that $p = 3$

(ii) Find the value of q

(4)

(b) Find an equation, with integer coefficients, for the normal to C at P.

(5)

(c) Find the exact value of the area of the triangle formed by the tangent to C at P, the normal to C at P and the x-axis.

(3)

The finite region bounded by C, the tangent to C at P, the x-axis and the y-axis is rotated through 360° about the x-axis.

(d) Find, to 2 significant figures, the volume of the solid generated.

(6)

Question 11 continued

Question 11 continued

Question 11 continued

Question 11 continued

(Total for Question 11 is 18 marks)

TOTAL FOR PAPER IS 100 MARKS