Write your name here

Surname	Other names

Pearson Edexcel
International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Further Pure Mathematics

Paper 1

Wednesday 21 May 2014 – Afternoon
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 3 0 2 4 A 0 1 3 2

PEARSON

Answer all TEN questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 (a) On the axes below, sketch the lines with equations $y = x + 3$ and $y + 2x = 7$

On your sketch mark the coordinates of the points where the lines cross the y-axis.

(2)

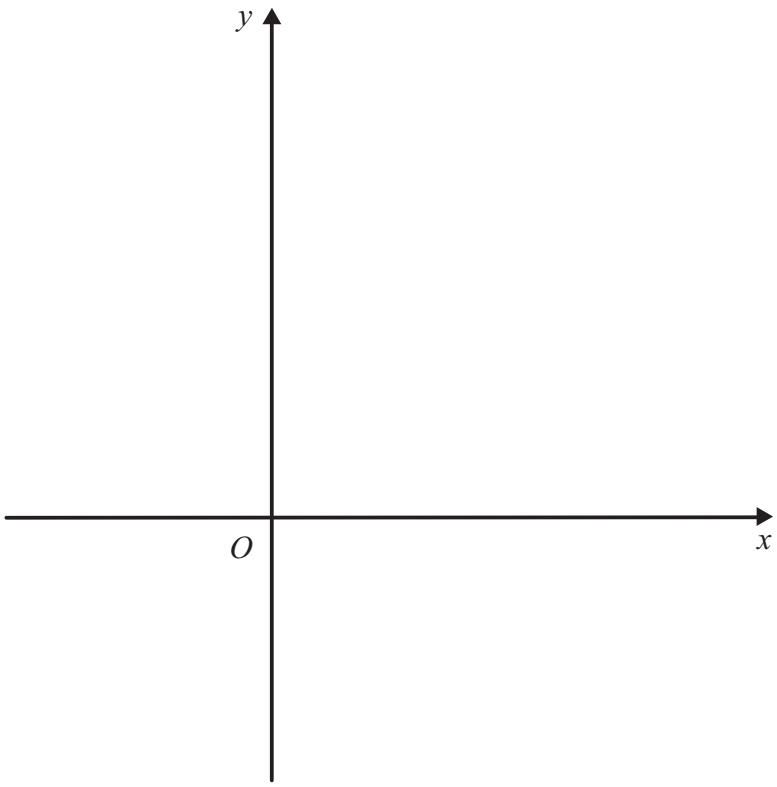
(b) Show, by shading on your sketch, the region R defined by the inequalities

$$y \leqslant x + 3,\ y + 2x \leqslant 7,\ x \geqslant 0 \text{ and } y \geqslant 0$$

(1)

(c) Determine, by calculation, whether or not the point with coordinates (2, 2) lies in R.

(2)



Question 1 continued

(Total for Question 1 is 5 marks)

2 Solve, in degrees to 1 decimal place, for $0 \leqslant \theta < 180°$

(a) $\tan 2\theta = 1.5$

(3)

(b) $(3\cos\theta + 1)(2\cos\theta + 3) = -2$

(4)

Question 2 continued

(Total for Question 2 is 7 marks)

3 Given that $2xy - 3y = e^{2x}$

(a) show that $\frac{dy}{dx} = \frac{4e^{2x}(x-2)}{(2x-3)^2}$

(5)

(b) find the value of $\frac{dy}{dx}$ when $x = 0$

(1)

(c) find an equation, with integer coefficients, of the tangent to the curve with equation $2xy - 3y = e^{2x}$ at the point on the curve where $x = 0$

(3)

Question 3 continued

(Total for Question 3 is 9 marks)

4 The 3rd term of an arithmetic series is 108 and the 12th term is 54

Find

(a) the common difference of the series,

(3)

(b) the first term of the series.

(1)

The sum of the first n terms of the series is S_n

(c) Show that $S_n = 3n(41 - n)$

(3)

Given that $S_n = 1200$

(d) find the two possible values of n.

(4)

Question 4 continued

Question 4 continued

(Total for Question 4 is 11 marks)

5 The volume of a right circular cone is increasing at the rate of 72 cm^3/s. The height of the cone is always four times the radius of the base of the cone. Find the rate of increase of the radius of the base, in cm/s to 3 significant figures, when the height of the cone is 12 cm.

(6)

(Total for Question 5 is 6 marks)

6 (a) Expand $(1 + 4x^2)^{-\frac{1}{5}}$ in ascending powers of x up to and including the term in x^6, expressing each coefficient as an exact fraction in its lowest terms.

(4)

(b) Find the range of values of x for which your expansion is valid.

(2)

$$f(x) = \frac{1 + kx}{(1 + 4x^2)^{\frac{1}{5}}} \quad \text{where } k \neq 0$$

(c) Obtain a series expansion for f(x) in ascending powers of x up to and including the term in x^5.

(3)

Given that the coefficients of x^2 and x^5 in the expansion of f(x) are equal,

(d) find the value of k.

(2)

Question 6 continued

Question 6 continued

Question 6 continued

(Total for Question 6 is 11 marks)

7 [In this question all distances are measured in metres.]

A particle P is moving along the x-axis. At time t seconds, P is at the point with coordinates $(x_P, 0)$, where $x_P = 8 - 10t + \frac{1}{3}t^3$

Find, in terms of t,

(a) the velocity of P at time t seconds,

(2)

(b) the acceleration of P at time t seconds.

(2)

A second particle Q is also moving along the x-axis. At time t seconds, the velocity of Q is v_Q m/s, where $v_Q = t^2 - 3t + 4$
At time $t = 0$, Q is at the origin and at time t seconds Q is at the point with coordinates $(x_Q, 0)$.

(c) Find x_Q in terms of t.

(3)

The particles P and Q collide at time T seconds, where $T < 5$

(d) Find the value of T.

(4)

Question 7 continued

Question 7 continued

Question 7 continued

(Total for Question 7 is 11 marks)

8 $f(x) = 3x^2 + px - 7$

The equation $f(x) = 0$ has roots α and β.

(a) Without solving the equation

(i) write down the value of $\alpha^2\beta^2$

(ii) find, in terms of p, $\alpha^2 + \beta^2$

(4)

Given that $3\alpha - \beta = 8$

(b) find the possible values of p.

(5)

Given also that p is negative,

(c) form an equation with roots $\frac{1}{\alpha^2}$ and $\frac{1}{\beta^2}$

(3)

Question 8 continued

Question 8 continued

Question 8 continued

(Total for Question 8 is 12 marks)

9 The points A and B have coordinates (2, 5) and (16, 12) respectively. The point D with coordinates (8, 8) lies on AB.

(a) Find, in the form $p:q$, the ratio in which D divides AB internally.

(3)

The line l passes through D and is perpendicular to AB.

(b) Find an equation of l.

(4)

The point E with coordinates $(e, 6)$ lies on l.

(c) Find the value of e.

(1)

The line ED is produced to F so that $ED = DF$.

(d) Find the coordinates of F.

(2)

(e) Find the area of the kite $AEBF$.

(3)

Question 9 continued

Question 9 continued

Question 9 continued

(Total for Question 9 is 13 marks)

10

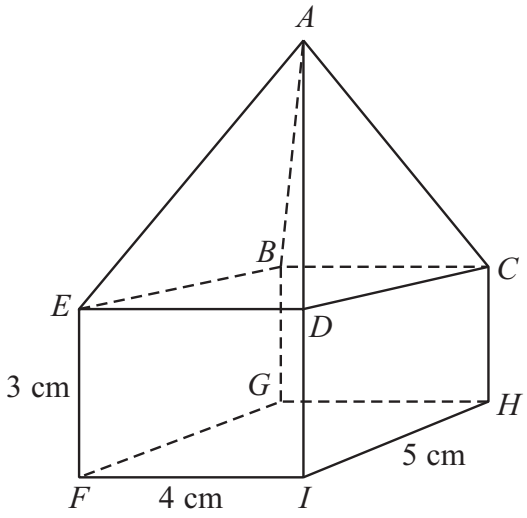


Diagram **NOT** accurately drawn

Figure 1

A paperweight *ABCDEFGHI* consists of a cuboid *BCDEFGHI* and a right pyramid *ABCDE* as shown in Figure 1.

$$EF = 3 \text{ cm}, \quad FI = 4 \text{ cm}, \quad IH = 5 \text{ cm}$$

The volume of the pyramid is equal to the volume of the cuboid.

(a) Show that the height of the pyramid is 9 cm.

(2)

Find, in cm to 3 significant figures, the length of

(b) *AE*,

(3)

(c) *EH*.

(2)

Find, in degrees to the nearest 0.1°, the size of

(d) the angle between *AE* and the plane *EBCD*,

(3)

(e) the obtuse angle between the plane *ABE* and the plane *BEIH*.

(5)

Question 10 continued

Question 10 continued

Question 10 continued

Question 10 continued

(Total for Question 10 is 15 marks)

TOTAL FOR PAPER IS 100 MARKS