Write your name here

Surname	Other names

Pearson Edexcel
International GCSE

Centre Number	Candidate Number

Further Pure Mathematics

Paper 1

Tuesday 13 June 2017 – 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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Pearson

Answer all TEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Find the exact solution of the equation

$$\frac{16}{e^x} - e^x = 6$$

(5)

Question 1 continued

(Total for Question 1 is 5 marks)

2 Sand is poured onto horizontal ground at a rate of $50\,cm^3/s$. The sand forms a right circular cone with its base on the ground. The volume of the cone increases in such a way that the radius of the base is always three times the height of the cone. Find the rate of change, in cm/s to 3 significant figures, of the radius of the cone when the radius is 10 cm.

(5)

Question 2 continued

(Total for Question 2 is 5 marks)

3

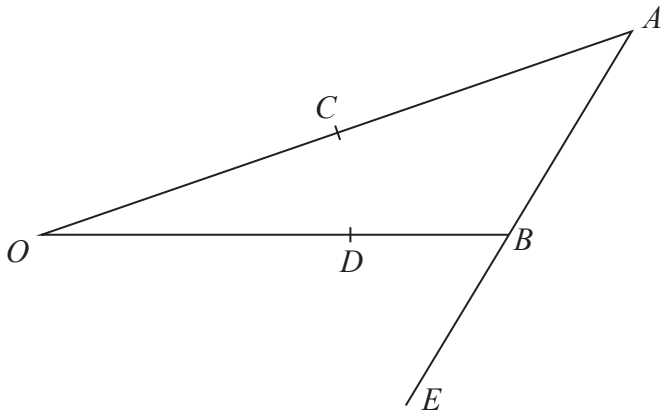

Diagram **NOT** accurately drawn

Figure 1

In Figure 1, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$

The point C is the midpoint of OA and the point D divides OB in the ratio $2 : 1$

(a) Find $\overrightarrow{CD}$ in terms of **a** and **b**

(2)

The point E lies on AB produced such that $\overrightarrow{OE} = 2\mathbf{b} - \mathbf{a}$

(b) Find $\overrightarrow{CE}$ in terms of **a** and **b**

(2)

(c) Hence show that C, D and E are collinear.

(2)

Question 3 continued

(Total for Question 3 is 6 marks)

4 Solve, for $0 \leqslant \theta < \pi$, to 4 significant figures,

(a) $(\tan\theta - 3)(\tan\theta + 2) = 0$

(3)

(b) $6\cos^2\theta - \sin\theta = 5$

(4)

Question 4 continued

(Total for Question 4 is 7 marks)

5 In triangle ABC, $AB = 10\,\text{cm}$, $BC = 7\,\text{cm}$ and angle $BAC = 40°$

(a) Find, in degrees to the nearest 0.1°, the two possible sizes of angle ACB.

(4)

(b) Find, in cm to 3 significant figures, the difference between the two possible lengths of AC.

(4)

Question 5 continued

(Total for Question 5 is 8 marks)

6 The sum of the first term and the third term of a geometric series is 250

The sum of the second term and the third term of the series is 150

The common ratio of the series is r.

(a) Find the two possible values of r.

(5)

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

Given that $r > 0$ and that $S_n > 399.99$

(b) find the least value of n.

(6)

Question 6 continued

Question 6 continued

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Question 6 continued

(Total for Question 6 is 11 marks)

7 (a) Solve $\log_a 1024 = 5$

(1)

(b) Solve $\log_3(6c + 9) = 4$

(2)

(c) Solve $2(\log_b 25 + \log_b 125) = 5$

(4)

(d) Solve the equations, giving the values of x and y to 3 significant figures,

$$3\log_2 x + 4\log_3 y = 10$$

$$\log_2 x - 2\log_3 y = 1$$

(6)

Question 7 continued

Question 7 continued

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Question 7 continued

(Total for Question 7 is 13 marks)

8 The points A and B have coordinates $(1, 7)$ and $(13, 1)$ respectively.

(a) Find the exact length of AB.

(2)

The point C divides AB in the ratio $1 : 2$

(b) Find the coordinates of C.

(2)

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

(c) Find an equation of l, giving your answer in the form $y = ax + b$ where a and b are integers.

(4)

The point D with coordinates $(9, d)$ lies on l.

(d) Find the value of d.

(1)

The point E is the midpoint of CD.

(e) Find the exact value of the area of the quadrilateral $ADBE$.

(5)

Question 8 continued

Question 8 continued

Question 8 continued

(Total for Question 8 is 14 marks)

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

(a) show that $\cos^2\theta = \frac{1}{2}(\cos 2\theta + 1)$

(2)

$$f(\theta) = 8\cos^4\theta + 4\cos^2\theta - 5$$

(b) show that $f(\theta) = \cos 4\theta + 6\cos 2\theta$

(4)

Hence

(c) solve, for $0° \leqslant x < 180°$, the equation

$$8\cos^4 x + 4\cos^2 x - 6\cos 2x = 4.5$$

(4)

(d) find

(i) $\int f(\theta)\, d\theta$

(ii) the exact value of $\int_0^{\frac{\pi}{3}} f(\theta)\, d\theta$

(5)

Question 9 continued

Question 9 continued

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Question 9 continued

(Total for Question 9 is 15 marks)

10 A curve C has equation $y = 8x + \dfrac{1}{2x-1} \qquad x \neq \dfrac{1}{2}$

(a) Write down an equation of the asymptote to C which is parallel to the y-axis.

(1)

(b) Show that C has a minimum point at $x = \dfrac{3}{4}$ and a maximum point at $x = \dfrac{1}{4}$

(9)

(c) Find the y coordinate of

(i) the minimum point,

(ii) the maximum point,

(iii) the point where C crosses the y-axis.

(3)

(d) Sketch the curve C, showing clearly the asymptote found in part (a), the coordinates of the turning points and the coordinates of the point where C crosses the y-axis.

(3)

Question 10 continued

Question 10 continued

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Question 10 continued

Question 10 continued

(Total for Question 10 is 16 marks)

TOTAL FOR PAPER IS 100 MARKS

END