Write your name here

Surname	Other names

Pearson Edexcel
International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Further Pure Mathematics

Paper 1

Friday 22 January 2016 – 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 ▶

P46242A

5/1/1/1/1/

P 4 6 2 4 2 A 0 1 3 6

PEARSON

Answer all ELEVEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 $f(x) = 3x^3 + 2\sin x - \frac{4}{x^2}$ where $x \neq 0$

(a) Find $f'(x)$

(3)

(b) Find $\int f(x)\,dx$

(4)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 1 continued

(Total for Question 1 is 7 marks)

2 Find the set of values of x for which $(2x - 3)^2 > 7x - 3$

(5)

Question 2 continued

(Total for Question 2 is 5 marks)

3 The volume, V cm^3, of a sphere of radius r cm is increasing at the rate of 60 cm^3/s.

Find the rate of increase of the radius, in cm/s correct to 2 significant figures, when the volume is $36\,000\pi$ cm^3.

(7)

Question 3 continued

(Total for Question 3 is 7 marks)

4 An arithmetic series has first term p and common difference p where $p \neq 0$
A geometric series also has first term p. The common ratio of this geometric series is r.
The sum of the first three terms of the arithmetic series is equal to the sum of the first three terms of the geometric series.

Given that $r > 0$

show that $r = \dfrac{-1 + \sqrt{21}}{2}$

(5)

Question 4 continued

(Total for Question 4 is 5 marks)

5 Given that $\frac{1}{\sqrt{4-x}}$ can be written as $p(1-qx)^{-\frac{1}{2}}$

(a) find the value of p and the value of q.

(2)

(b) (i) Find the first four terms in the expansion of $\frac{1}{\sqrt{4-x}}$ in ascending powers of x, simplifying each term.

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

(4)

Given that the first three terms of the expansion of $\frac{2(1+x)}{\sqrt{4-x}}$ are $a + bx + cx^2$

(c) find the exact value of

(i) a (ii) b (iii) c

(3)

Question 5 continued

Question 5 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 5 continued

(Total for Question 5 is 9 marks)

6 Giving your solutions to 3 decimal places, solve the equation

(a) $\cos x = 0.4$ $\quad -\pi < x < \pi$

(2)

(b) $\tan\left(2\theta + \frac{\pi}{4}\right) = 1.5$ $\quad 0 < \theta < \pi$

(4)

Question 6 continued

(Total for Question 6 is 6 marks)

7

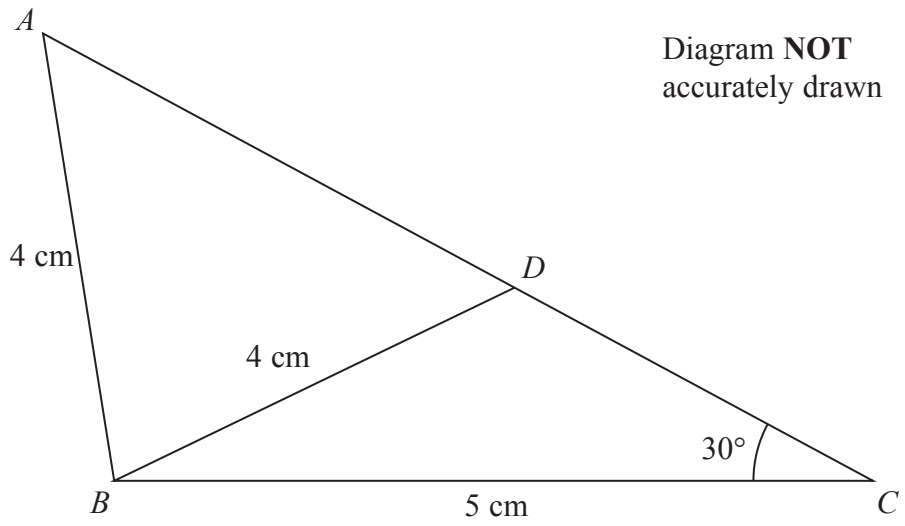

Figure 1

Figure 1 shows the triangle ABC with $AB = 4$ cm, $BC = 5$ cm and angle $BCA = 30°$

The point D lies on AC such that $BD = 4$ cm and angle BDC is obtuse.

Find

(a) the size of angle BDC, giving your answer in degrees correct to 1 decimal place,

(3)

(b) the length, in cm, of AD, giving your answer correct to 3 significant figures,

(3)

(c) the area, in cm^2, of triangle ABD, giving your answer correct to 3 significant figures.

(2)

Question 7 continued

Question 7 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 7 continued

(Total for Question 7 is 8 marks)

8 A particle P is moving along the positive x-axis. At time t seconds ($t \geqslant 0$), the acceleration a m/s^2 of P is given by $a = 6 - 4t$

When $t = 0$, P is at rest and the displacement of P from the origin O is 5 metres.

At time t seconds, the velocity of P is v m/s and the displacement of P from O is s metres.

(a) Find, in terms of t, an expression for

(i) v

(ii) s

(6)

For $t > 0$, P comes to instantaneous rest at the point A.

(b) Find

(i) the value of t when P reaches A,

(ii) the distance OA.

(5)

Question 8 continued

Question 8 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 8 continued

(Total for Question 8 is 11 marks)

9

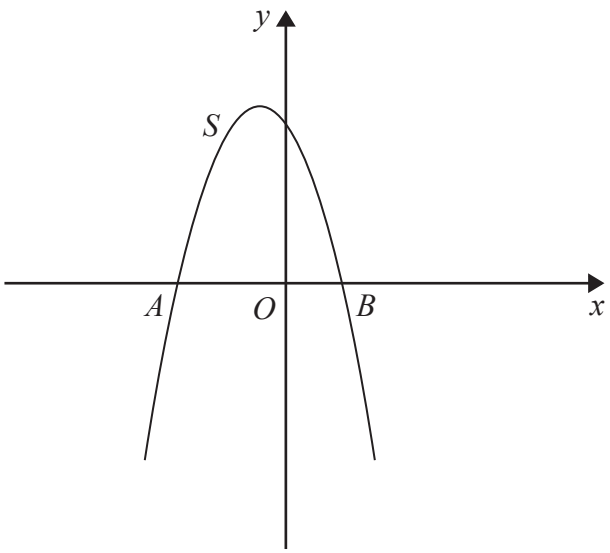

Figure 2

Figure 2 shows the curve S with equation $y = 8 - 2x - x^2$

The curve S crosses the x-axis at the points A and B.

(a) Find the x coordinate of A and the x coordinate of B.

(3)

(b) Use calculus to find the area of the finite region bounded by S and the x-axis.

(4)

The curve T with equation $y = x^2 + x + 6$ intersects S.

(c) Find the x coordinates of the points of intersection of S and T.

(2)

(d) Use calculus to find the area of the finite region bounded by S and T.

(4)

Question 9 continued

Question 9 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 9 continued

(Total for Question 9 is 13 marks)

10 Given that $2\log_y x + 2\log_x y = 5$

(a) show that $\log_y x = \frac{1}{2}$ or $\log_y x = 2$

(5)

(b) Hence, or otherwise, solve the equations

$$xy = 27$$

$$2\log_y x + 2\log_x y = 5$$

(6)

Question 10 continued

Question 10 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 10 continued

(Total for Question 10 is 11 marks)

11

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

(a) Write $f(x)$ in the form $P - Q(x + R)^2$, where P, Q and R are rational numbers.

(2)

The curve C has equation $y = 4 + 3x - x^2$

(b) Find the coordinates of the maximum point of C.

(1)

The line l_1 is a tangent to C at the point where $x = 1$

(c) Find an equation for l_1

(5)

Another line l_2 is perpendicular to l_1 and is also a tangent to C.

The lines l_1 and l_2 intersect at the point A.

(d) Find the coordinates of A.

(5)

The point B with coordinates $(-3, 2)$ lies on l_1

(e) Find the exact length of AB.

(2)

The point D with coordinates $(8, 0)$ lies on l_2

(f) Find the exact area of triangle ABD.

(3)

Question 11 continued

Question 11 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 11 continued

Question 11 continued

(Total for Question 11 is 18 marks)

TOTAL FOR PAPER IS 100 MARKS

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA