

Write your name here	
Surname	Other names
Edexcel	Centre Number
International GCSE	Candidate Number
<h1 style="margin: 0;">Further Pure Mathematics</h1> <h2 style="margin: 0;">Paper 2</h2>	
Tuesday 20 June 2017 – Afternoon	Paper Reference
Time: 2 hours	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 ►

P47877A

©2017 Pearson Education Ltd.

1/1/1/1/1/




Pearson

Answer all ELEVEN questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 (a) On the grid opposite, draw the graphs of the lines with equations

(i) $y = 2x$ (ii) $y = 6 - x$ (iii) $2y = x - 2$ (3)

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

$y \leq 2x$, $y \leq 6 - x$, $2y \geq x - 2$, $y \geq 0$ (1)

For all points in R , with coordinates (x, y) ,

$$P = y + 2x$$

(c) Find the greatest value of P . (1)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

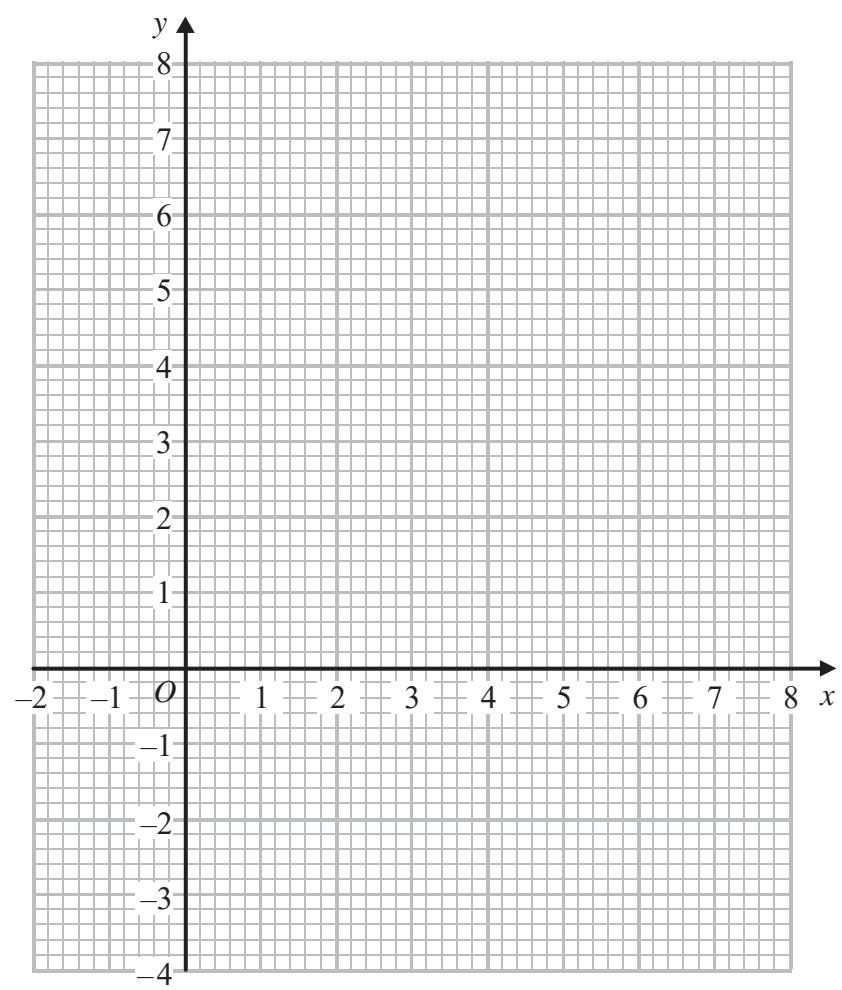


DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 1 continued



.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for Question 1 is 5 marks)



2 Solve the equations

$$y = x^2 - 6x + 5$$

$$y + x = 11$$

(5)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total for Question 2 is 5 marks)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

- 3 (a) Find the set of possible values of p for which the equation $3x^2 + px + 3 = 0$ has no real roots. (3)
- (b) Find the **integer** values of q for which the equation $x^2 + 7x + q^2 = 0$ has real roots. (3)

(Total for Question 3 is 6 marks)



- 4 A particle P is moving along a straight line which passes through the point O .
At time $t = 0$ the particle P is at the point O .

At time t seconds the velocity, v m/s, of P is given by $v = 3t^2 + 2t + 5$

(a) Find the acceleration of P when $t = 2$ (3)

(b) Find the displacement of P from O when $t = 3$ (3)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 4 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 4 is 6 marks)



- 5 In triangle ABC , $AB = x$ cm, $BC = (4x - 5)$ cm, $AC = (2x + 3)$ cm and angle $ABC = 60^\circ$.

Find, to 3 significant figures,

(a) the value of x ,

(5)

(b) the area of triangle ABC .

(3)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 5 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 5 is 8 marks)



6

$$f(x) = (p + qx)^6 \text{ where } p \neq 0 \text{ and } q \neq 0$$

- (a) Find the expansion of $f(x)$ in ascending powers of x up to and including the term in x^4 , simplifying each term as far as possible. (3)

In the expansion of $f(x)$, 4 times the coefficient of x^4 is equal to 9 times the coefficient of x^2

Given that $(p + q) > 0$ and $f(1) = 15625$

- (b) find the possible pairs of values of p and q . (6)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 6 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 6 is 9 marks)



7 A solid cuboid has width x cm, length $5x$ cm and height h cm. The total surface area of the block is 480 cm^2 . The volume of the block is $V\text{ cm}^3$.

(a) Show that $V = 200x - \frac{25}{6}x^3$ (4)

(b) Find the maximum value of V . (5)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 7 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 7 is 9 marks)



8

$$f(x) = x^2 + px + 7 \quad p \in \mathbb{R}$$

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

(a) Find, in terms of p where necessary,

$$(i) \alpha^2 + \beta^2 \quad (ii) \alpha^2\beta^2 \quad (4)$$

Given that $7(\alpha^2 + \beta^2) = 5\alpha^2\beta^2$

(b) find the possible values of p (2)

Using the positive value of p found in part (b) and without solving the equation $f(x) = 0$

(c) form a quadratic equation with roots $\frac{2p}{\alpha^2}$ and $\frac{2p}{\beta^2}$ (5)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 8 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Handwriting practice area consisting of 25 horizontal dotted lines.



Question 8 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 8 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 8 is 11 marks)



9

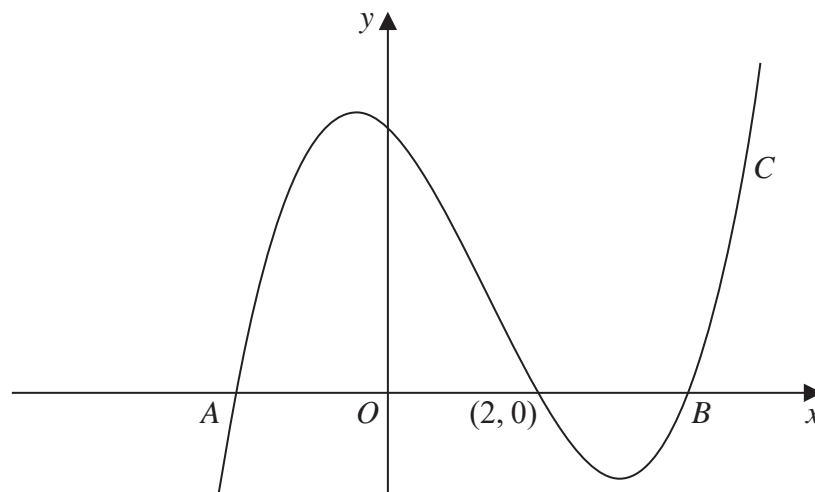


Figure 1

The curve C with equation $y = x^3 - 4x^2 - 4x + 16$ crosses the x -axis at the point with coordinates $(2, 0)$ and at the points A and B , as shown in Figure 1. The coordinates of the points A and B are $(a, 0)$ and $(b, 0)$ respectively.

- (a) Find the value of a and the value of b . (4)

The point D lies on C and has x coordinate 0

The line l is the tangent to C at the point D .

- (b) Find an equation of l . (5)

- (c) Show that l passes through B . (1)

- (d) Use algebraic integration to find the area of the finite region bounded by l and C . (5)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



Question 9 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.



Question 9 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 9 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 9 is 15 marks)



10

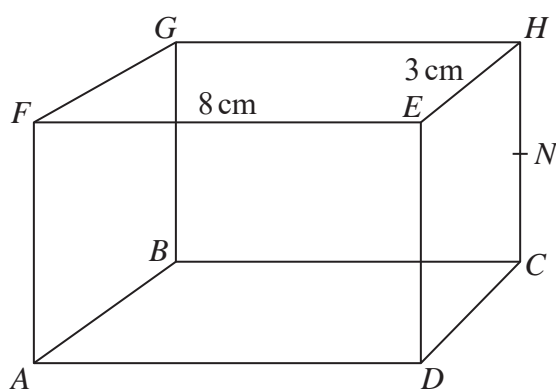


Diagram **NOT** accurately drawn

Figure 2

Figure 2 shows a solid cuboid $ABCDEFGH$ with $EF = 8 \text{ cm}$ and $EH = 3 \text{ cm}$.

The angle between the diagonal AH of the cuboid and the plane $ABCD$ is 45° .

The midpoint of CH is N .

Find, in cm to 3 significant figures,

- (a) the length of CH , (4)
 - (b) the length of AH , (3)
 - (c) the length of FN . (3)
- Find, in degrees to 1 decimal place, the size of
- (d) the angle between the plane $BCEF$ and the plane $FGHE$, (3)
 - (e) angle FNG . (3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 10 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.



Question 10 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 10 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 10 is 16 marks)



11 (a) Show that $\log pq^4 - \log pq^2 = \log pq^6 - \log pq^4$ (3)

Given that $\log pq^2$ and $\log pq^4$ are the second and third terms of an arithmetic series, find

(b) the first term of the series, (3)

(c) the sum of the first n terms of the series.

Give your answer in the form $n \log pq^s$, expressing s in terms of n . (4)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



Question 11 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.



Question 11 continued

Area with horizontal dotted lines for writing.

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total for Question 11 is 10 marks)

TOTAL FOR PAPER IS 100 MARKS

