

ADVANCED GCE

This paper follows the OCR Syllabus 4721.
It is not the original OCR paper which is freely available on the
OCR website.
All questions have been reworked from the June 2007 paper and
are a similar standard.

Mathematics Core 1

June 2007

1 hour 30 minutes



10 Questions. Total marks 72
(under review for errors)

Marks shown in brackets for each question (2)

1. Simplify $(3x + 5)^2 - (x - 2)^2$ Your answer should be in the form $ax^2 + bx + c$ (3)

2. Sketch the graph of the following on separate diagrams:

i) $y = \frac{1}{x^2}$ (2)

ii) $y = x^6$ (1)

iii) What is the transformation that transforms the curve $y = x^6$ to $y = 4x^6$ (2)

3. Simplify the following, giving each answer in the form $a\sqrt{6}$

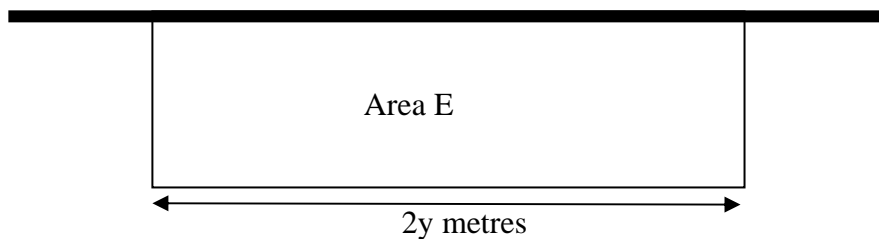
i) $4\sqrt{12} \times \sqrt{2}$ (2)

ii) $\sqrt{600} + \sqrt{150}$ (3)

4. i) Find the discriminant of $hx^2 - 6x + h$ (2)

ii) The quadratic equation of $hx^2 - 6x + h$ has equal roots. Find the possible values of h . (3)

5.



The diagram above shows a rectangular enclosure with a wall forming one side. A rope of length 30metres is used to form the remaining three sides. The width of the enclosure is $2y$ metres.

i) Show that the enclosed area E m^2 is given by

$$E = 30y - 2y^2 \quad (2)$$

ii) Differentiate to find the maximum value of E

(4)

6. Use the substitution $y = (x + 3)^2$ to find the real roots of the equation

$$(x + 3)^4 + 7(x + 3)^2 - 8 = 0 \quad (6)$$

7.

i) If $f(x) = 2x + \frac{2}{x^2}$, find $f'(x)$ (4)

ii) Find the gradient of the curve $y = x^{5/3}$ at the point where $x = 8$ (5)

8. i) Express $x^2 + 10x + 24$ in the form $(x + a)^2 - b$ (3)
- ii) Hence state the coordinates of the vertex of the curve $y = x^2 + 10x + 24$ (2)
- iii) Solve the inequality $x^2 + 10x + 24 > 0$ (4)
9. A circle with radius 5 has the equation $x^2 + y^2 - 8x - z$
- i) Find the centre of the circle and the value of z (4)
- The points P (4, p) and Q (8, 3) lie on the circumference of the circle with $p > 0$
- ii) Calculate the length of PQ giving your answer in simplified surd form. (5)
- iii) Find an equation for the line PQ. (3)
10. i) Solve the equation $5x^2 - 14x - 3 = 0$ (3)
- A curve has the equation $y = 5x^2 - 14x - 3$
- ii) Sketch the curve showing the coordinates of all intercepts with the axes. (3)
- iii) Find the value of t for which the line $y = 6x + t$ is a tangent to the curve. (6)

TOTAL FOR PAPER: 72 MARKS
END