

## Revision Paper 6

**Please skip Q1 and Q2 as they are not in the year 12 specification.**

1. A geometric series has first term  $a$  and common ratio  $r = \frac{3}{4}$

The sum of the first 4 terms of this series is 175

- (a) Show that  $a = 64$  (2)

- (b) Find the sum to infinity of the series. (2)

- (c) Find the difference between the 9th and 10th terms of the series.  
Give your answer to 3 decimal places. (3)

2. The curve  $C$  has equation

$$y = 8 - 2^{x-1}, \quad 0 \leq x \leq 4$$

- (a) Complete the table below with the value of  $y$  corresponding to  $x = 1$

$x$	0	1	2	3	4
$y$	7.5		6	4	0

(1)

- (b) Use the trapezium rule, with all the values of  $y$  in the completed table, to find an approximate value for  $\int_0^4 (8 - 2^{x-1}) dx$

(3)

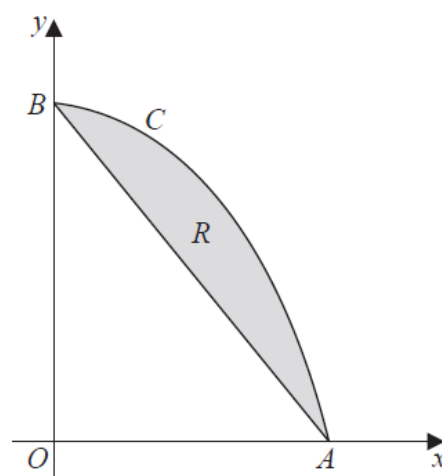


Figure 1

Figure 1 shows a sketch of the curve  $C$  with equation  $y = 8 - 2^{x-1}$ ,  $0 \leq x \leq 4$

The curve  $C$  meets the  $x$ -axis at the point  $A$  and meets the  $y$ -axis at the point  $B$ .

The region  $R$ , shown shaded in Figure 1, is bounded by the curve  $C$  and the straight line through  $A$  and  $B$ .

- (c) Use your answer to part (b) to find an approximate value for the area of  $R$ . (2)
- 

3.

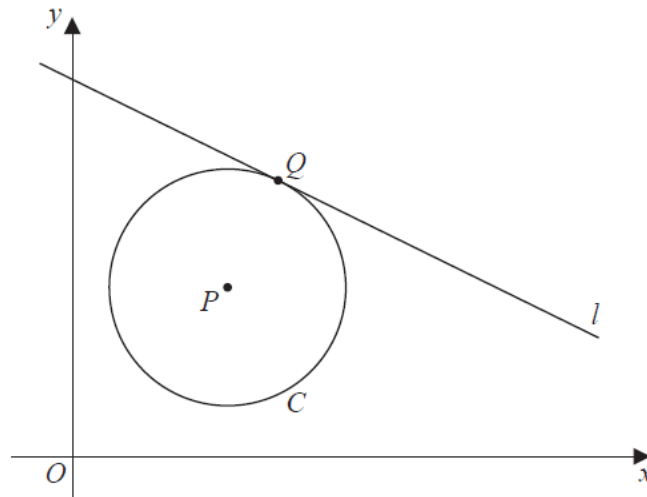


Figure 2

The circle  $C$  has centre  $P(7, 8)$  and passes through the point  $Q(10, 13)$ , as shown in Figure 2.

- (a) Find the length  $PQ$ , giving your answer as an exact value. (2)
- (b) Hence write down an equation for  $C$ . (2)

The line  $l$  is a tangent to  $C$  at the point  $Q$ , as shown in Figure 2.

- (c) Find an equation for  $l$ , giving your answer in the form  $ax + by + c = 0$ , where  $a$ ,  $b$  and  $c$  are integers. (4)
- 

**You may do part (a) of Q4 by Algebraic division.**

4.  $f(x) = 6x^3 + 13x^2 - 4$

- (a) Use the remainder theorem to find the remainder when  $f(x)$  is divided by  $(2x + 3)$ . (2)
- (b) Use the factor theorem to show that  $(x + 2)$  is a factor of  $f(x)$ . (2)
- (c) Factorise  $f(x)$  completely. (4)
-

5. (a) Find the first 3 terms, in ascending powers of  $x$ , of the binomial expansion of

$$(2 - 9x)^4$$

giving each term in its simplest form.

(4)

$$f(x) = (1 + kx)(2 - 9x)^4, \text{ where } k \text{ is a constant}$$

The expansion, in ascending powers of  $x$ , of  $f(x)$  up to and including the term in  $x^2$  is

$$A - 232x + Bx^2$$

where  $A$  and  $B$  are constants.

- (b) Write down the value of  $A$ .

(1)

- (c) Find the value of  $k$ .

(2)

- (d) Hence find the value of  $B$ .

(2)

---

6. (i) Solve, for  $-\pi < \theta \leq \pi$ ,

$$1 - 2 \cos\left(\theta - \frac{\pi}{5}\right) = 0$$

giving your answers in terms of  $\pi$ .

(3)

- (ii) Solve, for  $0 \leq x < 360^\circ$ ,

$$4 \cos^2 x + 7 \sin x - 2 = 0$$

giving your answers to one decimal place.

*(Solutions based entirely on graphical or numerical methods are not acceptable.)*

(6)

---

**Question 7 is on the next page.**

7.

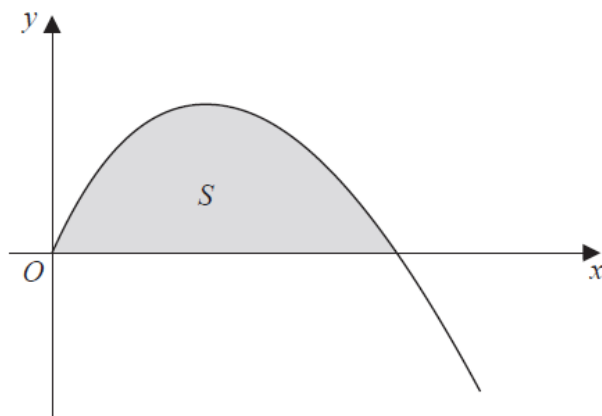


Figure 3

Figure 3 shows a sketch of part of the curve with equation

$$y = 3x - x^{\frac{3}{2}}, \quad x \geq 0$$

The finite region  $S$ , bounded by the  $x$ -axis and the curve, is shown shaded in Figure 3.

(a) Find

$$\int (3x - x^{\frac{3}{2}}) dx \quad (3)$$

(b) Hence find the area of  $S$ .

(3)

8. (i) Given that

$$\log_3(3b + 1) - \log_3(a - 2) = -1, \quad a > 2$$

express  $b$  in terms of  $a$ .

(3)

(ii) Solve the equation

$$2^{2x+5} - 7(2^x) = 0$$

giving your answer to 2 decimal places.

(Solutions based entirely on graphical or numerical methods are not acceptable.)

(4)

Question 9 is on the next page.

9.

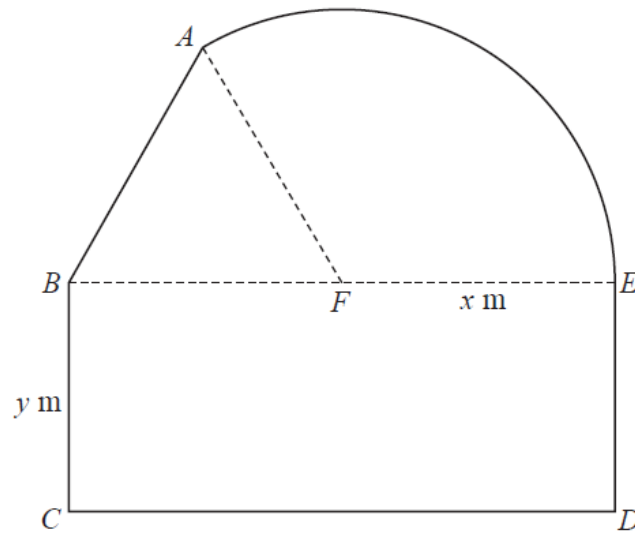


Diagram not drawn to scale

Figure 4

Figure 4 shows a plan view of a sheep enclosure.

The enclosure  $ABCDEA$ , as shown in Figure 4, consists of a rectangle  $BCDE$  joined to an equilateral triangle  $BFA$  and a sector  $FEA$  of a circle with radius  $x$  metres and centre  $F$ .

The points  $B$ ,  $F$  and  $E$  lie on a straight line with  $FE = x$  metres and  $10 \leq x \leq 25$

- (a) Find, in  $\text{m}^2$ , the exact area of the sector  $FEA$ , giving your answer in terms of  $x$ , in its simplest form. (2)

Given that  $BC = y$  metres, where  $y > 0$ , and the area of the enclosure is  $1000 \text{ m}^2$ ,

- (b) show that

$$y = \frac{500}{x} - \frac{x}{24}(4\pi + 3\sqrt{3}) \quad (3)$$

- (c) Hence show that the perimeter  $P$  metres of the enclosure is given by

$$P = \frac{1000}{x} + \frac{x}{12}(4\pi + 36 - 3\sqrt{3}) \quad (3)$$

- (d) Use calculus to find the minimum value of  $P$ , giving your answer to the nearest metre. (5)

- (e) Justify, by further differentiation, that the value of  $P$  you have found is a minimum. (2)