

## AN ROINN OIDEACHAIS AGUS EOLAÍOCHTA

## JUNIOR CERTIFICATE EXAMINATION, 2001

## MATHEMATICS - HIGHER LEVEL

THURSDAY, 7 JUNE - MORNING, 9.30 to 12.00

## PAPER 1 (300 marks)

Attempt **QUESTION 1** (100 marks) and **FOUR** other questions (50 marks each).

**Marks may be lost if necessary work is not clearly shown.**  
**Mathematics Tables may be obtained from the Superintendent.**

1. (i) A car was bought for IR£18 750. At the end of the first year the value of the car had fallen by 20%.  
 Find its value at the end of the first year.
- (ii) A train travelled 155 km at an average speed of 62 km/hr.  
 How long did the journey take?

- (iii) The length of a rectangle is three times its width.  
 The area of the rectangle is 48 cm<sup>2</sup>.  
 Calculate the length of the rectangle.

- (iv) Evaluate

$$\sqrt{\frac{1.6}{(0.2)^2} - 4}.$$

- (v) If  $y = \frac{x - zt}{3}$ , express  $t$  in terms of  $x$ ,  $y$  and  $z$ .

- (vi)  $A \cup B = \{1, 3, 6, 7, 9, 12\}$  and  $A \Delta B = \{3, 6, 9, 12\}$ .

Write down the elements of  $A \cap B$ .

(vii) If  $x * y = 2x - 3y$ , find the value of  $a$  for which  $a * (4 * 1) = 0$ .

(viii) Solve the equation  $3x^2 + 10x - 8 = 0$ .

(ix) Express  $\frac{1.26 \times 10^9}{2.8 \times 10^{12}}$  in the form  $a \times 10^n$  where  $1 \leq a < 10$  and  $n \in \mathbf{Z}$ .

(x) Graph on the number line the solution set of  $3x - 5 \leq x + 7$ ,  $x \in \mathbf{N}$ .

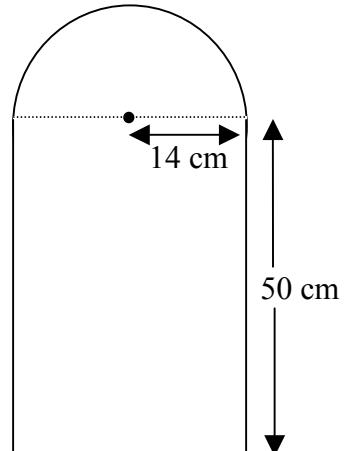
2. (a) A window is in the shape of a rectangle and semicircle as in the diagram.

The rectangular part of the window is 50 cm high and the radius of the semicircle is 14 cm.

Calculate:

- (i) the perimeter of the window  
(ii) the area of the window.

Take  $\pi = \frac{22}{7}$ .



(b) A solid cylinder, made of lead, has radius 4 cm and height 10 cm.

- (i) Find the volume of the cylinder in terms of  $\pi$ .

The cylinder is melted down and all of the lead is used to make three identical right circular cones.

The height of each cone is 8 cm.

- (ii) Find the length of the radius of each cone.

Give your answer in the form  $a\sqrt{b}$ , where  $a, b \in \mathbf{N}$ .

3. (a) Factorise fully each of the following:

(i)  $20xy - 4x^2$   
 (ii)  $5x^2 - 9x - 2$   
 (iii)  $x^3 - 27y^3$ .

(b) Find the value of  $x^2 - 2xy + 3$  when  $x = \frac{1}{2}$  and  $y = \frac{2}{3}$ .

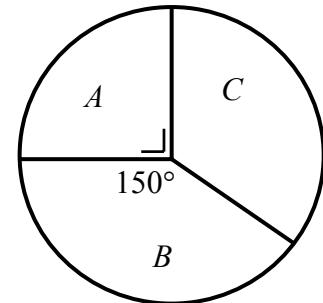
- (c) Solve, correct to two decimal places, the equation

$$\frac{4}{x+5} - \frac{1}{x+1} = -1, \quad x \neq -5, x \neq -1.$$

4. (a) A survey was taken to find out which of the political parties,  $A$ ,  $B$  or  $C$ , people voted for in an election. The results of the survey are shown in this pie chart.

420 people voted for party  $B$ .

- (i) How many people took part in the survey?  
 (ii) How many people voted for party  $C$ ?



- (b) The following frequency distribution table shows the scores obtained by 50 people in a quiz.

Score	0 - 10	10 - 20	20 - 30	30 - 60	60 - 100
No. of People	5	12	15	14	4

(Note: 0 - 10 means 0 or more but less than 10, etc.)

Copy and complete the following cumulative frequency table:

Score	< 10	< 20	< 30	< 60	< 100
No. of People	5				

- (i) On graph paper, draw the ogive (cumulative frequency curve), putting the number of people on the vertical axis.

Use your graph to estimate:

- (ii) the median score in the quiz  
 (iii) the number of people who scored between 25 and 50  
 (iv) the interquartile range.

5. (a) Graph the function  $f: x \rightarrow 3 + 3x - 2x^2$  in the domain  $-2 \leq x \leq 3$ ,  $x \in \mathbf{R}$ .

Use your graph to estimate

- (i)  $f(2.5)$
- (ii) the roots of the equation  $3 + 3x - 2x^2 = 0$
- (iii) the maximum value of  $f(x)$ .

- (b)  $g: x \rightarrow 9 - x^2$  is a function defined on  $\mathbf{R}$ .

- (i) What is  $g(-4)$ ?
- (ii) Find the values of  $x$  for which  $g(x) = 0$ .
- (iii) Verify that  $g(4) > (g \circ g)(2)$ .

6. (a) Solve the simultaneous equations:

$$3x - y = 7$$

$$\frac{x-1}{3} - \frac{y+4}{2} = 0.$$

- (b) Let  $p = \log_{10} 7$  and  $q = \log_{10} 2$ .

Express each of the following in the form  $\log_{10} n$ ,  $n \in \mathbf{Q}$ ,  $n > 0$  :

- (i)  $p + q$
- (ii)  $p - q$ .

Express in terms of  $p$  and  $q$ :

- (iii)  $\log_{10} 56$ .

- (c) The sides of a right angled triangle are  $3x$ ,  $4x$  and  $5x$  in length. The area of the triangle is 121.5 square units. Use this information to write an equation in  $x$ .

Solve the equation and hence, find the lengths of the sides of the triangle.

