

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 cm².
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 $n \in \mathbf{Z}$.

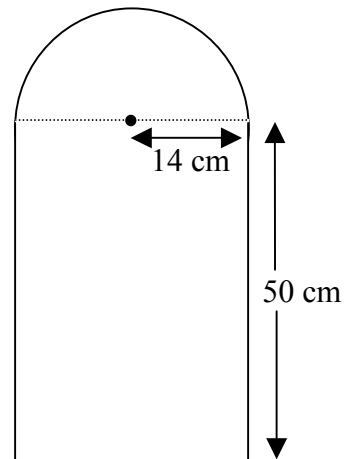
(x) Graph on the number line the solution set of $3x - 5 \leq x + 7$, $x \in \mathbf{N}$.

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 π .

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

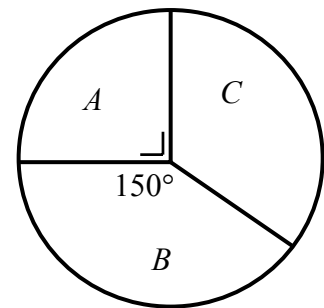
$$\frac{4}{x+5} - \frac{1}{x+1} = -1, \quad x \neq -5, x \neq -1.$$

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.

