

AN ROINN OIDEACHAIS

SAMPLE PAPER

INTERMEDIATE CERTIFICATE EXAMINATION, 1990

MATHEMATICS — SYLLABUS A — PAPER 1 (300 marks)

(TIME 2½ HOURS)

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

Marks may be lost if all your work is not clearly shown.

1. (i) Express $\frac{250}{0.005}$ in the form of $a \cdot 10^b$ where $1 \leq a < 10$ and $b \in \mathbb{Z}$.

(ii) Express the speed 1200m per minute in km per hour.

(iii) An income of IR£220 was taxed at the rate of 55p in the IR£. Calculate the amount of income that was left after the tax was deducted.

(iv) If $\log_2 5 = k$, express $\log_2 2.5$ in terms of k .

(v) The functions f and g are defined as

$$f: x \rightarrow 2x^2 - 1 \quad g: x \rightarrow 2x + 1.$$

Calculate $f\{g(-1)\}$

(vi) If $t = \frac{x - 2y}{z}$, express y in terms of t, x, z .

(vii) If $p * q = p - \frac{1}{q}$, evaluate $5 * \frac{1}{5}$

(viii) Express in surd form the roots x_1 and x_2 of the quadratic equation

$$2x^2 - 5x - 4 = 0$$

and evaluate $x_1 + x_2$.

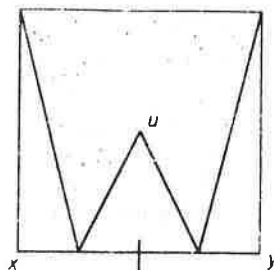
(ix) Show on the number line the set of x for which

$$-5 \leq 2x - 3 < -1 \text{ where } x \in \mathbb{R}.$$

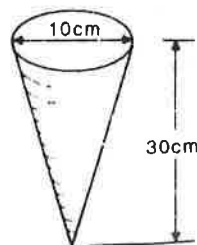
(x) If $A = \{1, 3, 7\}$, find the set X for which

$$A \Delta X = \{1, 9\}.$$

2. (a) The side $[xy]$ of the square is divided into 4 parts of equal length by the three points and the diagonals of the square meet at u . Express the area of the shaded region as a fraction of the area of the square.



(b) A vessel is in the shape of a cone, as in diagram. Milk from 44 cartons is to be transferred into vessels of this type. If each carton contains $\frac{1}{2}$ litre of milk, calculate the number of vessels needed.



(Note: Take $\pi = \frac{22}{7}$)

3. (a) Solve:

$$\frac{x+4}{x-1} - \frac{x+5}{x+1} = \frac{2}{x^2-1}$$

and verify your answer.

- (b) Factorise:

(i) $15x^2 + x - 6$

(ii) $(p+2q)^2 - (p-3q)^2$.

- (c) Only two candidates, P and Q , stood for an election in which 850 valid votes were cast. P won the election. However, if Q had taken 50 more votes from P , she would have won by 20 votes. How many votes did each receive?

4. (a) $R = \{(1, 3), (2, 4), (2, 6), (4, 5), (6, 9)\}$
 $S = \{(2, 4), (3, 4), (4, 9), (6, 1)\}$

where R and S are relations.

Write out the couples of (i) $R \circ S$ (ii) $S \circ R$.

Say, giving a reason, whether or not each is a function.

- (b) Complete the following table and draw the graph of the function.

$$f: x \rightarrow 2x^2 - 3x - 8$$

in the domain $-3 \leq x \leq 4, x \in \mathbb{R}$.

x	-3	-2	-1	0	1	2	3	4
$f(x)$	19		-3		-9			12

State the range of values of x for which $2x^2 - 3x - 1 \leq 7$.

5. The following table shows the frequency distribution of the marks in an examination.

Mark	0-20	20-30	30-40	40-50	50-60	60-70	70-100
Number of candidates	4	8	14	20	30	18	6

(0-20 includes 0 but excludes 20 etc.)

Draw a histogram to illustrate the data.

Fill in the following cumulative frequency table.

Mark	<20	<30	<40	<50	<60	<70	<100
Number of candidates							

and draw the ogive.

Use your graph to estimate the interquartile range.

What percentage of the range (i.e. 0-100) is the interquartile range?

6. Three problems A, B and C were given to a set of pupils.

The numbers in the brackets are the cardinal numbers of the different sets e.g. 31 solved problem A , 21 solved B , 5 solved all three problems etc.

Each pupil solved at least one problem.

- (i) How many pupils solved A only?
 (ii) Name the subset which has x as its cardinal number.
 (iii) By considering $x = 0, x = 1, x = 2$, etc. find the minimum and maximum number of pupils who could, according to the data, have solved A or B or C .
 (iv) If there were 48 pupils in all, how many solved B and C ?

