AN ROINN OIDEACHAIS

INTERMEDIATE CERTIFICATE EXAMINATION, 1975

MATHEMATICS—LOWER COURSE—PAPER II

MONDAY, 16 JUNE—MORNING, 9.30 to 12

SIX questions to be answered.

All questions are of equal value.

Mathematics tables may be obtained from the Superintendent.

---

1. (a) Find the simple interest on £3500 for 6 years at $6\frac{2}{3}\%$ per annum.

   (b) The table below shows the ages and heights of two children John and Angela.

 | | Age | Height |
   |--------|----------|---------|
   | John | 10 years | 120 cm |
   | Angela | 12 years | 140 cm |

   (i) Show that their heights are not in the same ratio as their ages.

   (ii) What should Angela's height be in order to have the heights in the same ratio as the ages?

2. (a) Evaluate:
$$\frac{10^3 \times (10^2)^3}{10^8}$$

   (b) Using the Tables, page 22, or otherwise, find $\sqrt{409\cdot6}$, correct to one place of decimals.

   (c) If $0 < x < 1$ (i.e. x between 0 and 1), write down the least one of the following:
$$x, \quad x^2, \quad \frac{1}{x}, \quad \frac{1}{x^2}$$

3. The Venn diagram shows the elements of three sets, P, Q, R in the universal set U. List the elements in the following sets:

   (i) Q (ii) Q^{I} (iii) $P \cap R$ (iv) $R \cap P$ (v) $Q \setminus R$ (vi) $R \setminus Q$

   (vii) $(P \cup Q)^{\text{I}}$ (viii) $P^{\text{I}} \cup Q^{\text{I}}$.

   Q^{I} means the complement of Q.
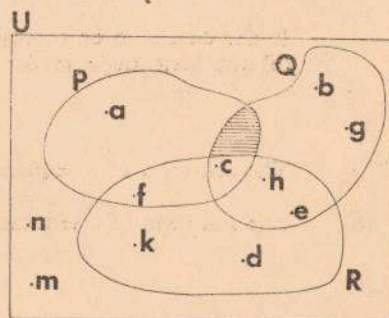
4. (a) Factorise

   (i) $pr - 2ps + 2qr - 4qs$.

   (ii) $2x^2 + 5x - 3$.

   (b) By using factors, or otherwise, find the value of
$$221^2 - 220^2.$$

   (c) Let $S = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ and let $x \in S$. Find the set of values of x that satisfies

   (i) $2x - 4 < x + 2$.

   (ii) $\frac{1}{2}x \geqslant 3$.

5. Liam walks at *3* km per hour for *x* hours. Express the distance he walks in terms of *x*.
Liam then cycles at *9* km per hour for *y* hours. Express the distance he cycles in terms of *y*.
If the total distance he covers (i.e. walks and cycles) is *33* km, write down an equation involving *x* and *y*.
Suppose Liam had walked for *y* hours and had cycled for *x* hours thereby covering *27* km, write down an equation involving *x* and *y*.
Find the value of *x* and the value of *y*.

6. (*a*) Write each of the ten denary numbers
1, 3, 5, 7, 9, 11, 13, 15, 17, 19 in binary form.

(*b*) *x* and *y* are two binary numbers such that $x+y=11001110101$.
If *x* is even, is *y* even or odd? Explain your answer.

(*c*) The thickness of *250* sheets of paper is *1·5* cm. If all the sheets are of equal thickness, express the thickness of one sheet in the form $a \times 10^n$, where $1 \leqslant a < 10$.

7. (*a*) A supermarket owner bought *1440* eggs for £*50*. If $2\frac{1}{2}\%$ of the eggs were broken and he sold the remainder at *50*p a dozen, calculate his percentage profit.

(*b*) Another supermarket owner also bought *1440* eggs for £*50* and some of his eggs were also broken. When he sold the remainder at *60*p a dozen, he had neither a loss nor a profit. How many of his eggs were broken?

8. Draw the graph of $y = x^2$ in the domain $-3 \leqslant x \leqslant 3$.
Use your graph to find, as accurately as you can,

(i) the domain of x for which $2 \leqslant y \leqslant 6$

(ii) the value of $\sqrt{7}$.

Why can you not solve the equation $x^2 + 1 = 0$?

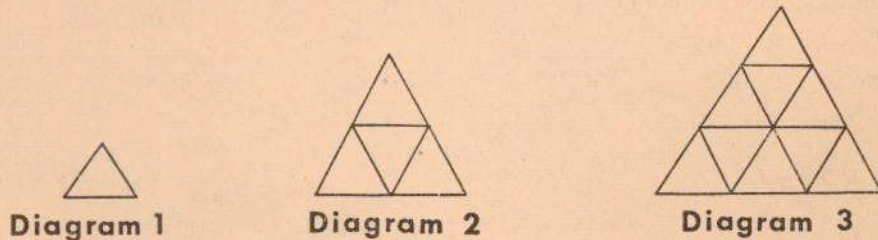9. (*a*) Solve each of the following equations:

(i) $\dfrac{x}{3} = \dfrac{x+5}{\cdot 4}$

(ii) $x - 6(2x - 7) + 4(x - 1) = 9x - 2$.

(*b*) The table gives the number of fish caught by each of *6* men in a fishing competition.

	Vincent	Thomas	Dan	Jim	Frank	Liam
No. of Fish	8	6	5	9	2	6

If the data is to be represented by a pie-chart, what will be the measure (size) of (i) the greatest angle (ii) the least angle in the pie-chart and which fishermen will these angles represent?

10. (*a*) The *n*th term of a sequence is $5n - 5$. Write out the first five terms of the sequence.

(*b*) The *n*th term of a sequence is 10^{4-n}. Which term is equal to *0·01*?

(*c*)

Diagram 1　　**Diagram 2**　　**Diagram 3**

In this sequence of diagrams, diagram *1* consists of an equilateral triangle of side *1* cm in length; diagram *2* consists of four such triangles and diagram *3* consists of nine such triangles.
Assuming that the same pattern holds, draw a sketch of the next diagram (Diagram *4*) and count the number of triangles, of side *1* cm in length, in it. How many such triangles would there be in (i) diagram *5* (ii) diagram *6* (iii) diagram *10*?

5. Liam walks at *3* km per hour for *x* hours.   Express the distance he walks in terms of *x*.
   Liam then cycles at *9* km per hour for *y* hours.   Express the distance he cycles in terms of *y*.
   If the total distance he covers (i.e. walks and cycles) is *33* km, write down an equation involving *x* and *y*.
   Suppose Liam had walked for *y* hours and had cycled for *x* hours thereby covering *27* km, write down an equation involving *x* and *y*.
   Find the value of *x* and the value of *y*.

6. (*a*)   Write each of the ten denary numbers
   1, 3, 5, 7, 9, 11, 13, 15, 17, 19 in binary form.

   (*b*)   *x* and *y* are two binary numbers such that $x+y=11001110101$.
   If *x* is even, is *y* even or odd?   Explain your answer.

   (*c*)   The thickness of *250* sheets of paper is *1·5* cm.   If all the sheets are of equal thickness, express the thickness of one sheet in the form $a \times 10^n$, where $1 \leqslant a < 10$.

7. (*a*)   A supermarket owner bought *1440* eggs for £*50*.   If $2\frac{1}{2}\%$ of the eggs were broken and he sold the remainder at *50*p a dozen, calculate his percentage profit.

   (*b*)   Another supermarket owner also bought *1440* eggs for £*50* and some of his eggs were also broken.   When he sold the remainder at *60*p a dozen, he had neither a loss nor a profit.   How many of his eggs were broken?

8. Draw the graph of $y = x^2$ in the domain $-3 \leqslant x \leqslant 3$.
   Use your graph to find, as accurately as you can,

   (i)   the domain of x for which $2 \leqslant y \leqslant 6$

   (ii)   the value of $\sqrt{7}$.

   Why can you not solve the equation $x^2 + 1 = 0$?

9. (*a*)   Solve each of the following equations:
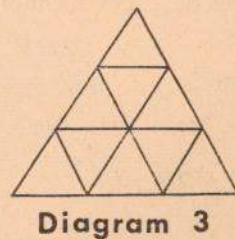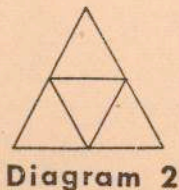
   (i) $$\frac{x}{3} = \frac{x + 5}{\cdot 4}$$

   (ii) $x - 6(2x - 7) + 4(x - 1) = 9x - 2$.

   (*b*)   The table gives the number of fish caught by each of *6* men in a fishing competition.

	Vincent	Thomas	Dan	Jim	Frank	Liam
No. of Fish	*8*	*6*	*5*	*9*	*2*	*6*

   If the data is to be represented by a pie-chart, what will be the measure (size) of (i) the greatest angle (ii) the least angle in the pie-chart and which fishermen will these angles represent?

10. (*a*)   The *n*th term of a sequence is $5n - 5$.   Write out the first five terms of the sequence.

   (*b*)   The *n*th term of a sequence is 10^{4-n}.   Which term is equal to *0·01*?

   (*c*)

   Diagram 1   **Diagram 2**   **Diagram 3**

   In this sequence of diagrams, diagram *1* consists of an equilateral triangle of side *1* cm in length; diagram *2* consists of four such triangles and diagram *3* consists of nine such triangles.
   Assuming that the same pattern holds, draw a sketch of the next diagram (Diagram *4*) and count the number of triangles, of side *1* cm in length, in it.   How many such triangles would there be in (i) diagram *5* (ii) diagram *6* (iii) diagram *10*?