AN ROINN OIDEACHAIS

INTERMEDIATE CERTIFICATE EXAMINATION, 1973

MATHEMATICS - LOWER COURSE - PAPER II

(150 marks)

WEDNESDAY, 13 JUNE - MORNING, 9.30 to 12

<u>SIX</u> questions to be answered.
<u>All</u> questions are of equal value.
Mathematics tables may be obtained from the Superintendent.

1. A man has £2,000. He invests £1,000 for 4 years at 6% per annum simple interest. He invests the remainder for 4 years at 9% per annum simple interest but in this case a tax deduction of 35p in the pound is made on all interest earned. Calculate his total gain on the £2,000.

2. (a) Simplify

$$\frac{31 \times \sqrt{5 \cdot 476}}{53}$$

and give your answer correct to three significant figures.

(b) If $\log_{10} x = 1 \cdot 6990$ and $\log_{10} y = 1 \cdot 5798$, use your tables to find x and y and hence show that

$$\log_{10}(x + y) \neq \log_{10} x + \log_{10} y.$$

[Note: $\neq$ means "not equal to"]

3. (a) Explain what is meant by saying that a set X is a subset of a set Y (e.g. $X \subset Y$). Give an example to illustrate your answer.
If $A = \{1, k\}$, $B = \{1, k, 3\}$, $C = \{1, k, 3, t\}$, say whether each of the following is true or false:

(i) $B \subset A$; (ii) $(A \cup B) \subset C$; (iii) $B \cap C = B$; (iv) $A \subset (C \setminus B)$.

(b) Use a Venn diagram to answer the following:

of the 63 farmers in a certain district 35 sow oats, 32 sow barley and 7 do not sow either crop.

(i) How many sow both crops ?

(ii) How many sow oats only ?

(iii) How many sow barley only ?

4. (a) Find the factors of each of the following:

(i) $a^2 - ab + 2ac - 2bc$.

(ii) $x^2 - 2x - 15$.

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

(b) If $x \in N$, show on the number line the solution of

$$\{x \mid 2x - 3 \leqslant 7\} \cap \{x \mid 3 - 2x < -1\}.$$

5. Mary goes to school by bus. She comes home from school by train, except on wet days when she comes by bus. Each bus journey costs 8p and each train journey costs 6p. For the school year her bus fares were £16·80 and her train fares were £9. On how many days did Mary go to school and how many of these days were wet ?

6. (a) Add the three binary numbers 11011, 1101 and 101 and give your answer in binary form.

(b) If the speed of light is 3×10^5 kilometers per second, how long will it take light from the sun to reach the earth, a distance of $1 \cdot 5 \times 10^8$ kilometers ?

7. A farmer spends £55 per acre on sowing 10 acres of a certain crop. How much should he receive from the sale of the crop so as to earn a profit of 15% ?
   If the farmer made a profit of 20% on the sale of 6 acres of the crop, at what price per acre should he sell the remainder of the crop so as to have an overall profit of 15% ? Give your answer correct to the nearest £.

8. (a) Solve each of the following equations:
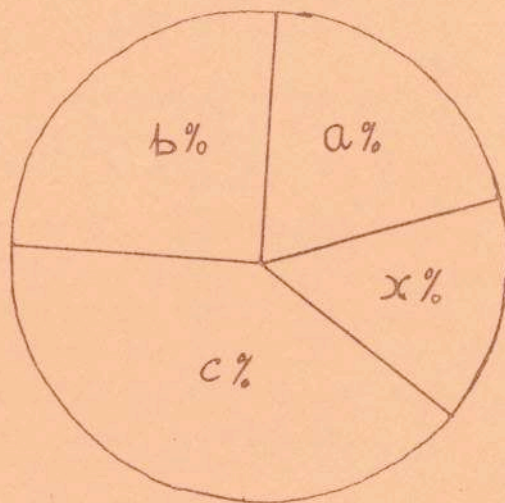
   (i) $12 - 7x = 2x - 15$.

   (ii) $4x - 11 = 7 - 3(5 - 2x)$.

(b) Calculate the values of $x^2 - 2x - 2$ when $x = -1, -\frac{1}{2}, 0, \frac{1}{2}, 1, 1\frac{1}{2}, 2, 2\frac{1}{2}, 3$, and use these values to draw the graph of $x^2 - 2x - 2$. Find from your graph:

   (i) the value of $x^2 - 2x - 2$ when $x = 2 \cdot 4$,

   (ii) the roots of the equation $x^2 - 2x - 2 = 0$.

9. Tourists from four different countries including France stayed at a certain holiday resort. In the pie-chart shown the percentage of the tourists that came from each of these countries is indicated i.e. a% from one of these countries, b% from another, c% from a third, the remaining x% coming from France. Examine the pie-chart and find (i) the value of c, (ii) the ratio of a to b. If the total number of tourists at the resort was 40,000, how many of them, approximately, came from France ?

10. (a) When $n = 3$, show that $2^n = 8$.

(b) Write out the values of $2n, \frac{n}{2}, 2^n$, when $n = 1, 2, 3, 4, 5, 6$.

(c) Look at the dot pattern in the diagram. Three rows of dots are shown, the first row having two dots. Copy the pattern and fill in the fourth row. How many dots are there in the sixth row ?
   The number of dots in any row may be found by using one of these: $2n, \frac{n}{2}, 2^n$. Which is the correct one ? Use this correct one to find the number of dots in the 10th row.