AN ROINN OIDEACHAIS

INTERMEDIATE CERTIFICATE EXAMINATION, 1970

MATHEMATICS — LOWER COURSE — PAPER II
(150 marks)

MONDAY, 15th JUNE — MORNING, 9.30 to 12

Six questions to be answered.
All questions are of equal value.
Mathematical tables may be obtained from the Superintendent.

1. A kitchen floor which is 4·5 metres long and 3 metres wide is to be covered by square tiles 30 cm. long. The tiles cost 72 new pence per dozen. Calculate the cost of the tiles required for the floor if discount of 5% is allowed.
   [*Note*: £1 = 100 new pence]

2. A mixture of sand and salt weighs 1 kilogram. There are 20 grams of salt in the mixture.
   (a) What percentage of the total weight is the weight of the salt?
   (b) What is the ratio of the weight of salt to the weight of sand?
   (c) If another 20 grams of salt is added to the mixture will the percentage of salt in the mixture be doubled? Give a reason for your answer.
   [*Note*: 1 kilogramme = 1,000 grams]

3. (a) Here are two numbers:
   $3{\cdot}7 \times 10^3$; $4{\cdot}2 \times 10^5$.
   Add the numbers and write their sum correct to 2 significant figures in the form $a.10^n$.
   (b) Write the following number in binary form
   $2^3 + 2^2 + 1$.
   (c) If a spaceship sets out to do a journey of $7{\cdot}2 \times 10^5$ miles at an average speed of $9{\cdot}6 \times 10^3$ m.p.h., how long should the journey take?

4. (a) $A = \{3, 4, 6, 7\}$; $B = \{4, 7, 9, 10\}$; $C = \{0, 1, 5, 6\}$.
   (i) List the elements of $A \cap (B \setminus C)$.
   (ii) Rewrite each of the following and say whether it is true or false:
   $A \cap C = \phi$; $A \setminus B = B \setminus A$; $(A \cap B) \subset A$.
   (b) Solve the simultaneous equations:
   $2x - y = 4$,
   $x - 2y = 5$.

5. A rectangular plot whose area is 600 square metres can be enclosed by a wire 100 metres long. Calculate the length and width of the plot.

6. (a) Here are 5 number sentences:
   (i) $3 \times (4 \times 2) = 3 \times 8$
   (ii) $(x + 1) + y = x + (1 + y)$
   (iii) $3 \times 4 = 6 \times 2$
   (iv) $a + b = b + a$
   (v) $a + (b + c) = a + (c + b)$.
   Which sentences illustrate commutativity?
   Which sentences illustrate associativity?
   (b) Factorise
   (i) $5a + 2b + 3a + 6b$.
   (ii) $ax - a + b - bx$.
   (iii) $n^2 - 4n + 4$.

7. (a) Solve each of the following equations
   (i) $3 - 2x = x + 4$.
   (ii) $y(y - 4) = 0$.
   (b) Graph the function f where $f(x) = x^2 + 1$ (i.e. $y = x^2 + 1$), for values of x from -2 to $+2$. Construct the image of the graph under reflection in the x-axis by folding or otherwise.

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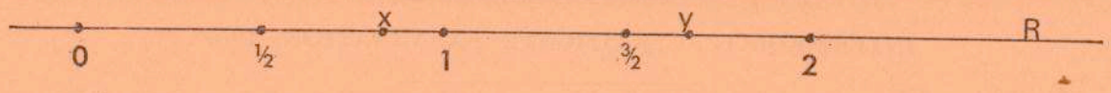
8. (a) x and y are numbers shown on the number line R (see diagram):



Say whether each of the following statements is true or false:

(i) $o < x < 1$ (ii) $1 > \frac{1}{x}$

(iii) $\frac{1}{x} < \frac{1}{y}$ (iv) $1 - x < x$

(b) From a full $3\frac{1}{2}$ lb. packet of flour a housewife takes a certain quantity to make a cake. The amount x taken is less than half what is left. Write a number sentence to describe the situation, and on the numberline show the possible values of x.

9. (a) S_1 and S_2 are sequences.

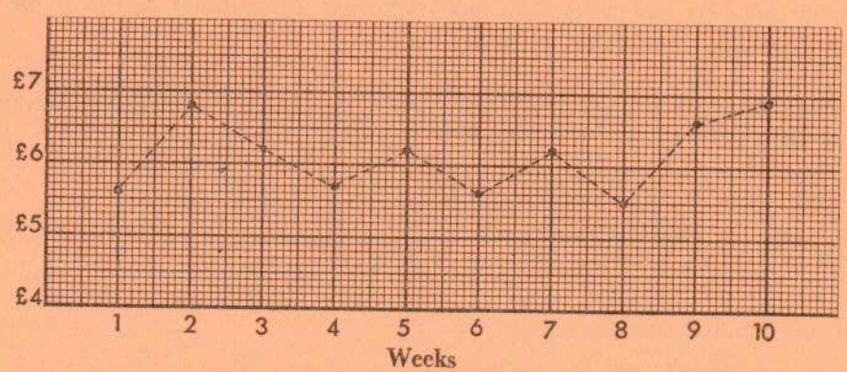
In S_1 the nth term is $\frac{1}{n} - 1$.

In S_2 the nth term is $2n - 1$.
Write the first three terms in each sequence.
Which sequence is decreasing?
Write a number which is smaller than every term in S_1.

(b) A stone is dropped into a large pool of water and a circular wave spreads out from the centre of the splash. The radius of the wave increases by 1 foot each second. Calculate the perimeter of the wave after 1 second; after 2 seconds; after n seconds.

[Give the answer in terms of π in each case.]

10. A housewife allows £6 per week for food for herself and her husband. At the end of each week she enters on a graph the total amount she spent on food (to the nearest 2 shillings). The following graph pictures the situation after 10 weeks:



Find from the graph, as accurately as you can

(i) in which week did she spend the most and how much was it,

(ii) in how many weeks did she exceed her allowance of £6,

(iii) what was the total amount she spent on food in those 10 weeks, and hence find her average weekly expenditure.