

AN ROINN OIDEACHAIS  
 INTERMEDIATE CERTIFICATE EXAMINATION, 1990

19790

MATHEMATICS - SYLLABUS A - PAPER I (300 marks)

THURSDAY, 7 JUNE - MORNING, 9.30 to 12.00

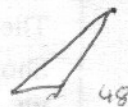
Attempt QUESTION 1 (100 marks) and FOUR other questions (50 marks each)

Marks may be lost if all your work is not clearly shown  
 Mathematics Tables may be obtained from the Superintendent

350

$$\frac{276}{3 \cdot 50}$$

$$\frac{276}{230} = \frac{12}{10}$$



1. (i) A journey of 276 km began at 1040 hrs and ended on the same day at 1430 hrs. Find the average speed in km/hour.

48 km/h

(ii) Money invested for a year earned interest at 4% on the first IR£5000 and 5% on any money in excess of IR£5000.

300

200

How much was invested if the interest earned was IR£300?

100 = 5

2000 = 100

(iii) Solve for x

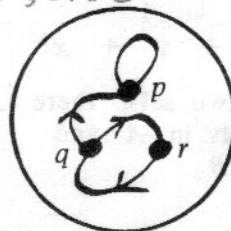
$$(3x - 1)^2 - (3x - 1) - 6 = 0$$

3x = 4    3x = 1  
 x = 4/3    x = 1/3

(3x - 3)(x + 2) = 0

x = 3 or x = 2

(iv) The diagram shows the relation R.



List the couples of R o R.

- R
- PP    qP    qR    Rq  
 PP    qP    RR

(v) f : x → 2x - 1 and g : x → (x + 1) / 2. Find (f o g)(x).

$$\frac{ca - ab}{a} = \frac{a + b}{a}$$

$$\frac{ca - ab}{a} = \frac{a + b}{a}$$

x(a - b) = a + b  
 a - b = (a + b) / x

(vi) Express a in terms of b and x if x = (a + b) / (a - b).

x(a - b) = a + b

a/b

4(a/b) + 2  
 8(a/b) - 1

(vii) If p/q = 3/4, find the value of (4p + 2q) / (8p - q).

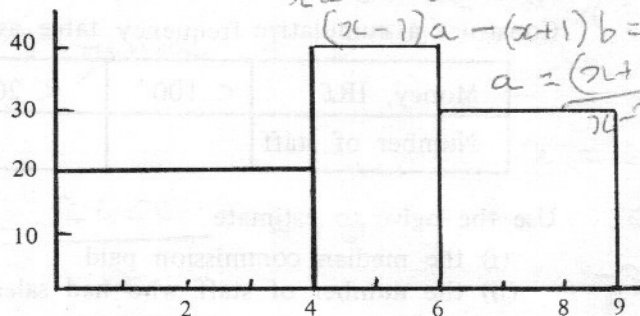
(viii) Find the value of k, if log<sub>8</sub> 64 + log<sub>4</sub> 64 = log<sub>2</sub> k.

8^x = 64    x = 2

3 = log<sub>2</sub> k  
 k = 8

x(a - b) = a + b  
 xa - xb - a - b = 0  
 (x - 1)a - (x + 1)b = 0  
 a = (x + 1)b

(ix) In the histogram shown, calculate the greatest of the three frequencies.



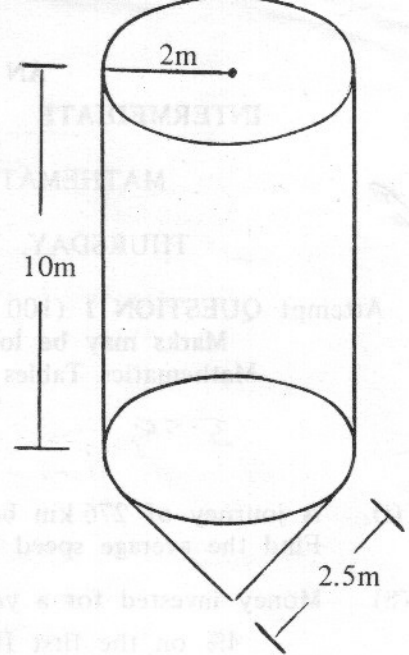
(x) Find the range of values of x for which (3 - x)(x + 2) ≥ 0.

-2, 3

-2    -1    0    1    2    3

OVER →

2. A grain-silo consists of a cylinder on an inverted cone, (as in diagram).  
 The height of the cylindrical part is 10 m and the length of its radius is 2 m.  
 The slant height of the cone is 2.5 m.  
 Show that  $42\pi \text{ m}^3$  is the volume of the silo.  
 When the volume of grain in the silo is  $22\pi \text{ m}^3$ , calculate the depth of grain measured from the apex (point) of the cone.



3. (a) Solve, correct to two decimal places,  
 $x^2 - 10x + 22 = 0$ .

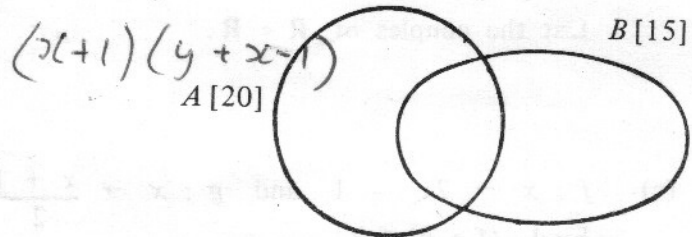
(b) Factorise

(i)  $8x^3 - 1$

(ii)  $xy + y + x^2 - 1$

$y(x-1) + x^2 - 1$   
 $y(x+1) + (x^2+1)(x-1)$

- (c) A and B are two sets, there being 20 elements in A and 15 elements in B.



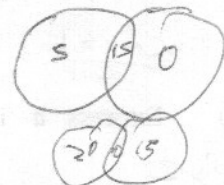
State the

(i) possible maximum  $\geq 5$

(ii) possible minimum  $\leq$

of  $\#(A \Delta B)$ .

Illustrate each of those situations using separate Venn diagrams.



4. The table shows commission money paid to members of staff of a large store during a particular month:

| Money, IR£      | 0-100 | 100-200 | 200-250 | 250-300 | 300-500 |
|-----------------|-------|---------|---------|---------|---------|
| Number of Staff | 4     | 14      | 16      | 10      | 6       |

[0-100 includes 0 but not 100, etc.]

Calculate, using mid-interval values, the mean sum paid per staff member.

Construct a cumulative frequency table as indicated and sketch its ogive.

| Money, IR£      | < 100 | < 200 | < 250 | < 300 | < 500 |
|-----------------|-------|-------|-------|-------|-------|
| Number of staff |       |       |       |       |       |

Use the ogive to estimate

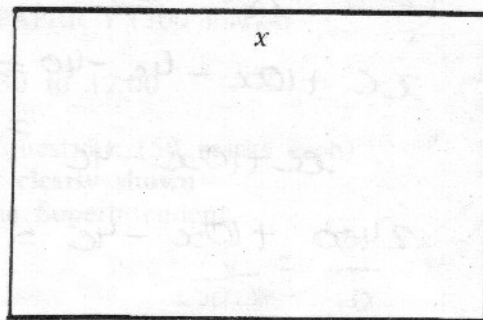
(i) the median commission paid.

(ii) the number of staff who had sales exceeding IR£15 000, assuming that commission is  $2\frac{1}{2}\%$  of the values of sales.

[Commission: e.g. A staff member who sells, say, IR£10 000 worth of goods would receive IR£250 over and above normal pay.]

5. The perimeter of a rectangle is 10.  
If the length of one side is taken as  $x$ , write an expression for

- (i) the length of an adjacent side ~~5~~  
(ii) the area of the rectangle.  $-x^2 + 5x$



Draw the graph of the area function

$$x \rightarrow 5x - x^2, \quad x \in \mathbb{R}$$

in the domain  $0 \leq x \leq 5$ .



Use the graph to estimate

- (i) the length of  $x$  for maximum area.  
(ii) the maximum area.  
(iii) the length of adjacent sides when the area is 3.5.



6. A club chartered an aeroplane for IR£2400 to fly a total of  $x$  members to a football game. The members agreed to share the cost equally.

When four members failed to travel, the club was obliged to charge the others an extra IR£10 each and also to pay the remaining IR£60 from club funds.

How many members were in the original list to travel ?

$$\frac{2400}{x} = \text{original value}$$

$$\frac{2400 - 60}{x - 4} = \text{original} + 10$$

$$x^2 + 22x - 960 = 0$$

$$\frac{2400 - 60}{x - 4} = \frac{2400}{x} + 10$$

$$x = 30$$

or

$$-32$$

$$(10x + 2400)(x - 4) = x(2400 - 60)$$

$$10x^2 + 2360x - 9600 = 2340x$$

$$10x^2 + 26x - 9600 = 0$$