

INTERMEDIATE CERTIFICATE EXAMINATION, 1984

MATHEMATICS - HIGHER COURSE - PAPER II (300 marks)

WEDNESDAY, 13 JUNE - MORNING 9.30 to 12.00

Examination Number

SECTION A (100 marks)

Attempt all questions. You should not spend more than 50 minutes on this section.

Answer each question by writing either (a), (b), (c), (d) in the box under each question number. If you wish to change an answer, cross out your first choice and write your new answer near the box.

Mathematics tables may be obtained from the Superintendent.

THIS PAPER MUST BE ENCLOSED IN YOUR ANSWER BOOK

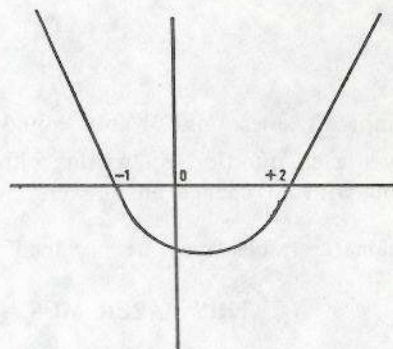
1. If $12_4 \times 12_4 = x_4$, then x is
 (a) 1101 (b) 36 (c) 210 (d) 144
2. Which of the following is the nearest approximation to
 $\frac{984 \times 39}{498}$?
 (a) 80 (b) 800 (c) 8 (d) 40
3. $2.45 \times 10^{-2} =$
 (a) 0.0245 (b) 0.245 (c) 245 (d) 2450
4. The selling price, including V.A.T. at 25% is IR£25. Without V.A.T. the price would be IR£
 (a) 24 (b) 23 (c) 21 (d) 20
5. $(0.4)^3$ correct to 1 significant figure is
 (a) 0.006 (b) 0.1 (c) 0.06 (d) 0.6
6. If $x : y = 2 : 3$ and $y : z = 1 : 2$, then $x : z =$
 (a) 3 : 1 (b) 1 : 3 (c) 4 : 3 (d) 3 : 4
7. $\#A = 5$, $\#B = 6$, then $\#(A \Delta B)$ could not be
 (a) 3 (b) 6 (c) 7 (d) 9
8. The n th term of a sequence is n . The sequence is
 (a) 0, 1, 2, 3, (b) 1, 2, 3, 4,
(c) $(n + 1)$, $(n + 2)$, $(n + 3)$ (d) $(n - 1)$, $(n - 2)$, $(n - 3)$,
9. The missing couple of the symmetric relation $R : \{(1, 1), (1, 2), (,), (2, 1), (3, 2)\}$ is
 (a) (2, 3) (b) (2, 2) (c) (1, 3) (d) (3, 1)
10. If y is the mode in the frequency distribution table
- | Item | x | y | z |
|-----------|-----|-----|-----|
| frequency | p | q | r |
- then which of the following is false ?
 (a) $q > p$ (b) $q > r$ (c) $q \neq \frac{1}{2}$ (d) $q < 1$.

11. If $u * v = \frac{uv}{u+v}$, then $\frac{1}{u} * \frac{1}{v}$ is

- (a) $\frac{u+v}{uv}$ (b) $u+v$ (c) $\frac{1}{u+v}$ (d) $\frac{u+v}{(uv)^2}$

12. The graph, in the diagram, could represent the function $x \rightarrow$

- (a) $x^2 + x - 2$ (b) $x^2 - x - 2$
 (c) $x^2 + x + 2$ (d) $x^2 - x + 2$



13. $(2\frac{1}{4})^{1\frac{1}{2}}$ is

- (a) $\frac{27}{8}$ (b) $\frac{3}{2}$ (c) $\frac{27}{24}$ (d) $\frac{81}{32}$

14. f is the function $x \rightarrow 3x - 2$. Then $f^{-1}(2)$ is

- (a) 4 (b) 0 (c) -2 (d) $\frac{4}{3}$

15. If $\log_x 2 = 2$, then x is

- (a) $\sqrt{2}$ (b) -1 (c) 1 (d) $\frac{1}{\sqrt{2}}$

16. A square has an area of x^2 . The area of the largest disc inscribed in the square is

- (a) πx^2 (b) πx^4 (c) $\frac{1}{4} \pi x^2$ (d) $4 \pi x^2$

17. Which of the following is the solution set of $x^2 - 1 = x - 1$

- (a) $\{0\}$ (b) $\{1\}$ (c) $\{1, 0\}$ (d) $\{1, -1\}$

18. In a school, the number of girls exceeds the number of boys by 84. Which one of the following does not represent the situation?

- (a) $x = y + 84$ (b) $x = y - 84$ (c) $x + y = 84$ (d) $\frac{x+84}{y} = 1$

19. $\frac{1 - 8x^3}{1 + 2x + 4x^2}$ is

- (a) $1 - 8x$ (b) $1 - 4x$ (c) $1 + 2x$ (d) $1 - 2x$

20. If $5x + 1 \geq 6x + 3$, which one of the following is impossible?

- (a) $x \geq -2$ (b) $x \geq 2$ (c) $-x \geq 2$ (d) $-2 \leq x \leq 2$

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INTERMEDIATE CERTIFICATE EXAMINATION, 1984

MATHEMATICS - HIGHER COURSE - PAPER II

WEDNESDAY, 13 JUNE - MORNING, 9.30 to 12.00

SECTION B (200 marks)

Attempt QUESTION 1 and THREE other questions (50 marks each)

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

1. (a) A , B , C and D share IR£15 750.
 B , C and D receive equal amounts.
 A receives 150% of B 's share.

Calculate (i) B 's share
(ii) A 's share.

- (b) If $v = 2.542$, $u = 1.533$ and $a = 0.7625$, find s , as accurately as the Tables (P. 20 - 27) allow, when

$$v^2 = u^2 + 2as.$$

2. (a) Factorise (i) $4 - x^2$
(ii) $2x^2 + x - 6$

and solve

$$\frac{4 - x^2}{2x^2 + x - 6} = 0, \text{ for } x \neq -2.$$

- (b) Solve, correct to two decimal places,

$$2x^2 - 3x - 4 = 0$$

and then solve, correct to two decimal places,

$$2(x - 1)^2 - 3(x - 1) - 4 = 0.$$

3. (a) Solve the simultaneous equations

$$x = 5 - y$$

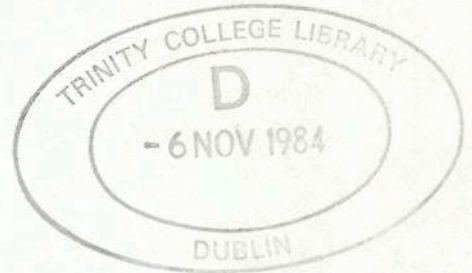
$$\frac{4x}{3} + 8 = \frac{y}{2}.$$

- (b) f and g are two functions defined on \mathbf{R} :

$$f : x \rightarrow \frac{2x - 1}{3}$$

$$g : x \rightarrow \frac{3x + 1}{2}$$

- (i) Evaluate $f(1)$, $f(2)$, $g(1)$, $g(-1)$.
(ii) Find the value of x for which $f(x) = g(x)$.
(iii) Simplify $f \circ g(x)$.
(iv) Draw sketches of f , g and $f \circ g$ on the same diagram.
State the relationship between f and g .



4. The function $f : x \rightarrow 4 - 3x - x^2$, $x \in \mathbf{R}$ is defined in the domain $-5 \leq x \leq 2$.

Verify the three values of $f(x)$ shown in the table.

x	-5	-4	-3	-2	-1	0	1	2
$f(x)$	-6	0		6				

Complete the table and draw the graph of f .

Using the graph, or otherwise,

- write down the maximum value of $f(x)$
- draw in the axis of symmetry of the graph and write the equation of this axis in the form $x = k$
- state the value of $f(k - 2)$ and the value of $f(k + 2)$.

Using the same axes and scales, sketch the graph of the function $g : x \rightarrow x^2 + 3x - 4$, $x \in \mathbf{R}$ in the same domain as f . Use a dotted line for the graph of g .

5. (a) The attendance at each of two games was 1850 and 2050. Find the least number that must attend a third game so that the mean attendance for the three games exceeds 2000.
- (b) Pupils in a class of thirty were asked "how many children in your family?" The following is a table of the replies:

1	4	5	4	3	3	6	2	3	2
2	3	7	4	2	4	4	2	4	1
3	4	5	3	6	4	3	5	5	4

- Rewrite the data in a frequency table.
- Draw a barchart to illustrate the data and state the mode.
- Calculate the mean number of children in each family if the data represents children from 30 different families.
- Calculate the least number of families that can be represented, if no more than two children of any one family were in the class.

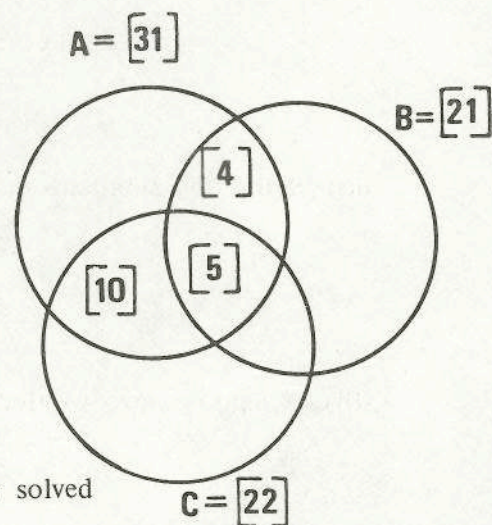
6. (a) Find the value of x which satisfies

$$\sqrt{2+x} = 2 - 2x.$$

- (b) 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?
- Find the (ii) maximum (iii) minimum number of pupils that could have solved A or B or C ?
- (iv) If there were 48 pupils in all, how many solved B and C ?



7. (a) If $\log_2 5 = k$, find in terms of k

(i) $\log_2 10$ (ii) $\log_2 2\frac{1}{2}$ (iii) $\log_2 25$.

- (b) Only two candidates, P and Q stood for an election in which 850 correct 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?