10th Maths - IMPORTANT 2,5 MARKS

CHAPTER - I - Relations and Functions

1) If $A = \{1, 3, 5\}$ and $B = \{2, 3\}$ then Example: 1.1

i) Find $A \times B$ and $B \times A$

ii) Is $A \times B = B \times A$? If not why?

iii) Show that $n(A \times B) = n(B \times A) = n(A) \times n(B)$

2) Let $A = \{x \in N \mid 1 < x < 4\}$, $B = \{x \in W \mid 0 \leq x < 2\}$ and $C = \{x \in N \mid x < 3\}$. Then verify that Example: 1.3

i) $A \times (B \cup C) = (A \times B) \cup (A \times C)$

ii) $A \times (B \cap C) = (A \times B) \cap (A \times C)$

3) Let $A = \{1, 2, 3\}$ and $B = \{x \mid x$ is a prime number less than $10\}$. Find $A \times B$ and $B \times A$ Exercise: 1.1 (2)

4) If $A = \{5, 6\}$, $B = \{4, 5, 6\}$, $C = \{5, 6, 7\}$ show that $A \times A = (B \times B) \cap (C \times C)$ Exercise: 1.1 (4)

5) Given $A = \{1, 2, 3\}$, $B = \{2, 3, 5\}$ $C = \{3, 4\}$ and $D = \{1, 3, 5\}$ Exercise: 1.1 (5)

Check if:

$(A \cap C) \times (B \cap D) = (A \times B) \cap (C \times D)$ is true?

6) Let $A = \{x \in W \mid x < 2\}$, $B = \{x \in N \mid 1 < x \leq 4\}$ and $C = \{3, 5\}$ verify that Exercise: 1.1 (6)

i) $A \times (B \cup C) = (A \times B) \cup (A \times C)$

ii) $A \times (B \cap C) = (A \times B) \cap (A \times C)$

iii) $(A \cup B) \times C = (A \times C) \cup (B \times C)$

7) Let A = The set of all natural numbers less than 8, B = The set of all prime numbers less than 8, C = the set of even prime number verify that

Exercise: 1.1 (7)

i) $(A \cap B) \times C = (A \times C) \cap (B \times C)$

ii) $A \times (B - C) = (A \times B) - (A \times C)$

8) Let $A = \{3, 4, 7, 8\}$ and $B = \{1, 7, 10\}$. which of the following sets are relations from A to B?

Example: 1.4

i) $R_1 = \{(3, 7), (4, 7), (7, 10), (8, 1)\}$

ii) $R_2 = \{(3, 1), (4, 12)\}$

iii) $R_3 = \{(3, 7), (4, 10), (7, 7), (7, 8), (8, 11), (8, 7), (8, 10)\}$

9) Let $A = \{1, 2, 3, 4, \ldots, 45\}$ and R be the relation defined as "is square of a number" on A. write R as a subset of $A \times A$. Also, find the domain and range of R.

Exercise: 1.2 (2)

10) A Relation R is given by a set $\{(x, y) / y = x + 3, x \in \{0, 1, 2, 3, 4, 5\}\}$. Determine its domain and range

Exercise: 1.2 (3)

11) Represent each of the given relations by

Exercise: 1.2 (4)

(a) an arrow diagram

(b) a graph and

(c) a set in roster form, wherever possible.

i) $\{(x, y) / x = 2y, x \in \{2, 3, 4, 5\}, y \in \{1, 2, 3, 4\}\}$

ii) $\{(x, y) / y = x + 3, x, y$ are natural numbers $< 10\}$

12) A relation $f : x \to y$ is defined by $f(x) = x^2 - 2$ where $x = \{-2, -1, 0, 3\}$ and $y = R$. Example: 1.7

i) List the elements of f

ii) Is f a function?

13) Given $f(x) = 2x - x^2$ find

i) $f(1)$ (ii) $f(x+1)$ (iii) $f(x) + f(1)$ Example: 1.9

14) Let $x = \{3, 4, 6, 8\}$. Determine whether the relation $R = \{(x, f(x)) / x \in X, f(x) = x^2 + 1\}$ is a function from x to N? Exercise: 1.3 (2)

15) Given the function $f : x \to x^2 - 5x + 6$, evaluate

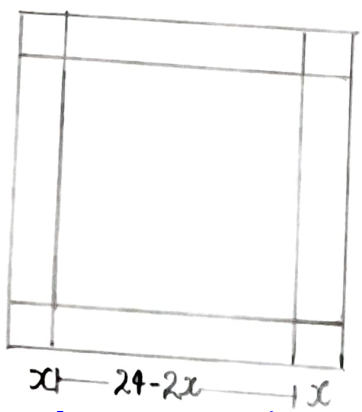
i) $f(-1)$ iii) $f(2)$ Exercise: 1.3 (3)

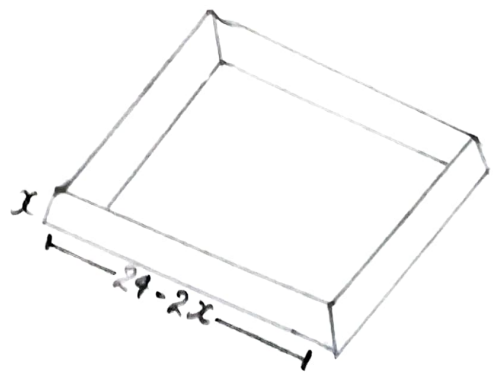
ii) $f(2a)$ iv) $f(x-1)$

16) Let $f(x) = 2x + 5$. If $x \neq 0$ then find

$$\frac{f(x+2) - f(2)}{x}$$ Exercise: 1.3 (5)

17) An open box is to be made from a square piece of material, 24 cm on a side, by cutting equal squares from the corners and turning up the sides as shown in figure. Express the volume V of the box as a function of x. Exercise: 1.3 (7)





18) A function f is defined by $f(x) = 3 - 2x$. Find x such that $f(x^2) = (f(x))^2$ Exercise 1.3(8)

19) A plane is flying at a speed of 500 km per hour. Express the distance 'd' travelled by the plane as function of time t in hours. Exercise 1.3(9)

20) Let $A = \{1, 2, 3, 4\}$ and $B = \{2, 5, 8, 11, 14\}$ be two sets. Let $f : A \to B$ be a function given by $f(x) = 3x - 1$. Represent this function. Example 1.11

i) by arrow diagram

ii) in a table form

iii) as a set of ordered pairs

iv) in a graphical form.

21) If $A = \{-2, -1, 0, 1, 2\}$ and $f : A \to B$ is an onto function defined by $f(x) = x^2 + x + 1$ then find B. Example : 1.14

22) Forensic Scientists can determine the height (in cm) of a person based on the length of the thigh bone. They usually do so using the function $h(b) = 2.47b + 54.10$. where b is the length of the thigh bone.

i) verify the function h is one-one or not.

ii) Also find the height of a person if the length of his thigh bone is 50 cm.

iii) Find the length of the thigh bone if the height of a person is 147.96 cm.

Example : 1.16

23) If the function $f: R \to R$ is defined by

$$f(x) = \begin{cases} 2x+7 ; & x < -2 \\ x^2 - 2 ; & -2 \le x < 3 \\ 3x - 2 ; & x \ge 3 \end{cases}$$, then find the values of

i) $f(4)$ ii) $f(-2)$

iii) $f(4) + 2f(1)$ iii) $\dfrac{f(1) - 3f(4)}{f(-3)}$

Example : 1.18

24) Let $f: A \to B$ be a function defined by $f(x) = \frac{x}{2} - 1$. where $A = \{2, 4, 6, 10, 12\}$, $B = \{0, 1, 2, 4, 5, 9\}$.

Represent f by

i) Set of ordered pairs ii) a table

iii) an arrow diagram iv) a graph

Exercise : 1.4(2)

25) Represent the function $f = \{(1,2) (2,2) (3,2) (4,3) (5,4)\}$ through

(i) an arrow diagram (ii) a table form

(iii) a graph

Exercise : 1.4(3)

26) Show that the function $f: N \to N$ defined by $f(m) = m - m - 3$ is one-one function. Exercise : 1.4(5)

27) Let $A = \{-1, i\}$ and $B = \{0, 2\}$. If the function $f: A \to B$ defined by $f(x) = ax + b$ is an onto function? Find a and b.

Exercise : 1.4(8)

28) A function $f : \{-5, 9\} \to R$ is defined as follows.

$$f(x) = \begin{cases} 6x + 1 ; & -5 \le x < 2 \\ 5x^2 - 1 ; & 2 \le x < 6 \\ 3x - 4 ; & 6 \le x \le 9 \end{cases}$$

Exercise: 1.4(10)

Find (i) $f(-3) + f(2)$

(ii) $f(7) - f(1)$

(iii) $2f(4) + f(8)$

(iv) $\dfrac{2f(-2) - f(6)}{f(4) + f(-2)}$

29) If the function f is defined by

$$f(x) = \begin{cases} x + 2 ; & x > 1 \\ 2 ; & -1 \le x \le 1 \\ x - 1 ; & -3 < x < -1 \end{cases}$$

, Find the values of

Exercise: 1.4 (9)

(i) $f(3)$ (ii) $f(0)$ (iii) $f(-1.5)$ (iv) $f(2) + f(-2)$

30) The function 'E' which maps temperature in Celsius (C) into temperature in Fahrenheit (F) is defined by $E(C) = F$ where $F = \frac{9}{5}C + 32$, Find.

(i) $E(0)$

(ii) $E(28)$

(iii) $E(-10)$

(iv) The value of C when $E(C) = 212$

(v) The temperature when the Celsius value is equal to the Farenheit value.

Exercise : 1.4(12)

31) Find fog and gof when $f(x) = 2x + 1$ and $g(x) = x^2 - 2$ Example: 1.19

32) Represent the function $f(x) = \sqrt{2x^2 - 5x + 3}$ as a composition of two functions. Example 1.20

33) Find k if $fof(k) = 5$, where $f(k) = 2k - 1$ Example: 1.22

34) Find x if $gff(x) = fgg(x)$, given $f(x) = 3x + 1$ and $g(x) = x + 3$. Example: 1.24

35) Using the function f and g given below, find fog and gof. Check whether fog = gof

(i) $f(x) = x - 6$, $g(x) = x^2$

(ii) $f(x) = \frac{2}{x}$, $g(x) = 2x^2 - 1$

(iii) $f(x) = \frac{x+6}{3}$, $g(x) = 3 - x$

(iv) $f(x) = 3 + x$, $g(x) = x - 4$ Exercise: 1.5(1)

(v) $f(x) = 4x^2 - 1$, $g(x) = 1 + x$

36) Find the value of k, such that fog = gof

(i) $f(x) = 3x + 2$, $g(x) = 6x - k$

(ii) $f(x) = 2x - k$, $g(x) = 4x + 5$

Exercise: 1.5(2)

37) If $f(x) = 2x - 1$, $g(x) = \frac{x+1}{2}$, show that $f \circ g = g \circ f = x$

Exercise : 1.5 (3)

38) consider the functions $f(x)$, $g(x)$, $h(x)$ as given below. show that $(f \circ g) \circ h = f \circ (g \circ h)$ in each case.

(i) $f(x) = x - 1$, $g(x) = 3x + 1$ and $h(x) = x^2$

(ii) $f(x) = x^2$, $g(x) = 2x$ and $h(x) = x + 4$

(iii) $f(x) = x - 4$, $g(x) = x^2$ and $h(x) = 3x - 5$.

Exercise : 1.5 (8)