

Relations and Functions FULL TEST

10th Standard

Maths

Reg.No. :

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Exam Time : 02:30:00 Hrs

Total Marks : 1

14 x 1 =

- 1) If $n(A \times B) = 6$ and $A = \{1, 3\}$ then $n(B)$ is
 (a) 1 (b) 2 (c) 3 (d) 6
- 2) $A = \{a, b, p\}$, $B = \{2, 3\}$, $C = \{p, q, r, s\}$ then $n[(A \cup C) \times B]$ is
 (a) 8 (b) 20 (c) 12 (d) 16
- 3) If $A = \{1, 2\}$, $B = \{1, 2, 3, 4\}$, $C = \{5, 6\}$ and $D = \{5, 6, 7, 8\}$ then state which of the following statement is true..
 (a) $(A \times C) \subset (B \times D)$ (b) $(B \times D) \subset (A \times C)$ (c) $(A \times B) \subset (A \times D)$ (d) $(D \times A) \subset (B \times A)$
- 4) If there are 1024 relations from a set $A = \{1, 2, 3, 4, 5\}$ to a set B , then the number of elements in B is
 (a) 3 (b) 2 (c) 4 (d) 8
- 5) The range of the relation $R = \{(x, x^2) | x \text{ is a prime number less than } 13\}$ is
 (a) $\{2, 3, 5, 7\}$ (b) $\{2, 3, 5, 7, 11\}$ (c) $\{4, 9, 25, 49, 121\}$ (d) $\{1, 4, 9, 25, 49, 121\}$
- 6) If the ordered pairs $(a+2, 4)$ and $(5, 2a+b)$ are equal then (a, b) is
 (a) $(2, -2)$ (b) $(5, 1)$ (c) $(2,)$ (d) $(3, -2)$
- 7) Let $n(A) = m$ and $n(B) = n$ then the total number of non-empty relations that can be defined from A to B
 (a) m^n (b) n^m (c) $2^{mn} - 1$ (d) 2^{mn}
- 8) If $\{(a, 8), (6, b)\}$ represents an identity function, then the value of a and b are respectively
 (a) $(8, 6)$ (b) $(8, 8)$ (c) $(6, 8)$ (d) $(6, 6)$
- 9) Let $A = \{1, 2, 3, 4\}$ and $B = \{4, 8, 9, 10\}$. A function $f: A \rightarrow B$ given by $f = \{(1, 4), (2, 8), (3, 9), (4, 10)\}$ is a
 (a) Many-one function (b) Identity function (c) One-to-one function (d) Into function
- 10) If $f(x) = 2x^2$ and $g(x) = \frac{1}{3x}$, then $f \circ g$ is
 (a) $\frac{3}{2x^2}$ (b) $\frac{2}{3x^2}$ (c) $\frac{2}{9x^2}$ (d) $\frac{1}{6x^2}$
- 11) If $f: A \rightarrow B$ is a bijective function and if $n(B) = 8$, then $n(A)$ is equal to
 (a) 7 (b) 49 (c) 1 (d) 14
- 12) Let f and g be two functions given by
 $f = \{(0, 1), (2, 0), (3, -4), (4, 2), (5, 7)\}$
 $g = \{(0, 2), (1, 0), (2, 4), (-4, 2), (7, 0)\}$ then the range of $f \circ g$ is
 (a) $\{0, 2, 3, 4, 5\}$ (b) $\{-4, 1, 0, 2, 7\}$ (c) $\{1, 2, 3, 4, 5\}$ (d) $\{0, 1, 2\}$
- 13) Let $f(x) = \frac{\sqrt{1+x^2}}{1+x^2}$ then
 (a) $f(xy) = f(x).f(y)$ (b) $f(xy) \geq f(x).f(y)$ (c) $f(xy) \leq f(x).f(y)$ (d) None of these
- 14) If $g = \{(1, 1), (2, 3), (3, 5), (4, 7)\}$ is a function given by $g(x) = \alpha x + \beta$ then the values of α and β are
 (a) $(-1, 2)$ (b) $(2, -1)$ (c) $(-1, -2)$ (d) $(1, 2)$
- 15) A relation 'f' is defined by $f(x) = x^2 - 2$ where $x \in \{-2, -1, 0, 3\}$
 (i) List the elements of f
 (ii) Is f a function?
- 16) Find $f \circ g$ and $g \circ f$ when $f(x) = 2x + 1$ and $g(x) = x^2 - 2$
- 17) Represent the function $f(x) = \frac{\sqrt{2x^2 - 5x + 3}}{2x^2 - 5x + 3}$ as a composition of two functions.
- 18) Find k if $f \circ g(k) = 5$ where $f(k) = 2k - 1$.
- 19) If $f(x) = 2x + 3$, $g(x) = 1 - 2x$ and $h(x) = 3x$. Prove that $f \circ (f \circ g) \circ h$.
- 20) Let $A = \{0, 1, 2, 3\}$ and $B = \{1, 3, 5, 7, 9\}$ be two sets. Let $f: A \rightarrow B$ be a function given by $f(x) = 2x +$
 Represent this function as a set of ordered pairs.

10 x 2 =

- 21) Let $A = \{0, 1, 2, 3\}$ and $B = \{1, 3, 5, 7, 9\}$ be two sets. Let $f: A \rightarrow B$ be a function given by $f(x) = 2x + 1$. Represent this function as a graph.
- 22) Let $A = \{3, 4, 7, 8\}$ and $B = \{1, 7, 10\}$. Which of the following sets are relations from A to B ?
- $R_1 = \{(3, 7), (4, 7), (7, 10), (8, 1)\}$
 - $R_2 = \{(3, 1), (4, 12)\}$
 - $R_3 = \{(3, 7), (4, 10), (7, 7), (7, 8), (8, 11), (8, 7), (8, 10)\}$
- 23) Using vertical line test, determine which of the following curves (Fig.1.18(a), 1.18(b), 1.18(c), 1.18(d)) represent a function?

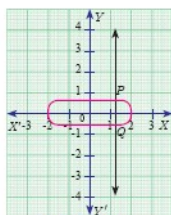


Fig. 1.18(a)

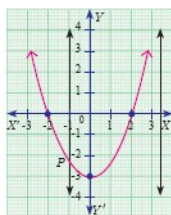


Fig. 1.18(b)

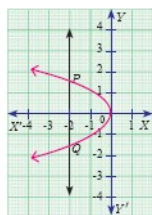


Fig. 1.18(c)

- 24) Using horizontal line test (Fig.1.35(a), 1.35(b), 1.35(c)), determine which of the following functions are one – one.

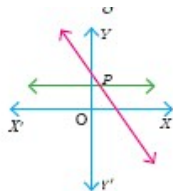


Fig. 1.35(a)

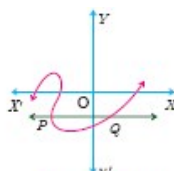


Fig. 1.35(b)

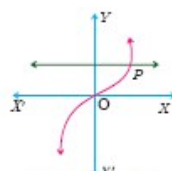


Fig. 1.35(c)

- 25) Let $A = \{1, 2, 3\}$, $B = \{4, 5, 6, 7\}$, and $f = \{(1, 4), (2, 5), (3, 6)\}$ be a function from A to B . Show that f is one – one but not onto function.
- 26) If $A = \{-2, -1, 0, 1, 2\}$ and $f: A \rightarrow B$ is an onto function defined by $f(x) = x^2 + x + 1$ then find B .
- 27) Let f be a function $f: \mathbb{N} \rightarrow \mathbb{N}$ be defined by $f(x) = 3x + 2x \in \mathbb{N}$
- Find the images of 1, 2, 3
 - Find the pre-images of 29, 53
 - Identify the type of function
- 28) A function $f: [-7, 6] \rightarrow \mathbb{R}$ is defined as follows.

$$f(x) = \begin{cases} x^2 + 2x + 1 & -7 \leq x < -5 \\ x + 5 & -5 \leq x \leq 2 \\ x - 1 & 2 < x < 6 \end{cases}$$

$$f(-7) - f(-3)$$

$$10 \times 5 =$$

- 29) Find $A \times B$, $A \times A$ and $B \times A$

$$A = \{2, -2, 3\} \text{ and } B = \{1, -4\}$$

- 30) If $A = \{5, 6\}$, $B = \{4, 5, 6\}$, $C = \{5, 6, 7\}$, Show that $A \times A = (B \times B) \cap (C \times C)$

- 31) Let $A = \{x \in \mathbb{W} \mid x < 2\}$, $B = \{x \in \mathbb{N} \mid x \leq 4\}$ and $C = \{3, 5\}$. Verify that

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

- 32) A graph representing the function $f(x)$ is given in Fig.1.16 it is clear that $f(9) = 2$.

- (i) Find the following values of the function

(a) $f(0)$

(b) $f(7)$

- (c) $f(2)$
 (d) $f(10)$
 (ii) For what value of x is $f(x) = 1$?
 (iii) Describe the following (i) Domain (ii) Range.
 (iv) What is the image of 6 under f ?

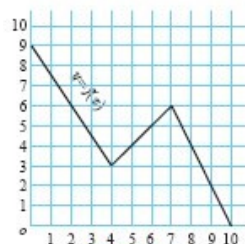


Fig. 1.16

- 33) Let $f(x)=2x+5$. If $x \neq 0$ then find $\frac{f(x+2)-f(2)}{x}$.
 34) The data in the adjacent table depicts the length of a woman's forearm and her corresponding height. Based on this data, a student finds a relationship between the height (y) and the forearm length(x) as $y = ax + b$, where a, b are constants.
 (i) Check if this relation is a function.
 (ii) Find a and b .
 (iii) Find the height of a woman whose forearm length is 40 cm.
 (iv) Find the length of forearm of a woman if her height is 53.3 inches.

Length 'x' of forearm (in cm)	Height 'y' (in inches)
45.5	65.5
35	56
45	65
50	69.5
55	75

- 35) Let $f: A \rightarrow B$ 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 by
 (i) set of ordered pairs
 (ii) a table
 (iii) an arrow diagram
 (iv) a graph
 36) Let $A = \{1, 2, 3, 4\}$ and $B = \mathbb{N}$. Let $f: A \rightarrow B$ be defined by $f(x) = x^3$ then
 (i) find the range of f
 (ii) identify the type of function
 37) The function ' t ' which maps temperature in Celsius (C) into temperature in Fahrenheit (F) is defined by $t(C) = F$ where $F = \frac{9}{5}C + 32$. Find,
 (i) $t(0)$
 (ii) $t(28)$
 (iii) $t(-10)$
 (iv) the value of C when $t(C) = 212$
 (v) the temperature when the Celsius value is equal to the Fahrenheit value.
 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.
 $f(x) = x - 1$, $g(x) = 3x + 1$ and $h(x) = x^2$
 39) If $f(x) = x^2$, $g(x) = 3x$ and $h(x) = x - 2$, Prove that $(f \circ g) \circ h = f \circ (g \circ h)$.

40) Let $A = \{x \in \mathbb{W} \mid x < 2\}$, $B = \{x \in \mathbb{N} \mid x \leq 4\}$ and $C = (3, 5)$. Verify that

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

41) A function $f: [-5, 9] \rightarrow \mathbb{R}$ is defined as follows:

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

Find $\frac{2f(-2)-f(6)}{f(4)+f(-2)}$.

42) 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.

$$f(x) = x-4, \quad g(x) = x^2 \quad \text{and} \quad h(x) = 3x-5$$
