# MATHS

## BOOKS - MODERN PUBLICATION

## RELATIONS AND FUNCTIONS

**Example**

**1.** If A = {1, 2} and B = (3, 4, 5}, obtain $A \times B$ and represent it graphically.

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**2.** If A : {1, 2} and B = {a, b, c}, obtain $A \times B$ and represent it by an arrow diagram.

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**3.** Find x and y, if (2x, x + y) = (6, 2).

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**4.** Let A = {a, b}, B = {a, b, c}. What is $A \times B$?

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**5.** If $A \times B = \{(p, q), (p, r), (m, q), (m, r)\}$, find A and B.

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**6.** Let A and B be two sets such that n (A) = 5 and n(B) = 2. If $(a_1, 2), (a_2, 3), (a_3, 2), (a_4, 3), (a_5, 2)$ are in $A \times B$ and $a_1, a_2, a_3, a_4$ and $a_5$ are distinct, find A and B.

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**7.** If G = {7, 8} and H = {5, 4, 2}, find $G \times H$ and $H \times G$.

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**8.** If P = {a, b,c } and Q= {r}, form the sets $P \times Q$ and $Q \times P$. Are these two Products equal ?

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**9.** Let A and B be two sets such that n (A) = 5 and n(B) = 2. If a, b,c, d, e are distinct and (a, 2), (6, 3), (c, 2), (d, 3), (e, 2) are in $A \times B$, find A and B.

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**10.** If P = {1, 2}, form the set $P \times P \times P$.

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**11.** Let A = {1, 2, 3, 4} and B = {5, 7, 9}. Determine : $A \times B$ and represent it graphically.

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**12.** Let A = {1, 2, 3, 4} and B = {5, 7, 9}. Determine : $B \times A$ and represent it graphically.

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**13.** Let A = {1, 2, 3, 4} and B = {5, 7, 9}. Determine : Is $A \times B = B \times A$ ?

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**14.** Let A = {1, 2, 3, 4} and B = {5, 7, 9}. Determine : Is $n(A \times B) = n(B \times A)$ ?

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**15.** Let A = {2, 4, 6} and B = {a, b}. Represent the following product by arrow diagram :

$A \times B$.

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**16.** Let A = {2, 4, 6} and B = {a, b}. Represent the following product by arrow diagram :

$B \times A$ .

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**17.** Let A = {2, 4, 6} and B = {a, b}. Represent the following product by arrow diagram :

$A \times A$ .

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**18.** Let A = {2, 4, 6} and B = {a, b}. Represent the following product by arrow diagram :

$B \times B$ .

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**19.** If A = { 1, 2}, B = {3, 4}, C = {4, 5}, find $A \times (B \cup C)$.

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**20.** Let A = {1, 2, 4}, B= {3, 5, 7} and C = {5, 7, 9}, find $A \times (B \cap C)$.

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**21.** Let A = {1, 2, 3}, B = {2, 3, 4} and C = {4, 5}. Verify that : $A \times (B \cap C) = (A \times B) \cap (A \times C)$.

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**22.** Let $A = \left\{\frac{1}{2}, 2\right\}$, B= {2, 3, 5}, C = {- 1, - 2}, then verify the following :

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

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**23.** Let $A = \left\{\frac{1}{2}, 2\right\}$, B= {2, 3, 5}, C = {- 1, - 2}, then verify the following :

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

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**24.** For any three sets A, B, C, prove that :

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

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**25.** For any three sets A, B, C, prove that :

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

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**26.** For any sets A, B, C, D , prove that: $(A \times B) \cap (C \times D) = (A \cap C) \times (B \cap D)$.

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**27.** Determine the domain and range of the relation R defined by R = {(x, x + 5) : x $\in$ {0, 1, 2, 3, 4, 5}}.

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**28.** LetA= {1, 2, 3, 4, 6}. Let R be the relation on A defined by {(a, b): a ,$b \in A$ , b is exactly divisible by a}. Find the range of R.

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**29.** LetA= {1, 2, 3, 4, 6}. Let R be the relation on A defined by {(a, b): a ,$b \in A$ , b is exactly divisible by a}. Find the domain of R

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**30.** LetA= {1, 2, 3, 4, 6}. Let R be the relation on A defined by {(a, b): a ,$b \in A$ , b is exactly divisible by a}. Find the range of R.

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**31.** If A ={4,9,16,25}, B = {1, 2, 3, 4} and R is the relation “is square of" from A to B, write down the set corresponding to R. Also find the domain and range of R.

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**32.** If R is a relation "is divisor of" from the set A = {1, 2, 3} to B = {4, 10, 15}, write down the set of ordered pairs corresponding to R.

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**33.** Let R be the relation on the set N of natural numbers defined by a + 3b = 12. Find : R.

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**34.** Let R be relation on the set N of natural numbers defined by a +3b=12 . Find : (i) R (ii) domain of R (iii) Range of R

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**35.** Let R be relation on the set N of natural numbers defined by a +3b=12 . Find : (i) R (ii) domain of R (iii) Range of R

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**36.** Let A = {1, 2} and B = {3, 4}. Find the number of relations from A to B.

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**37.** If R is the relation 'lessthan from A={1,2,3,4,5} to B={1,4,5}. Write down the cartesion product corresponding to R. Also find the inverse relation to R.

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**38.** Let A = {1, 2, 3, 4,5,6}. Define a relation R from A to A by : R = {(x, y): y= x +1}. Depict this relation by arrow diagram.

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**39.** Let A = {1, 2, 3, 4,5,6}. Define a relation R from A to A by : R = {(x, y): y= x +1}. Write down the domain, co-domain and range of R.

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**40.** The figure given below shows the relationship between the sets P and Q.

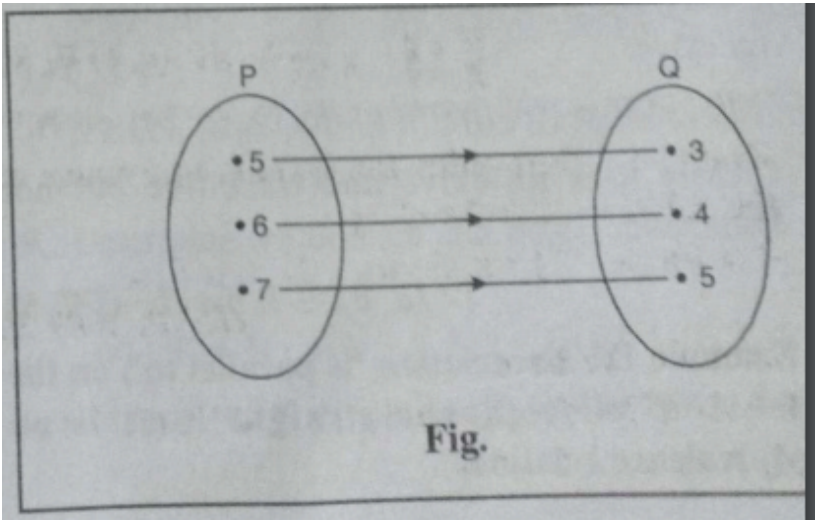

Fig.

Write this relation in set builder form.`

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**41.** The figure given below shows the relationship between the sets P and Q.

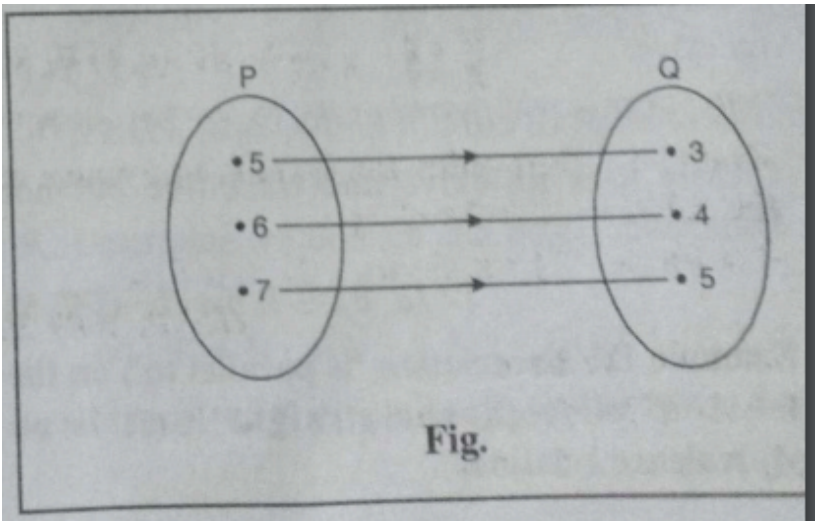


Fig.

Write this relation in roster form.

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**42.** The figure given below shows the relationship between the sets P and Q.

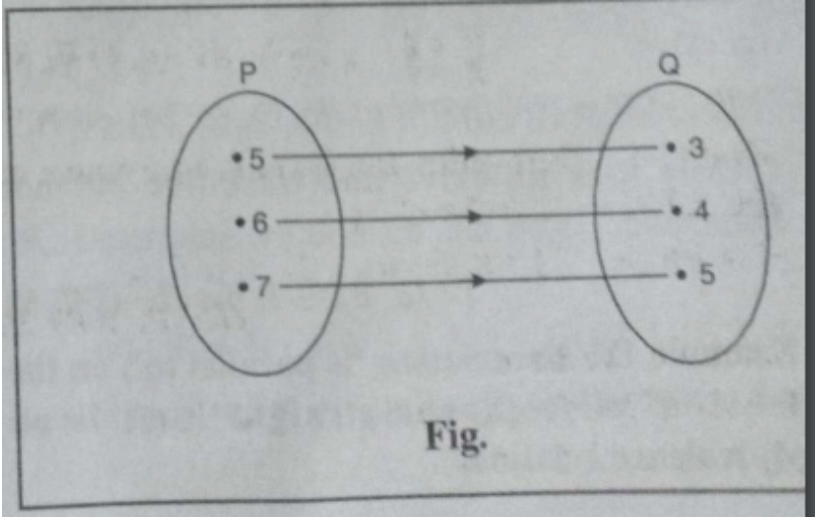

Fig.

Write this relation What is its domain and range?

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**43.** Show that the relation '>' on the set R of all real numbers is transitive but it is neither reflexive nor symmetric.

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**44.** Consider the set A = {a, b, c}. Give an example of a relation R on A. which is : reflexive and symmetric but not transitive.

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**45.** Consider the set A = {a, b, c}. Give an example of a relation R on A. which is : Symmetric and transitive but not reflexive.

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**46.** Consider the set A = {a, b, c}. Give an example of a relation R on A. which is : reflexive and transitive but not symmetric.

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**47.** The relation 'is parallel to', on the set A of all coplanar straight lines is an equivalence relation.

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**48.** Let 'm' be a given positive integer. Prove that the relation, Congruence modulo m' on the set Z of all integers defined by : $a \equiv b(\mod m) \Leftrightarrow (a-b)$ is divisible by m is an equivalence relation.

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**49.** Let Z be the set of all integers and R be the relation on Z defined as $R=(a,b): a, b$in` Z and a-b is divisible by 5) Prove that R is an equivalence relation.

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**50.** If R is a relation in $N \times N$, show that the relation R defined by (a, b) R (c, d) if and only if ad = bc is an equivalence relation.

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**51.** Which of the following graphs represent the function of x ? Why ?

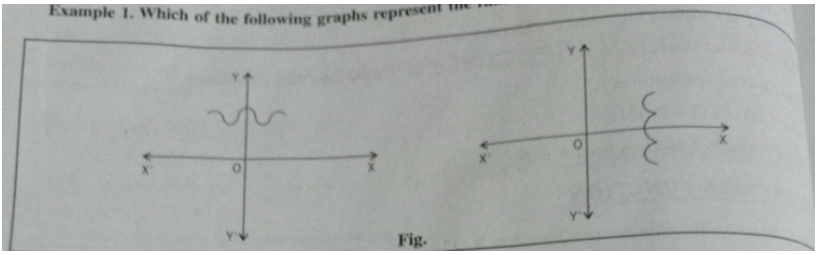

Fig.

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**52.** Let N be the set of natural numbers and the relation R be defined on N such that $R = \{(x, y) : y = 2x, x, y \in N\}$. What is the domain, co-domain and Range of R ?

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**53.** Let N be the set of natural numbers and the relation R be defined on N such that $R = \{(x, y) : y = 2x, x, y \in N\}$. Is this relation a function ?

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**54.** Which of the following relations are functions ? Give reasons. If it is a function, determine its domain and range. R = {(2, 1), (3, 1), (4, 2), (5, 7), (6, 9)}.

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**55.** Which of the following relations are functions ? Give reasons. If it is a function, determine its domain and range. R = {(2, 2), (2, 4), (3, 3), (4, 4), (5, 8)}.

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**56.** Which of the following relations are functions ? Give reasons. If it is a function, determine its domain and range. R = {(1, 3), (1, 5), (2, 5), (3, 6), (3, 7)}.

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**57.** Let f = {(1 ,1), (2, 3), (0, -1), (-1, -3)} be a linear function from Z into Z. Find f (x).

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**58.** Let A = {1, 2, 3}, B= {4, 5} and let f = {(1, 4), (2, 5), (3, 5)}. Show that 'f' is an onto function from A into B.

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**59.** Let N $\rightarrow$ N be defined by f (x) = 3x. Show that f is not an onto function.

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**60.** Let A = {1, 2, 3}, B = {4, 5, 6, 7} and let f = {(1, 4), (2, 5), (3, 6)} be a function from A to B. Show that f is one-one.

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**61.** If $f(x) = x^3 - \frac{1}{x^3}$, find the value of $f(x) + f\left(\frac{1}{x}\right)$.

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**62.** If 'f' is a real function defined by : $f(x) = \frac{x-1}{x+1}$, then prove that $f(2x) = \frac{3f(x)+1}{f(x)+3}$.

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**63.** If $f(x) = \frac{1}{2x+1}, x \neq -\frac{1}{2}$, then show that , $f(f(x)) = \frac{2x+1}{2x+3}, x \neq -\frac{3}{2}$.

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**64.** If $f(x) = \log_e\left(\frac{1+x}{1-x}\right)$, prove that: $f(x) + f(y) = f\left(\frac{x+y}{1+xy}\right)$.

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**65.** The function 't', which maps temperature in Celsius into temperature in Fahrenheit is defined by $t(c) = \frac{9c}{5} + 32$. Find : t(5 ).

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**66.** The function 't', which maps temperature in Celsius into temperature in Fahrenheit is defined by $t(c) = \frac{9c}{5} + 32$. Find : t(25).

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**67.** The function 't', which maps temperature in Celsius into temperature in Fahrenheit is defined by $t(c) = \frac{9c}{5} + 32$. Find : t(-5).

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**68.** The function 't', which maps temperature in Celsius into temperature in Fahrenheit is defined by $t(c) = \frac{9c}{5} + 32$. Find : the value of c when t(c) = 210.

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**69.** If the function f : R $\rightarrow$ R is defined by ,

$$f(x) = \begin{cases} 3x - 1 & \text{if} \quad x > 3 \\ x^2 - 2 & \text{if} \quad -2 \leq x \leq 3 \\ 2x + 3 & \text{if} \quad x < -2 \end{cases}$$ Find : f (2).

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**70.** If the function f : R $\rightarrow$ R is defined by ,

$$f(x) = \begin{cases} 3x - 1 & \text{if} \quad x > 3 \\ x^2 - 2 & \text{if} \quad -2 \leq x \leq 3 \\ 2x + 3 & \text{if} \quad x < -2 \end{cases}$$ Find : f (4).

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**71.** If the function f : R $\rightarrow$ R is defined by ,

$$f(x) = \begin{cases} 3x - 1 & \text{if} \quad x > 3 \\ x^2 - 2 & \text{if} \quad -2 \leq x \leq 3 \\ 2x + 3 & \text{if} \quad x < -2 \end{cases}$$ Find : f(-1).

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**72.** If the function f : R $\rightarrow$ R is defined by ,

$$f(x) = \begin{cases} 3x - 1 & \text{if} \quad x > 3 \\ x^2 - 2 & \text{if} \quad -2 \leq x \leq 3 \\ 2x + 3 & \text{if} \quad x < -2 \end{cases}$$ Find : f(-3).

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**73.** For the relation $y = \sqrt{x}$ , say whether it is a function or not. If it is a function, find its domain and range.

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**74.** Find the domain and range of the following functions : $f(x) = \sqrt{(x-1)(3-x)}$.

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**75.** Find the domain and range of the following function : $f(x) = 11 - 7\sin x$.

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**76.** Find the domain and range of the following function : $f(x) = 1 - |x|$.

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**77.** Find the range of the following function : $f(x) = \dfrac{1}{(2x-3)(x+1)}$.

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**78.** Find the domain of the function $f(x) = \dfrac{x^2 + 3x + 5}{x^2 - 5x + 4}$

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**79.** Which of the following functions are odd or even or neither :

$f(x) = \tan x + 3 \quad \text{cosec} \quad x + x$

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**80.** Which of the following functions are odd or even or neither :

$f(x) = |x| + 1$

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**81.** Which of the following functions are odd or even or neither :

$f(x) = |x - 2|$

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**82.** Prove that f (x) =x-[x], where [x] denotes the integral part of x not exceeding and is periodic and find its period.

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**83.** Solve : [2x- 3] = 5.

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**84.** Whether the following relation is function? Give reason. If it is a function, determine its domain and range :

{(2, 1), (3, 1), (4, 2)}.

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**85.** Which of the following relations are functions? Give reasons. If it is a function, determine its domain and range. $\{(1, 3), (1, 5), (2, 5)\}$.

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**86.** Whether the following relation is function? Give reason. If it is a function, determine its domain and range :

{(2, 2), (2, 4), (3, 3), (4, 4)}.

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**87.** Which of the following relations are functions? Give reasons. If it is a function, determine its domain and range.

$\{(2, 1), (5, 1), (8, 1), (11, 1), (14, 1), (17, 1)\}$

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**88.** Whether the following relation is function? Give reason. If it is a function, determine its domain and range :

{(2, 1), (5, 1), (8, 1), (11, 2), (14, 2), (17, 2)}.

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**89.** Whether the following relation is function? Give reason. If it is a function, determine its domain and range :

{(1, 2), (2, 3), (3, 4), (4, 5), (5, 6), (6, 7)}.

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**90.** Whether the following relation is function? Give reason. If it is a function, determine its domain and range :

{(2, 1), (4, 2),(6, 3), (8, 4), (10, 5), (12, 6), (14, 7)}

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**91.** Whether the following relation is function? Give reason. If it is a function, determine its domain and range :

{(2, 1), (4, 2), (6, 3), (8, 4), (10, 5)}.

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**92.** Whether the following relation is function? Give reason. If it is a function, determine its domain and range :

{(1, 2), (2, 3), (3, 4), (3,5), (3, 7), (4,8)}.

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**93.** Let f = {(1,1), (2,3), (0,-1), (-1, -3)} be a function from Z to Z defined by $f(x) = ax + b$, for some integers a, b. Determine a, b.

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**94.** Determine function given below is one-to-one :

To each state of India assign its capital.

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**95.** Determine function given below is one-to-one :

To each person on earth assign the number, which corresponds to his height.

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**96.** Determine function given below is one-to-one : To each country in the world assign the latitude and longitude of its capital.

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**97.** Let f: A $\rightarrow$ B be one-to-one function such that range of f is (b). Determine the number of elements in A.

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**98.** If $f(x) = 3x^4 - 5x^2 + 7$, find f(x-1).

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**99.** If $f(x) = x^2 - 3x + 4$, then find the values of x satisfying f (x) =f (2x+1).

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**100.** If $f(x) = x^2$, find $\frac{f(1.1) - f(1)}{(1.1 - 1)}$.

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**101.** If $f(x) = x + \frac{1}{x}$, prove that : $[f(x)]^3 = f(x^3) + 3f\left(\frac{1}{x}\right)$.

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**102.** If $f(x) = x^3 - \frac{1}{x^3}$, find the value of $f(x) + f\left(\frac{1}{x}\right)$.

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**103.** If $f(x) = \frac{1-x^2}{1+x^2}$, prove that $f(\tan\theta) = \cos 2\theta$.

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**104.** If $y = f(x) = \frac{3x-1}{5x-3}$, prove that f(y) =x.

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**105.** If $y = f(x) = \frac{ax-b}{bx-a}$, prove that f(y) =x.

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**106.** If $f(x) = \log_e\left(\frac{1+x}{1-x}\right)$, prove that $f\left(\frac{2x}{1+x^2}\right) = 2f(x)$.

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**107.** What are the real numbers x such that [x] = 2?

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**108.** What are the values taken by the function |x| ?

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**109.** What values does the function $x \to 2x^2 - 1$ associate with the number 7 in the range ?

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**110.** Given $f(x) = \begin{cases} 3x - 8 & f \text{ or } x \leq 5 \\ 7 & f \text{ or } x > 5 \end{cases}$ .What is the value of the function : at x=3 ?

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**111.** Given $f(x) = \begin{cases} 3x - 8 & f \text{ or } x \leq 5 \\ 7 & f \text{ or } x > 5 \end{cases}$ .What is the value of the function : at x=7 ?

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**112.** A function 'f' is defined by f(x) = 2x - 5, find : f(0).

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**113.** A function 'f' is defined by f(x) = 2x - 5, find : f(7).

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**114.** A function 'f' is defined by f(x) = 2x - 5, find : f(-3).

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**115.** If f (x) = |x|+|x-1|, find the value of : $f\left(-\frac{1}{3}\right)$.

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**116.** If f (x) = |x|+|x-1|, find the value of : f(0).

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**117.** If f (x) = |x|+|x-1|, find the value of : $f\left(\frac{1}{3}\right)$.

Watch Video Solution

**118.** If f (x) = |x|+|x-1|, find the value of : f(1).

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**119.** If f (x) = |x|+|x-1|, find the value of : f(2).

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**120.** Let A={1,2,3,4}, B = {1,5,9,11,15,16} and f={(1,5), (2,9), (3,1), (4,5), (2,11)}. Is the following true? Justify your answer. f is a relation from A to B

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**121.** Let A={1,2,3,4}, B = {1,5,9,11,15,16} and f={(1,5), (2,9), (3,1), (4,5), (2,11)}. Is the following true? Justify your answer. f is a function from A to B.

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**122.** Let A = {9,10,11,12,13} and let $f: A \to N$ be defined by f(n)= the highest prime factor of n. Find the range of f.

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**123.** Let f be the subset of $Z \times Z$ defined by $f = \{(ab, a + b) : a, b \in Z\}$

.Is f a function from Z to Z? Justify your answer.

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**124.** Whether the following function is odd or even or neither :

$f(x) = \cot x + 4\cos ecx + x.$

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**125.** Whether the following function is odd or even or neither :

$f(x) = \sec x + 4\cos x + 3x^2.$

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**126.** Whether the following function is odd or even or neither :

$f(x) = \sin x + \cos x.$

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**127.** Whether the following function is odd or even or neither :

$f(x) = |x - 1|$.

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**128.** Whether the following function is odd or even or neither :

$f(x) = \frac{|x|}{x}$ for all $x \in R - \{0\}$.

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**129.** Whether the following function is odd or even or neither :

$f(x) = \frac{|x|}{x^2 + 1}$ for all $x \in R$.

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**130.** Whether the following function is odd or even or neither :

$f(x) = \log\left(x + \sqrt{x^2 + 1}\right).$

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**131.** Whether the following function is odd or even or neither :

$f(x) = x\left(\frac{a^x - 1}{a^x + 1}\right).$

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**132.** Whether the following function is odd or even or neither :

$f(x) = x^2 - |x|.$

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**133.** What is the domain of the function $\frac{x}{x^2 - 3x + 2}$ ?

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**134.** What is the range of the constant function 1?

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**135.** For what value of x is the following function not defined ?

$$\frac{3x}{4x-3}.$$

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**136.** For what value of x is the following function not defined ?

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

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**137.** For what value of x is the following function not defined ?

$$\frac{1}{\sqrt{x-3}}.$$

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**138.** For what value of x is the following function not defined ?

$\frac{\sin x}{x}$.

Watch Video Solution

**139.** For what value of x is the following function not defined ?

$\sin \frac{1}{x}$.

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**140.** For what value of x is the following function not defined ?

$\sqrt{(x+2)(x-3)}$.

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**141.** Find the period of the following function, if periodic :

|cos x|.

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**142.** Find the period of the following function, if periodic :

tan 4x.

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**143.** Find the period of the following function, if periodic :

$2\cos\frac{1}{3}(x-\pi)$.

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**144.** Determine whether the following function $fR \to R$ are onto :

$f(x) = x + 1$.

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**145.** Determine whether the following function $fR \to R$ are onto :

$f(x) = x^3$.

Watch Video Solution

**146.** Determine whether the following function $fR \to R$ are onto :

$f(x) = |x| + x$.

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**147.** Determine whether the following function $fR \to R$ are onto :

$f(x) = 1$, if x is rational.

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**148.** Determine whether the following function $fR \to R$ are onto :

$f(x) = -1$, if x is irrational.

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**149.** Show that f: N $\to$ N defined by : $f(n) = \begin{cases} \frac{n+1}{2} & \text{if } nisodd \\ \frac{n}{2} & \text{if } niseven \end{cases}$ is many-one onto function.

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**150.** If $f(x) = \cos(\log_e x)$, find the value of : $f(x)f(y) - \frac{1}{2}\left[f\left(\frac{x}{y}\right) + f(xy)\right]$.

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**151.** If $f(x) = \sqrt{x}$, prove that : $\frac{f(x+h) - f(x)}{h} = \frac{1}{\sqrt{x+h} + \sqrt{x}}$.

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**152.** Find the domain and range of the following function :

$f(x) = x^2$.

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**153.** Find the domain and range of the following function :

$f(x) = \frac{3 - x}{x - 3}$.

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**154.** Find the domain and range of the following function :

$f(x) = \frac{x^2 - 1}{x - 1}$.

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**155.** Find the domain and range of the following real function:-

$f(x) = \sqrt{9 - x^2}$

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**156.** Find the domain and range of the following real function:-

$f(x) = -|x|$

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**157.** Find the domain and range of the following function :

$|x - 1|$.

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**158.** Find the domain and range of the following function :

$f(x) = \frac{|x - 3|}{x - 3}$.

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**159.** Find the domain and range of the following function :

$f(x) = \frac{|x-2|}{2-x}$.

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**160.** Find the domain and range of the following function :

$f(x) = \sqrt{x-1}$.

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**161.** Find the domain and range of the following function :

$f(x) = \sqrt{3-2x}$.

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**162.** Find the domain and range of the following function :

$$f(x) = \frac{1}{\sqrt{x+2}}.$$

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**163.** Find the domain and range of the following function :

$$f(x) = 1 + x - [x - 2].$$

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**164.** Find the domain of the following :

$$f(x) = \sqrt{-16x^2 + 24x}.$$

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**165.** Find the domain of the following :

$$f(x) = \frac{1}{|x| - x}.$$

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**166.** Find the domain of the following :

$$f(x) = \sqrt{\log\left(\frac{5x - x^2}{6}\right)}.$$

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**167.** Find the domain of the function $f(x) = \frac{x^2 + 2x + 1}{x^2 - 8x + 12}$.

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**168.** Find the range of the following function:-

$f(x) = 2 - 3x, x \in R, x > 0.$

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**169.** Find the range of the following function:- $f(x) = x^2 + 2$, x is a real number.

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**170.** Find the range of the following function:- $f(x) = x$, x is a real number.

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**171.** Let $f = \left\{\left(x, \frac{x^2}{1+x^2}\right) : x \in R\right\}$ be a function from R into R. Determine the range of 'f'.

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**172.** State, giving justification for your answer, whether the following pair is equal :

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

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**173.** State, giving justification for your answer, whether the following pair is equal :

$f(x) = \sqrt{x^2}, g(x) = |x|.$

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**174.** Is the following function invertible in the respective domain ? If so, find the inverse :

$f(x) = -\frac{1}{3}x + 4.$

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**175.** Are the following function invertible in their respective domains? If so,find the inverse in each case $f(x) = \frac{x-1}{x+1}, x \neq -1$

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**176.** Is the following function invertible in the respective domain ? If so, find the inverse :

$f(x) = \sqrt{1 - x^2}, 0 \leq x \leq 1.$

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**177.** Let f= R $\rightarrow$ R be defined by f(x)=3x-7. Show that f is invertible.

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**178.** Let f, g: R $\rightarrow$ R be defined respectively by : $f(x) = x + 1, g(x) = 2x - 3$. Find $f + g$, $f - g$, $fog$ and $\frac{f}{g}$.

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**179.** Let f and g be two functions defined by $f(x) = \sqrt{x-1}$ and $g(x) = \sqrt{4-x^2}$. Find : $f+g$.

Watch Video Solution

**180.** Let f and g be two functions defined by $f(x) = \sqrt{x-1}$ and $g(x) = \sqrt{4-x^2}$. Find : $f+g$.

Watch Video Solution

**181.** Let f and g be two functions defined by $f(x) = \sqrt{x-1}$ and $g(x) = \sqrt{4-x^2}$. Find : $f-g$.

Watch Video Solution

**182.** Let f and g be two functions defined by $f(x) = \sqrt{x-1}$ and $g(x) = \sqrt{4-x^2}$. Find : $g-f$.

Watch Video Solution

**183.** Let f and g be two functions defined by $f(x) = \sqrt{x-1}$ and $g(x) = \sqrt{4-x^2}$. Find : fg .

Watch Video Solution

**184.** Let f and g be two functions defined by $f(x) = \sqrt{x-1}$ and $g(x) = \sqrt{4-x^2}$. Find : gf .

Watch Video Solution

**185.** Let f and g be two functions defined by $f(x) = \sqrt{x-1}$ and $g(x) = \sqrt{4-x^2}$. Find : $\frac{f}{g}$.

Watch Video Solution

**186.** Let f and g be two functions defined by $f(x) = \sqrt{x-1}$ and $g(x) = \sqrt{4-x^2}$. Find : $\frac{g}{f}$.

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**187.** Find the domain of the function : $f(x) = \frac{\sin^{-1} x}{[x]}$.

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**188.** Draw the graph of the function : f: R $\rightarrow$ R defined by $f(x) = x^3, x \in R$.

Watch Video Solution

**189.** Let R be the set of real numbers. Define a real function $f: R \rightarrow R$ by $f(x) = x + 10$. Sketch the graph of this function.

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**190.** The function f is defined by : $f(x) = \begin{cases} 1-x & x<0 \\ 1 & x=0 \\ x+1 & x>0 \end{cases}$. Draw the graph of f (x).

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**191.** Draw the graph of the function : $1-x$.

Watch Video Solution

**192.** Draw the graph of the function : $1-x$.

Watch Video Solution

**193.** Draw the graph of the function : $f(x) = |1-x| + |1+x|, \ -2 \leq x \leq 2.$

Watch Video Solution

Watch Video Solution

**194.** If $f(x) = \frac{1+x}{1-x}$, show that $f(f(\tan\theta)) = -\cot\theta$.

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**195.** If for non-zero x, $lf(x) + mf\left(\frac{1}{x}\right) = \frac{1}{x} - 5$, where 1 $\neq$ m, then obtain f (x).

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**196.** If $f(x)$ is defined on $[-2, 2]$ and is given by

$f(x) = \begin{cases} -1, & -2 \leq x < 0 \\ x-1, & 0 < x \leq 2 \end{cases}$ and $g(x) = f|x| + |f(x)|$, then $g(x)$ is defined as

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**197.** Find the period of $f(x) = \sin^4 x + \cos^4 x$.

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**198.** Find the domain and range of the function:

$$f(x) = \begin{cases} x^2 & when x < 0 \\ x & when 0 \leq x \leq 1 \\ \frac{1}{x} & when x > 1 \end{cases}.$$

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**199.** Find the domain of the following :

$$f(x) = \frac{1}{\log_{10}(1-x)} + \sqrt{x+2}.$$

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**200.** Find the domain of the following :

$$f(x) = \sqrt{1-2x} + 3\sin^{-1}\left(\frac{3x-1}{2}\right).$$

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**201.** Find the domain of $F(x) = \frac{1}{x} + 2^{\sin^{-1}x} + \frac{1}{\sqrt{x-2}}$.

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## Exercise

**1.** If A = { a, b,c}, B = {p,q}, find $B \times A$ .

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**2.** Let A = {1, 2, 3, 4,5,6} and B = {2,4,6, 8}. Find $A \times B$ .

Watch Video Solution

**3.** Find x and y if : (x+1,y -2) = (3,1)

Watch Video Solution

**4.** Find x and y if : (x+ 2,4) = (5, 2x+ y)

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**5.** If $\left(\frac{x}{3}+1, y-\frac{2}{3}\right)=\left(\frac{5}{3}, \frac{1}{3}\right)$, find the values of x and y.

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**6.** Let A= {1, 2, 3,4} and S = {(a, b) : a $\in$ A, b $\in$ A, a divides b}. Write S explicitly.

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**7.** Let A = {1, 2} and B = {3, 4}. Write $A \times B$. How many subsets will $A \times B$ have? List them.

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**8.** Let A and B be two sets such that n(A) = 3 and n(B) = 2. If (x, 1), (y, 2),(z, 1) are in $A \times B$, find A and B. where x, y and z are distinct elements.

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**9.** If the set A has 3 elements and the set B = {3, 4, 5}, then find the number of elements in $(A \times B)$.

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**10.** The Cartesian product $A \times A$ has 9 elements among which are found (-1, 0) and (0,1). Find the setA and the remaining elements of $A \times A$.

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**11.** If A= {-1, 1}, find $A \times A \times A$.

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**12.** If R is the set of all real numbers. what do the cartesian products $R \times R$ and $R \times R \times R$ represent ?

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**13.** If $A \times B$ = {(a, x).(a , y). (b, x), (b, y)}. Find A and B.

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**14.** If A = { 1, 2}, B = {3, 4}, C = {4, 5}, find $A \times (B \cup C)$.

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**15.** If A={a, b,c}, B= {c, d} and C= {d, e, f}, find : $(A \cap B) \times C$.

Watch Video Solution

**16.** If A={a, b,c}, B= {c, d} and C= {d, e, f}, find : $(A \times B) \cap (B \times C)$.

Watch Video Solution

**17.** Let A = {1, 2, 4}, B= {3, 5, 7} and C = {5, 7, 9}, find $A \times (B \cap C)$.

Watch Video Solution

**18.** Let A= {1, 2, 3}, B= {3, 4} and C = {4, 5, 6}. Find : $(A \times B) \cap (A \times C)$.

Watch Video Solution

**19.** Let A= {1, 2, 3}, B= {3, 4} and C = {4, 5, 6}. Find : $(A \times B) \cap (A \times C)$.

Watch Video Solution

**20.** Let A= {1, 2, 3}, B= {3, 4} and C = {4, 5, 6}. Find : $A \times (B \cup C)$.

Watch Video Solution

**21.** Let A= {1, 2, 3}, B= {3, 4} and C = {4, 5, 6}. Find : $(A \times B) \cap (A \times C)$.

Watch Video Solution

**22.** Let A = {2, 4, 6}, B= {6, 8, 10} and C = {10, 12,14}. Find $B \times (A \cup C)$.

Watch Video Solution

**23.** Let $A = \left\{\frac{1}{2}, 2\right\}$, B = {2,3,5}, C= {-1,- 2}. Verify that : $A \times (B \cap C) = (A \times B) \cap (A \times C)$.

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**24.** Let A and B be two sets such that n(A) = 3 and n(B) = 2. If (x, 1), (y, 2),(z, 1) are in $A \times B$, find A and B. where x, y and z are distinct elements.

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**25.** The Cartesian product $A \times A$ has 9 elements among which are found (-1, 0) and (0,1). Find the setA and the remaining elements of $A \times A$.

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**26.** Let A = {1, 2, 3}, B= {2, 3, 4} and C= {4, 5}. Verity that : $A \times (B \cup C) = (A \times B) \cup (A \times C)$.

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**27.** If A= {1, 2, 3}, B= {4},C = {5}. then verify that : $A \times (B \cup C) = (A \times B) \cup (A \times C)$.

Watch Video Solution

**28.** If A= {1, 2, 3}, B= {4},C = {5}. then verify that : $A \times (B \cap C) = (A \times B) \cap (A \times C)$.

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**29.** If A= {1, 2, 3}, B= {4},C = {5}. then verify that : $A \times (B - C) = (A \times B) - (A \times C)$.

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**30.** Let A= {1, 2}, B = {1, 2, 3, 4}, C = {5, 6} andD = {5, 6, 7, 8}. Verify that $A \times C$ is a subset of $B \times D$.

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**31.** Let A= {1, 2}, B = {1, 2, 3, 4}, C = {5, 6} andD = {5, 6, 7, 8}. Verify that $A \times (B \cap C) = (A \times B) \cap (A \times C)$.

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**32.** Let A = {1, 2, 3}, B= {- 1,0, 1,2,3} and C= {1}, D={- 1,1}. Then Verify the following : $(A \times B) \cap (C \times D) = (A \cap C) \times (B \cap D)$.

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**33.** Let A = {1, 2, 3}, B= {- 1,0, 1,2,3} and C= {1}, D={- 1,1}. Then Verify the following : If $A \subset B$ and $C \subset D$, then $(A \times C) \subset (B \times D)$.

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**34.** Let P = {1, 4,9} and Q= {2,4,6}. Write the elements of $(P \cap Q) \times (P \cup Q)$. Also find $(P \times Q) \cap (Q \times P)$.

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**35.** IfA and B are non-empty sets and A $\times$ B=B $\times$ A, then

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**36.** Let A be a non-empty set such that $A \times B = A \times C$. Show that B = C.

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**37.** Prove that $A \subseteq B$ and $C \subseteq D$ imply : $(A \times C) \subseteq (B \times D)$.

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**38.** If $A \subseteq B$, prove that $A \times A \subseteq (A \times B) \cap (B \times A)$.

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**39.** If $A \subseteq B$, prove that $A \times C \subseteq B \times C$ for any set C.

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**40.** For any three sets A, B,C prove that : $A \times (B \cup C) = (A \times B) \cup (A \times C)$.

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**41.** For any three sets A, B,C prove that : $(A - B) \times C = (A \times C) - (B \times C)$.

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**42.** For any three sets A, B,C prove that : $A \times (B \cup C) = (A \times B) \cup (A \times C)$.

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**43.** For any three sets A, B,C prove that : $(A \cap B) \times C = (A \times C) \cap (B \times C)$.

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**44.** For any four sets A, B, C and D, prove that : $(A \cap B) \times (C \cap D) = (A \times C) \cap (B \times D)$.

Watch Video Solution

**45.** For any three sets A, B,C prove that : $A \times (B^c \cup C^c)^c = (A \times B) \cap (A \times C)$.

Watch Video Solution

**46.** For any three sets A, B,C prove that : $A \times (B^c \cap C^c)^c = (A \times B) \cup (A \times C)$.

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**47.** State whether the following statement is true or false. If the statement is false, rewrite the given statement correctly. ) If P = {m, n} and Q = { n, m}, then $P \times Q$ = {(m, n),{n. m)}.

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**48.** State whether the following statement is true or false. If the statement is false, rewrite the given statement correctly. If A and B are non-empty sets, then $A \times B$ is a non-empty set of ordered pairs (x, y) such that $x \in A$ and $y \in B$.

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**49.** State whether the following statement is true or false. If the statement is false, rewrite the given statement correctly. If A = {1, 2}, B = {3, 4}, then $A \times (B \cap \phi) = \phi$.

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**50.** If A= {1, 2, 3} and B = {1, 2}, then find : $A \times B$.

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**51.** If A= {1, 2, 3} and B = {1, 2}, then find : $B \times A$.

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**52.** If A= {1, 2, 3} and B = {1, 2}, then find : Is $A \times B = B \times A$ ?

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**53.** If A= {1, 2, 3} and B = {1, 2}, then find : Represent $A \times B$ graphically and by arrow diagram.

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**54.** Let X = {- 2,0, 1}, Y = {2, 3}. Represent $X \times Y$ and $Y \times X$ graphically.Also find $n(X \times Y)$ and $n(Y \times X)$.

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**55.** Let A = {2, 3, 5, 7}, B = (1, 12, 13, 15}. How many elements are there in $A \times B$? In $B \times A$? Is $A \times B = B \times A$? Is $n(A \times B) = n(B \times A)$?

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**56.** If A and B are two non-empty sets having n elements in common, then prove that $A \times B$ and $B \times A$ have $n^2$ elements in common.

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**57.** Let A = {x, y,z} and B = {1,2}. Find the number of relations from A to B.

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**58.** Let A = {1, 2}. List all relations on A.

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**59.** A = {1, 2, 3, 5} andB= {4, 6, 9}. Define a relation R Ifom A to B by R = {(x,y): the difference between x and y is odd, $x \in A, y \in B$}. Write R in roster form.

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**60.** Write the relation R = {(x, $x^3$) : x is a prime number less than 10} in roster form.

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**61.** Let R be the relation on Z defined by R = {(a,b ): a, b $\in$ Z, a-b is an integer}. Find the domain and range of R.

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**62.** Let A = {3,5} and B = {7, 11}. Let $R = \{(a, b) : a \in A, b \in B, a - b$ is odd}. Show that R is an empty relation from A into B.

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**63.** Which of the following graphs of relations defines a transitive relation in A = {1, 2, 3, 4} ? $R_1 = \{(1, 2), (3, 4), (2, 3), (2, 4)\}$, $R_2 = (1, 2), (3, 4), (2, 4)\}$.

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**64.** Let R be the relation on Z defined by aRb if and only if a -b is an even integer. Find : R.

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**65.** Let R be the relation on Z defined by aRb if and only if a -b is an even integer. Find : domain of R.

Watch Video Solution

**66.** Let R be the relation on Z defined by aRb if and only if a -b is an even integer. Find : range of R.

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**67.** Let R be the relation on Z defined by : $R = \{(a, b) : a \in Z, b \in Z, a^2 = b^2\}$. Find : R.

Watch Video Solution

**68.** Let R be the relation on Z defined by : $R = \{(a, b) : a \in Z, b \in Z, a^2 = b^2\}$. Find : domain of R.

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**69.** Let R be the relation on Z defined by : $R = \{(a, b) : a \in Z, b \in Z, a^2 = b^2\}$. Find : range of R.

Watch Video Solution

**70.** Let A = {1, 2, 3, 4, 5} and B = {2, 4, 6, 8, 10}. Let $R = \{(a, b) : a \in A, b \in B$, a divides b} be a relation from A into B. Find R. Show that domain of R is A and range of R is B.

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**71.** Determine the domain and range of the relation R defined by : $R = \{(x+1, x+5) : x \in \{0, 1, 2, 3, 4, 5\}\}$.

Watch Video Solution

**72.** Determine the domain and range of the relation R defined by : $R = \{(x, x^3) : x$ is prime number less than 10$\}$.

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**73.** Determine the domain and range of the following relation : {(1,2), (1,4), (1,6), (1,8)}.

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**74.** Determine the domain and range of the following relation : $\{(x, y) : x \in N, y \in N \text{ and } x + y = 10\}$.

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**75.** Determine the domain and range of the following relation : $\{(x, y): x \in N, x < 5, y = 3\}$.

Watch Video Solution

**76.** Determine the domain and range of the following relation : $\{(x, y): y = |x - 1|, x \in Z \text{ and } |x| \leq 3\}$.

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**77.** Let A = {1, 2, 3, 4} and B = {x,y,z}. Let R be a relation from A into B defined by : R= {(1,x), (1,z), (3,x), (4,y)}. Find the domain and range of R.

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**78.** Show that the relation 'is perpendicular to' on the set A of all coplanar straight lines is symmetric but it is neither reflexive nor transitive.

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**79.** Show that $R = \{(a, b) : a \geq b\}$ is reflexive and transitive but not symmetric.

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**80.** Show that the relation 'is a factor of' on the set N of all natural numbers is reflexive and transitive but not symmetric.

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**81.** Let A = {1, 2, 3, ....., 14}. Define a relation R from A to A by R = {(x,y): 3x-y=0, where x, y $\in$ A}. Depict this relationship using an arrow diagram.

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**82.** Define a relation R on the set N of natural numbers by : R= {(x, y): y =x + 5, x is a natural number less than 4, x, y $\in$ N}. Depict this relationship using (i) roster form (ii) an arrow diagram.

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**83.** LetA= {1, 2, 3, 4, 6}. Let R be the relation on A defined by {(a, b): a ,$b \in A$ , b is exactly divisible by a}. Write R in roster form

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**84.** LetA= {1, 2, 3, 4, 6}. Let R be the relation on A defined by {(a, b): a ,$b \in A$ , b is exactly divisible by a}. Find the domain of R

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**85.** LetA= {1, 2, 3, 4, 6}. Let R be the relation on A defined by {(a, b): a ,$b \in A$ , b is exactly divisible by a}. Find the range of R.

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**86.** The following figure shows a relation between P and Q. Write the relation in : set builder form. What is its domain and range ?

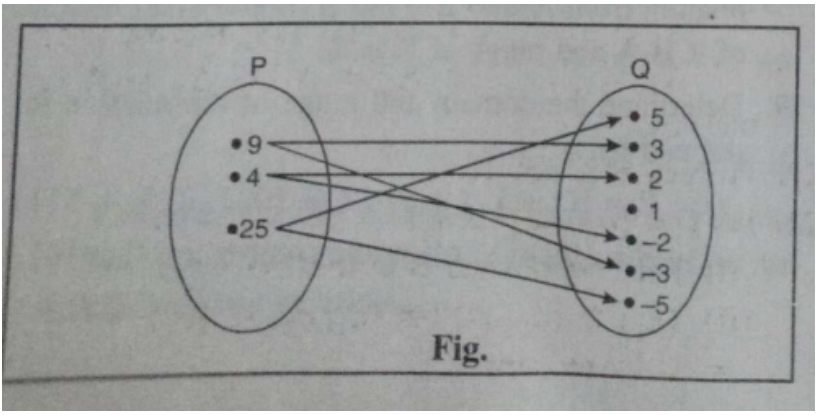

Fig.

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**87.** The following figure shows a relation between P and Q. Write the relation in : roster form. What is its domain and range ?

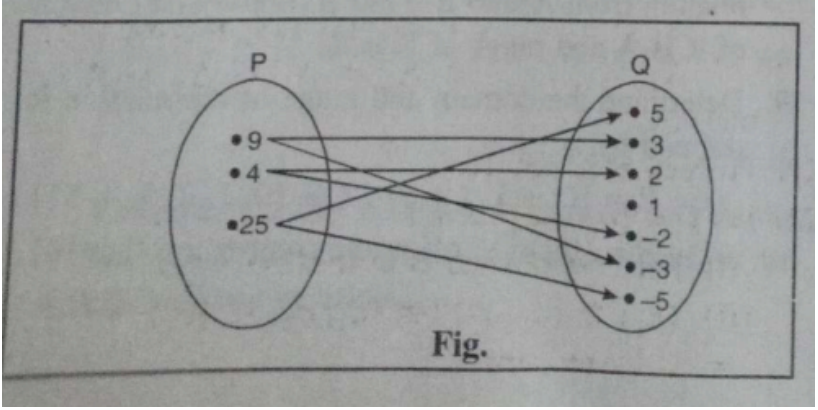

Fig.

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**88.** For the given relation R on a set S, determine which are equivalence relations : (i) S is the set of all rational numbers a R b iff a= b. (ii) S is the set of all real numbers iff : (I) $|a| = |b|$ (II) $a \geq b$.

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**89.** For the given relation R on a set S, determine which are equivalence relations : (i) S is the set of all rational numbers a R b iff a= b. (ii) S is the set of all real numbers iff : (I) $|a| = |b|$ (II) $a \geq b$.

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**90.** If R is the relation in $N \times N$ defined by (a, b) R (c,d) if and only if (a + d) =(b + c), show that R is an equivalence relation.

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**91.** Is inclusion of a subset in another, in the context of a universal set, an equivalence relation in the class of subsets of the sets ? Justify your answer.

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**92.** Given the relation R = {(1, 2), (2, 3)} on the set of natural numbers, add a minimum of ordered pairs so that the enlarged relation is symmetric, transitive and reflexive.

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**93.** Let $f(x) = x^2$ and g(x) = 2x + 1 be two real functions. Find : (f + g) (x), (f-g)(x), (fg) (x) and $\left(\frac{f}{g}\right)$ (x).

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**94.** Let $f(x) = \sqrt{x}$ and g (x) = x be two functions defined over the set of non-negative real numbers. Find (f+ g) (x), (f-g)(x), (fg) (x) and $\left(\frac{f}{g}\right)$ (x).

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**95.** If f and g are functions defined by : $f(x) = \sqrt{x-1}, g(x) = \frac{1}{x}$,then describe the following : f+g.

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**96.** If f and g are functions defined by : $f(x) = \sqrt{x-1}, g(x) = \frac{1}{x}$,then describe the following : f-g.

Watch Video Solution

Watch Video Solution

**97.** If f and g are functions defined by : $f(x) = \sqrt{x-1}, g(x) = \frac{1}{x}$,then describe the following : fg.

Watch Video Solution

**98.** If f and g are functions defined by : $f(x) = \sqrt{x-1}, g(x) = \frac{1}{x}$,then describe the following : $\frac{f}{g}$.

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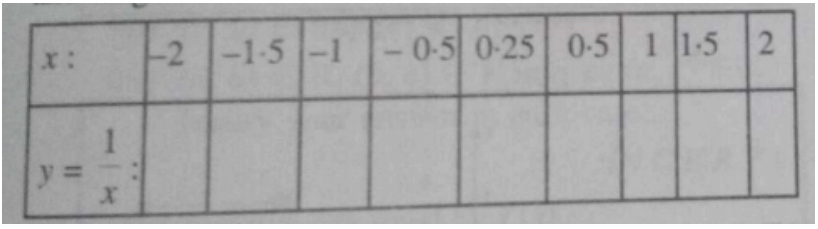
**99.** Define the real valued function f:R- {0} $\rightarrow$ R defined by $f(x) = \frac{1}{x}, x \in R - \{0\}$. Complete the table given below using this definition. What is the domain and range of this function.



| $x$ : | -2 | -1·5 | -1 | - 0·5 | 0·25 | 0·5 | 1 | 1·5 | 2 |
|---|---|---|---|---|---|---|---|---|---|
| $y = \frac{1}{x}$ : | | | | | | | | | |

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**100.** Sketch the graph of the following function : $f(x) = 4 - 2x$. Also find its domain and range.

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**101.** Sketch the graph of the following function : (i) f(x)=|x+2| (ii) f(x)= |x-2| (iii) f(x)= x|x|. Also find its domain and range.

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**102.** Draw the graph of f(x) = sgn (x -2).

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**103.** Draw the graph of y = [x] + x.

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**104.** Draw the graph of the function : $f(x) = \begin{cases} 0 & \text{if } x \text{ is an even integer} \\ 1 & \text{if } x \text{ is an odd integer} \end{cases}$.

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**105.** Let R be a relation from Q to Q defined by : $R = \{(a, b) : a, b \in Q$ and $a - b \in Z\}$. Show that : (a, a) $\in$ R for all a $\in$ Q.

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**106.** Let R be a relation from Q to Q defined by : $R = \{(a, b) : a, b \in Q$ and $a - b \in Z\}$. Show that : (a, b) $\in$ R implies that (b, a) $\in$ R.

Watch Video Solution

**107.** Let R be a relation from Q to Q defined by : $R = \{(a, b) : a, b \in Q$ and $a - b \in Z\}$. Show that : (a, b) $\in$ R and (b, c) $\in$ R implies (a, c) $\in$ R.

Watch Video Solution

**108.** Let R be a relation from N to N defined by : R = {(a, b): a, b $\in$ N and $a = b^2$}. Is the following true ?

(0, a) $\in$ R, for all a $\in$ N.Justify your answer.

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**109.** Let R be a relation from N to N defined by R = {(a, b) : a, b $\in$ N and a= $b^2$}. Is the following true? $(a, b) \in R$, implies $(b, a) \in R$. Justify your answer

Watch Video Solution

**110.** Let R be a relation from N to N defined by R = {(a, b) : a, b $\in$ N and a= $b^2$}. Is the following true? $(a, b) \in R, (b, c) \in R$ implies $(a, c) \in R$. Justify your answer

Watch Video Solution

**111.** The relation 'f' is defined by $f(x) = \begin{cases} x^2 & 0 \leq x \leq 3 \\ 3x & 3 \leq x \leq 10 \end{cases}$ The relation 'g' is defined by $g(x) = \begin{cases} x^2 & 0 \leq x \leq 2 \\ 3x & 2 \leq x \leq 10 \end{cases}$ Show that 'f' is a function and 'g' is not a function.

Watch Video Solution

**112.** If $f(x) = \log_e\left(\frac{1+x}{1-x}\right)$, prove that $f\left(\frac{2x}{1+x^2}\right) = 2f(x)$.

Watch Video Solution

**113.** If $f(x) = \frac{2x}{1+x^2}$, prove that $f(\tan\theta) = \sin 2\theta$.

Watch Video Solution

**114.** If $f(x) = \log_e x, x > 0$, prove that : f (uvw) = f (u) + f (v) +f (w).

Watch Video Solution

**115.** Is the function: $f(x) = \dfrac{x^2 - 8x + 18}{x^2 + 4x + 30}$ one-one ?

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**116.** Prove that f: (-1, 1) $\rightarrow$ R defined by , f(x)= {(x/(1+x),-1

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**117.** Let f: N $\rightarrow$ N be defined by : $f(n) = \begin{cases} n+1 & \text{if } nisodd \\ n-1 & \text{if } niseven \end{cases}$ .Show that f is a bijective function.

Watch Video Solution

**118.** Let $f: N \cup \{0\} \to N \cup \{0\}$ be defined by : $f(n) = \begin{cases} n+1 & \text{if } n \text{ is even} \\ n-1 & \text{if } n \text{ is odd} \end{cases}$ .Show that f is invertible and $f = f^{-1}$.

Watch Video Solution

**119.** The set of numbers which are mutiples of 5 is :

A. a finite set

B. an infinite set

C. a universal set

D. None of these.

**Answer:**

Watch Video Solution

**120.** The set of prime numbers less than 100 is :

A. Null set

B. Finite set

C. Infinite set

D. None of these.

**Answer:**

Watch Video Solution

**121.** The set of circles passing through (0, 0) is :

A. Infinite set

B. Finite set

C. Null set

D. None of these.

**Answer:**

Watch Video Solution

**122.** The set $A \cup A'$ is:

A. A

B. A'

C. $\phi$

D. U.

**Answer:**

Watch Video Solution

**123.** The set $A \cap A'$ is:

A. $\phi$

B. U

C. A

D. A'.

**Answer:**

Watch Video Solution

**124.** The set $\phi$ is

A. $\phi$

B. U

C. U'

D. None of these.

**Answer:**

Watch Video Solution

**125.** Let A = {1, 2}, B= {3, 4}, then the number of relations from A to B will be:

A. 2

B. $2^2$

C. $2^3$

D. $2^4$.

**Answer:**

Watch Video Solution

**126.** Let A = {x, y,z} and B = {1,2}. Find the number of relations from A to B.

A. $2^3$

B. $2^4$

C. $2^5$

D. $2^8$.

**Answer:**

Watch Video Solution

**127.** A function 'f' is defined by f(x) = 2x - 5, find : f(-3).

A. $-3$

B. 3

C. $-11$

D. $-15.$

**Answer:**

Watch Video Solution

**128.** If U ={1,2, 3, 4,5, 6,7,8, 9,10} and A= {3, 4, 7, 9}, then A' equals :

A. {1, 2, 8, 10}

B. {1, 2,5, 8, 10}

C. {1, 2,5, 6, 8, 10}

D. None of these.

**Answer:**

Watch Video Solution

**129.** If A= {1,2,3,4,5,6,7} and B= {7,8,9,10}, then A-B equals :

A. {7, 9}

B. {3, 4,8,10}

C. {7}

D. None of these.

**Answer:**

Watch Video Solution

**130.** If A= {1, 2,3, 4,5, 6,7} and B= {3,5,7,9,11}, then A $\cap$ B equals :

A. {1, 3, 4, 7, 9}

B. {3,5,7}

C. {1, 3, 5, 7, 9}

D. None of these.

**Answer:**

Watch Video Solution

**131.** Which of the following are sets ? Justify your answer. A collection of novels written by the writer Munshi Prem Chand.

A. an ampty set

B. a finite set

C. an infinite set

D. Not a well defined collection.

**Answer:**

Watch Video Solution

**132.** Set of even prime number is a

A. a void set

B. an infinite set

C. Not a set

D. a singleton set.

**Answer:**

Watch Video Solution

**133.** A collection of most dangerous animals of the word is :

A. a null set

B. a finite set

C. a singleton set

D. Not a set.

**Answer:**

Watch Video Solution

**134.** Let $f(x) = [x]$, then $f\left(-\frac{3}{2}\right)$ is equal to :

A. $-3$

B. $-2$

C. $-1.5$

D. None of these.

**Answer:**

Watch Video Solution

**135.** Let f (x) = |x|, then $f\left(-\frac{5}{2}\right)$ is :

A. $2.5$

B. $-2.5$

C. $-5$

D. 2

**Answer:**

Watch Video Solution

**136.** Let $f(x) = \frac{|x|}{x}$, then $f(-3)$ equals :

A. $-3$

B. 3

C. 1

D. $-1.$

**Answer:**

Watch Video Solution

**137.** State whether each of the following set is finite or infinite: The set of lines which are parallel to the x-axis

A. finite set

B. infinite set

C. null set

D. None of these.

**Answer:**

Watch Video Solution

**138.** State whether each of the following set is finite or infinite: The set of letters in the English alphabet

A. finite set

B. infinite set

C. singleton set

D. None of these.

**Answer:**

Watch Video Solution

**139.** The set of circles passing through (0, 0) is :

A. finite set

B. infinite set

C. power set

D. None of these.

**Answer:**

Watch Video Solution

**140.** The number of subsets of the set {a, b} is :

A. 7

B. 4

C. 12

D. 10

**Answer:**

Watch Video Solution

**141.** The number of subsets of the set {1, 2, 3} is:

A. 8

B. 6

C. 4

D. 16

**Answer:**

Watch Video Solution

**142.** The number of subsets of the set {a, e, i, o, u} is:

A. 32

B. 16

C. 8

D. 48

**Answer:**

Watch Video Solution

**143.** If (x + 1, y - 2) = (3, 1), the value of :

A. x=1, y=3

B. x=2, y=1

C. x=2, y=3

D. None of these.

**Answer:**

Watch Video Solution

**144.** If $\left(\frac{x}{3}+1, y-\frac{2}{3}\right)=\left(\frac{5}{3}, \frac{1}{3}\right)$, find the values of x and y.

A. x=2, y=0

B. x=1, y=3

C. x=2, y=4

D. x=2, y=1.

**Answer:**

Watch Video Solution

**145.** State whether the following statement is true or false. If the statement is false, rewrite the given statement correctly. If A = {1, 2}, B = {3, 4}, then $A \times (B \cap \phi) = \phi$.

A. {1, 2, 3, 4}

B. {(1, 3), (1, 4), (2, 3), (2, 4)}

C. {(1, 3), (2, 4)}

D. $\phi$.

**Answer:**

Watch Video Solution

**146.** The set {x:x is a prime number and divisor of 6} is equal to:

A. $\phi$

B. {1, 2, 3, 6}

C. {1, 2, 3, 4}

D. {2, 3}.

**Answer:**

Watch Video Solution

**147.** The set A = {x : x is an odd number less than 10} equals :

A. $\phi$

B. {2, 3}

C. {1, 3,5, 7, 9}

D. {1, 2, 3, 6}.

**Answer:**

Watch Video Solution

**148.** The set {x:x is an integer and $-3 < x \leq 2$} is equal to:

A. $\phi$

B. {-3,-2,- 1,0, 1}

C. {-3, -2,- 1,0, 1, 2}

D. None of these.

**Answer:**

Watch Video Solution

**149.** The set of right-angled triangles in a plane is :

A. a null set

B. a singleton set

C. finite set

D. well defined set.

**Answer:**

Watch Video Solution

**150.** The set of poor students in the class is :

A. a null set

B. finite set

C. not well-defined set

D. singleton set.

**Answer:**

Watch Video Solution

**151.** State whether the following set is finite or infinite : B= {x:x $\in$ N and $x^2 = 4$}.

A. infinite set

B. singleton set

C. $\phi$

D. None of these.

**Answer:**

Watch Video Solution

**152.** Write the solution set of the equation : $x^2 + x - 2 = 0$ in Roster Form.

A. {1,-2}

B. {-1,- 2}

C. {0, 1}

D. {- 1, 2}.

**Answer:**

Watch Video Solution

**153.** Solution set of equation $x^2 + 5x + 6 = 0$ in Roster form is :

A. {2,3}

B. {-2,-3}

C. {-3,2}

D. {- 2, 3}.

**Answer:**

Watch Video Solution

**154.** Solution set of equation $x^2 - 5x + 6 = 0$ in Roster form is :

A. {-2,-3}

B. {2,3}

C. {-3,2}

D. {- 2, 3}.

**Answer:**

Watch Video Solution

**155.** The set A= {x: $x^2$=4, x is odd} is :

A. a singleton set

B. null set

C. an infinite set

D. a finite set.

**Answer:**

Watch Video Solution

**156.** Set of even prime number is a

A. Null set

B. a singleton set

C. a finite set

D. an infinite set.

**Answer:**

Watch Video Solution

**157.** Which of the following are examples of the null set :- Set of odd natural numbers divisible by 2

A. null set

B. a singleton set

C. a finite set

D. an infinite set.

**Answer:**

Watch Video Solution

**158.** Find the range of the following function:- $f(x) = x$, x is a real number.

A. N

B. W

C. Z

D. R.

**Answer:**

Watch Video Solution

**159.** Find the range of the following function:- $f(x) = 2 - 3x, x \in R, x > 0.$

A. $[2, \infty)$

B. $[2, \infty]$

C. $(-2, \infty)$

D. $(-\infty, 2]$.

**Answer:**

Watch Video Solution

**160.** Find the range of the following function:- $f(x) = x^2 + 2$, x is a real number.

A. $[2, \infty)$

B. $(2, \infty]$

C. $(-2, \infty]$

D. $[2, \infty]$.

**Answer:**

Watch Video Solution

**161.** The set of A= {x:x $\in$ R, $x^2 = 16$ and 2x=6} equals :

A. $\phi$

B. {14,3,4}

C. {3}

D. {4}.

**Answer:**

Watch Video Solution

**162.** The set of intelligent students in a class is

A. a null set

B. a singleton set

C. a finite set

D. not a well defined collection.

**Answer:**

Watch Video Solution

**163.** Let f= {(1, 5), (2, 6), (3, 4)} g = {(4, 7), (5,8), (6,9)}. Then gof is :

A. {(4,7),(5,8),(6,9), (1, 5), (2, 6), (3, 4)}

B. { }

C. {(1,8),(2,9),(3,7)}

D. None of these.

**Answer:**

Watch Video Solution

**164.** The set of $A = \{u : u \varepsilon R, u^2 = 49, 2u = 14\}$ is

A. $\phi$

B. {7}

C. {-7}

D. {-7,7}.

**Answer:**

Watch Video Solution

**165.** The set of $A = \{x : x \varepsilon R, x^2 = 25)$ is

A. {5}

B. {-5}

C. {-5,5}

D. $\phi$.

**Answer:**

Watch Video Solution

**166.** The set of principals in a school is :

A. a null set

B. a singleton set

C. an infinite set

D. None of these.

**Answer:**

Watch Video Solution

**167.** The set of Girls in a Boys school is

A. a null set

B. a singleton set

C. a finite set

D. Not a well defined collection.

**Answer:**

Watch Video Solution

**168.** The set of weak students in a class is :

A. a null set

B. a singleton set

C. a finite set

D. Not a well defined collection.

**Answer:**

Watch Video Solution

**169.** $(A \cup B)^c$ is equal to :

A. $A^c \cup B^c$

B. $A^c \cap B^c$

C. $A^c - B^c$

D. None of these.

**Answer:**

Watch Video Solution

**170.** If f(x) = 2x - 5, then f (0) is :

A. 2

B. 3

C. $-5$

D. 0

**Answer:**

Watch Video Solution

**171.** The range of $f(x) = \frac{1+x^2}{x^2}$

A. [0,1]

B. (0, 1]

C. $(1, \infty)$

D. $[1, \infty)$.

**Answer:**

Watch Video Solution

**172.** If f(x)=2x-5, then f(1) is

A. 5

B. $-3$

C. $-5$

D. 3

**Answer:**

Watch Video Solution

**173.** Suppose $A_1, A_2, \ldots, A_{30}$ are thirty sets each with five elements and $B_1, B_2, \ldots, B_n$ are n sets each with three elements.

Let $\bigcup_{i=1}^{30} A_i = \bigcup_{j=1}^{n} B_j = S$

Assume that each element of S belongs to exactly ten of the $A_i's$ and exactly to nine of the $B_j's$. Find n.

A. 45

B. 35

C. 40

D. 30

**Answer:**

Watch Video Solution

**174.** For any two sets A and B, A - (A - B) equals :

A. B

B. $A - B$

C. $A \cap B$

D. $A \cap B^c$.

**Answer:**

Watch Video Solution

**175.** The domain of definition of the function : $f(x) = \sqrt{1 + \log_e(1 - x)}$ is :

A. $-\infty < x \leq 0$

B. $-\infty \leq x \leq \frac{e-1}{e}$

C. $-\infty < x \leq 1$

D. $x \geq 1 - e$.

**Answer:**

Watch Video Solution

**176.** Two finite sets A and B have m and n elements respectively. If the total number of subsets of A is 112 more than the total number of subsets of B, then the value of m is :

A. 7

B. 9

C. 10

D. 12

**Answer:**

Watch Video Solution

**177.** If f (x) satisfies the relation : $2f(x) + f(1-x) = x^2$ for all real x, then f (x) is :

A. $\frac{x^2 + 2x - 1}{6}$

B. $\frac{x^2 + 2x - 1}{3}$

C. $\frac{x^2 + 4x - 1}{3}$

D. $\frac{x^2 - 3x + 1}{6}$.

**Answer:**

Watch Video Solution

**178.** $f(x) = \frac{1}{\left[\sqrt{|x| - x}\right]}$. Domain of the function is :

A. $(-\infty, 0]$

B. $(-\infty, 0)$

C. $(0, \infty)$

D. $[0, \infty)$.

**Answer:**

Watch Video Solution

**179.** Let A and B be sets. If $A \cap X = B \cap X = \phi$ and $A \cup X = B \cup X$ for some set X, show that A = B. (Hints $A = A \cap (A \cup X)$, $B = B \cap (B \cup X)$ and use Distributive law )

A. $A - B = A \cap B$

B. A=B

C. $B - A = A \cap B$

D. None of these.

**Answer:**

Watch Video Solution

**180.** If S is a set with 10 elements and $A = \{(x, y) : x, y \in S, x \neq y\}$, then the number of elements in A is :

A. 100

B. 90

C. 50

D. 45

**Answer:**

Watch Video Solution

**181.** If A and B are subsets of a set X, then what is : $(A \cap (X - B)) \cup B$ equal to

A. $A \cup B$

B. $A \cap B$

C. A

D. B.

**Answer:**

Watch Video Solution

**182.** If V = {x: x+2=0} $R = \{x : x^2 + 2x = 0\}$ $S = \{x : x^2 + x - 2 = 0\}$.

then for what value of x, V=R=S?

A. 0

B. $-1$

C. $-2$

D. 1

**Answer:**

Watch Video Solution

**183.** What is the total number of proper subsets of a set containing n elements ?

A. $2n - 1$

B. $2n - 2$

C. $2^n - 1$

D. $2^n - 2$.

**Answer:**

Watch Video Solution

**184.** Which one of the following is correct?

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

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

C. $A \cap (B \cup C) = (A \cap B) \cup C$

D. $A \cup (B \cap C) = (A \cup B) \cap C$.

**Answer:**

Watch Video Solution

**185.** Let $R = \{x \mid x \in N,$ x is a multiple of 3 and $x \leq 100\}$ $S = \{x \mid x \in N,$ x is a multiple of 5 and $x \leq 100\}$. What is the number of elements in: $(R \times S) \cap (S \times R)$ ?

A. 36

B. 33

C. 20

D. 6

**Answer:**

Watch Video Solution

**186.** If X and Y are two non-empty sets, then what is (X - Y)' equal to

A. $X' - Y'$

B. $X' \cap Y$

C. $X' \cup Y$

D. $X - Y'$.

**Answer:**

Watch Video Solution

**187.** If A, B and C are three finite sets, then what is , $[(A \cup B) \cap C]'$ equal to?

A. $A' \cup B' \cup C'$

B. $A' \cap B' \cap C'$

C. $A' \cap B' \cup C'$

D. $A \cap B \cap C$.

**Answer:**

Watch Video Solution

**188.** The total number of subsets of a finite set A has 56 more elements then the total number of subsets of another finite set B. What is the number of elements in the set A ?

A. 5

B. 6

C. 7

D. 8

**Answer:**

Watch Video Solution

**189.** Out of a group of 20 teachers in a school, 10 teach Mathematics, 9 teach Physics and 7 teach Chemistry. 4 teachers both Mathematics and

Physics but none teaches both Mathematics and Chemistry. What is the number of teachers who teach both Chemistry and Physics ?

A. 1

B. 2

C. 3

D. 4

**Answer:**

Watch Video Solution

**190.** Let E = {1, 2, 3, 4} and F = {1, 2}. Then the number of onto functions from E to F is :

A. 14

B. 16

C. 12

D. 8

**Answer:**

Watch Video Solution

**191.** The domain of $\sin^{-1}[\log_3(x/3)]$ is :

A. [1, 9]

B. [- 1, 9]

C. [- 9, 1]

D. [- 9, - 1].

**Answer:**

Watch Video Solution

**192.** Find the period of $f(x) = \sin^4 x + \cos^4 x$.

A. $\pi$

B. $\frac{\pi}{2}$

C. $2\pi$

D. None of these.

**Answer:**

Watch Video Solution

**193.** The range of the function $f(x) = \frac{x^2 + x + 2}{x^2 + x + 1}, x \in R,$ is

(a) $(1, \infty)$ (b) $\left(1, \frac{11}{7}\right)$ (c) $\left(1, \frac{7}{3}\right)$ (d) $\left(1, \frac{7}{5}\right)$

A. $[1, \infty)$

B. $(1, \infty)$

C. $\left[1, \frac{7}{5}\right)$

D. $\left(1, \frac{7}{3}\right]$.

**Answer:**

Watch Video Solution

**194.** Let R = {(1, 3), (4, 2), (2, 4), (2, 3) (3, 1)} be a a relation on the set A = {1, 2, 3, 4}. The relation R is :

A. a function

B. transitive

C. not symmetric

D. reflexive.

**Answer:**

Watch Video Solution

**195.** If f : R $\rightarrow$ S, defined by : $f(x) = \sin x - \sqrt{3}\cos x + 1$ is onto , then the interval of S is :

A. [0,3]

B. [-1,1]

C. [0,1]

D. [-1,3].

**Answer:**

Watch Video Solution

**196.** The domain of the function : $f(x) = \frac{\sin^{-1}(x-3)}{\sqrt{9-x^2}}$ is :

A. [2,3]

B. [2,3)

C. [1,2]

D. [1,2).

**Answer:**

Watch Video Solution

**197.** The range of the function $f(x) = {}^{7-x}P_{x-3}$ is :

A. {1, 2, 3}

B. {1, 2, 3,4,5,6}

C. {1, 2, 3,4}

D. {1, 2, 3,4,5}.

**Answer:**

Watch Video Solution

**198.** The graph of the function y = f(x) is symmetrical about the line x = 2, then:

A. $f(x+2) = f(x-2)$

B. $f(2+x) = f(2-x)$

C. $f(x) = f(-x)$

D. $f(x) = -f(-x)$.

**Answer:**

Watch Video Solution

**199.** If f(x)=sinx+cosx, g(x)=$x^2 - 1$, then g{f(x)} is invertible in the domain

A. $\left[0, \frac{\pi}{2}\right]$

B. $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$

C. $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

D. $[0, \pi]$.

**Answer:**

Watch Video Solution

**200.** Let $R = \{(3, 3), (6, 6), (9, 9), (6, 12), (3, 9), (3, 12), (12, 12), (3, 6)\}$ is a relation on set $A = \{3, 6, 9, 12\}$ then R is a) an equivalence relation b)

reflexive and symmetric only c) reflexive and transitive only d) reflexive only

A. reflexive only

B. reflexive and transitive only

C. reflexive and symmetric only

D. an equivalence relation.

**Answer:**

Watch Video Solution

**201.** Let f: (-1, 1) $\rightarrow$ B be a function defined by $(x) = \tan^{-1} \frac{2x}{1+x^2}$, then f is both one-one and onto when B is the interval:

A. $\left[0, \frac{\pi}{2}\right)$

B. $\left(0, \frac{\pi}{2}\right)$

C. $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

D. $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$.

**Answer:**

Watch Video Solution

**202.** The set $S = \{1, 2, 3, \ldots\ldots . , 12)$ is to be partitioned into three sets A, B, C of equal size. Thus, $A \cup B \cup C = S, A \cap B = B \cap C = A \cap C = \varphi$ . The number of ways to partition S is

A. $\frac{12!}{3!(3!)^4}$

B. $\frac{12!}{(4!)^3}$

C. $\frac{12!}{(3!)^4}$

D. $\frac{12!}{3!(4!)^3}$

**Answer:**

Watch Video Solution

**203.** The largest Interval lying in $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ for which the function : $f(x) = \left[4^{-x^2} + \cos^{-1}\left(\frac{x}{2} - 1\right) + \log(\cos x)\right]$ is defined is :

A. $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

B. $\left[-\frac{\pi}{4}, \frac{\pi}{2}\right)$

C. $\left[0, \frac{\pi}{2}\right)$

D. $[0, \pi]$.

**Answer:**

Watch Video Solution

**204.** Let R be the real number. Consider the following subsets of the plane $R \times R$

$S = \{(x, y)\} : y = x + 1$ and $0 < x < 2$

$T = \{(x, y)\} : x - y$ is an integer.

Which one of the following is true ?

A. T is an equivalence relation on R but S is not

B. Neither S nor T is an equivalence relation on R

C. Both S and T are equivalence relations on R

D. S is an equivalence relation on R but T is not.

**Answer:**

Watch Video Solution

**205.** If A, B and C are three sets such that $A \cap B = A \cap C$ and $A \cup B = A \cup C$, then

A. A=C

B. B=C

C. $A \cap B = \phi$

D. A=B.

**Answer:**

Watch Video Solution

**206.** For real x, let $f(x) = x^3 + 5x + 1$, then:

A. f is onto R but not one-one

B. f is one-one and onto R

C. f is neither one-one nor onto R

D. f is one-one but nor onto R.

**Answer:**

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**207.** Consider the following relations: R = {(x, y) | x, y are real numbers and x = wy for some rational number w}; $S = \left\{ \left( \frac{m}{n}, \frac{p}{q} \right) \mathrm{m}, \mathrm{n}, \mathrm{p} \text{ and } \mathrm{q} \text{ are integers such that } \mathrm{n}, \mathrm{q} \neq 0 \text{ and } \mathrm{q}\,\mathrm{m} = \mathrm{p} \right.$. Then (1) neither R nor S is an equivalence relation (2) S is an equivalence relation but R is not an equivalence relation (3) R and S both are

equivalence relations (4) R is an equivalence relation but S is not an equivalence relation

A. is an equivalence relation but S is not an equivalence relation

B. neither R nor S is an equivalence relation

C. S is an equivalence relation but R is not an equivalence relation

D. R and S are both equivalence relations.

**Answer:**

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**208.** Let S={1, 2, 3,4}. The total number of unordered pairs of disjoint subsets of S is equal to :

A. 25

B. 34

C. 42

D. 41

**Answer:**

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**209.** The domain of the function $f(x) = \frac{1}{\sqrt{|x| - x}}$ is :

A. $(-\infty, \infty)$

B. $(0, \infty)$

C. $(-\infty, 0)$

D. $(-\infty, \infty) - \{0\}$.

**Answer:**

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**210.** Let $P = \{\theta : \sin\theta - \cos\theta = \sqrt{2}\cos\theta\}$ and $Q = \{\theta : \sin\theta + \cos\theta = \sqrt{2}\sin\theta\}$ be two sets. Then :

A. $P \subset Q$ and $Q - P \neq \phi$

B. $Q \not\subset P$

C. $P \not\subset Q$

D. P=Q.

**Answer:**

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**211.** Let $f(x) = x^2 and g(x) = \sin x$ for all $x$ in $R$ Then the set of all $x$ satisfying $(fogogof)(x) = (gogof)(x), where (fog)(x) = f(g(x)),$ is

A. $\pm\sqrt{n\pi}, n \in \{0, 1, 2.....\}$

B. $\pm\sqrt{n\pi}, n \in \{1, 2.....\}$

C. $\frac{\pi}{2} + 2n\pi, n \in \{..... - 2, -1, 0, 1, 2\}$

D. $2n\pi, n \in \{..... -2, -1, 0, 1, 2.....\}$

**Answer:**

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**212.** In a town of 10,000 families, it was found that 40% families buy newspaper A, 20% by newspaper B and 10% buy newspaper C. Further 5% buy A and B, 3% buy B and C, 4% buy A and C. If 2% of the families buy all the three newspaper find:

Number of families that buy none of the three newspapers.

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**213.** In a town of 10000 families, it was found that 40% families buy newspaper A, 20% families buy newspaper B and 10% families buy newpaper C, 5% families buy newspaper A and B, 3% buy newspapers B and C and 4% buy newspaper A and C. If 2% families buy all the three newspapers, then number of families which buy A only is

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**214.** In a town of 10000 families, it was found that 40% families buy newspaper A, 20% families buy newspaper B and 10% families buy newpaper C, 5% families buy newspaper A and B, 3% buy newspapers B and C and 4% buy newspaper A and C. If 2% families buy all the three newspapers, then number of families which buy A only is

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**215.** In a town of 10,000 families, it was found that 40% families buy newspaper A, 20% by newspaper B and 10% buy newspaper C. Further 5% buy A and B, 3% buy B and C, 4% buy A and C. If 2% of the families buy all the three newspaper find:

Number of families that buy none of the three newspapers.

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**216.** Given $A = \left\{x : \frac{\pi}{6} \leq x \leq \frac{\pi}{3}\right\}$ and f (x) = cos x -x(1 + x), find f (A).

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**217.** Prove that f (x) =x-[x], where [x] denotes the integral part of x not exceeding and is periodic and find its period.

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**218.** Find the domain of the function $f(x) = \frac{[x]+1}{[x]-1}$, where [x] denotes the greatest integer $\leq x$. Is the function one-one ? Support your answer.

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**219.** Find the domain of the following function :

$f(x) = \frac{1}{\sqrt{|x| - x}}$.

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**220.** Find the domain of the following function :

$$f(x) = \sqrt{\cos(\sin x)} + \sin^{-1}\left(\frac{1+x^2}{2x}\right).$$

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**221.** Find the domain of the following :

$$f(x) = \frac{1}{\log_{10}(1-x)} + \sqrt{x+2}.$$

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**222.** Find the domain and range of the following function :

$$f(x) = \frac{1}{\sqrt{x-[x]}}.$$

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**223.** Find the domain and range of the following function :

$$f(x) = \sin\left(\log\left(\frac{\sqrt{4-x^2}}{1-x}\right)\right).$$

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**224.** Find the domain of definition of the function f (x) given by : $f(x) = \log_4\{\log_5(\log_3(18x - x^2 - 77))\}$.

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**225.** Find the natural number a for which $\sum_{k=1}^{n} f(a+k) = 16(2^n - 1)$, where the function $f$ satisfies $f(x+y) = f(x)f(y)$ for all natural numbers x, y and further $f(1) = 2$.

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**226.** A function f : R $\rightarrow$ R, where R is the set of real numbers, is defined by : $f(x) = \frac{\alpha x^2 + 6x - 8}{\alpha + 6x - 8x^2}$. Find the interval of values of $\alpha$ for which f is onto. Is the function one-one for $\alpha = 3$ ? Justify your answer.

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