MATHS

BOOKS - KUMAR PRAKASHAN KENDRA MATHS (GUJRATI ENGLISH)

RELATIONS AND FUNCTIONS

Practice Work

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1. Find the value of a and b:

$$(2a - 5, 4) = (5, b + 6)$$

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2. Find the value of a and b:

$$(a - 3, b + 7) = (3, 7)$$

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3. Find the value of a and b:

$$(a + 2, 4) = (5, 2a + b)$$

4. Find the value of a and b:

$$(a + 1, 1) = (3, b - a)$$

5. Set A= {1,2,3,4}, B= {2,4} then verify that $n(A \times B) = n(A)n(B)$.

6. A and B are not singleton sets. $n(A \times B) = 21.$ If $A \subset B$ then $n(B) = \ldots\ldots\ldots$

7. If a set A has 2 elements then how many elements are there in $n(A \times A \times A)$?

8. A= {1, 2, 3} and B= { $x : x \in N$, x is a prime number less than 5}, Find $A \times B$ and $B \times A$

9. If $A = \{-1, 3, 4\}$ and $B = \{2, 3\}$ then find $A \times B, B \times A$ and $A \times A$

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

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

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

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13. A = {1, 4} B= {2, 3, 6} and C= {2, 3, 7}, Verify the following result

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

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14. A = {1, 4} B= {2, 3, 6} and C= {2, 3, 7}, Verify the following result

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

15. A = {1, 4} B= {2, 3, 6} and C= {2, 3, 7}, Verify the following result

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

16. If $a \in \{-1, 2, 3, 4, 5\}$ and $b \in \{0, 3, 6\}$. Write the set of all ordered pairs (a,b) such that $a + b = 5$. How many subset has it?

17. If A and B are two sets having 3 elements is common. If n(A)= 5, n(B)= 4. find $n(A \times B)$ and $n[(A \times B) \cap (B \times A)]$

18. A and B are two sets such that $n(A) = 5$ and $n(B) = 2$. If $(a, 2), (b, 3), (c, 2), (d, 2), (e, 2)$ are elements of $A \times B$ then find A and B.

19. If the number of the elements of ordered pairs $A \times A$ is 16 and (a, a) (b, a) (a,c) (d,d) are elements of $A \times A$ then find A

20. $R = \{(x, y) : x \in N, y \in N \text{ and } x + y = 10\}$. Write domain and range of R.

21. $R = \{(a, b) : a \in N, a < 5, b = 4\}$ write domain and range of R.

22. Determine the domain and range of the relation R defined by

$R = \{(x, x + 5) : x \in [0, 1, 2, 3, 4, 5]\}$.

23. A relation R from set A= {1, 3, 5, 7} to B= {2, 4, 6, 8} definded as follows:

$(x, y) \in R \Leftrightarrow x > y$. Express R as set of ordered pairs.

24. $R = \{(a, b) : a \in N, b \in N, a + 3b = 12\}$. Express R as roster

method. Find the domain and range of R.

25. Two dice are tossed. Find whether the following two events A and B are independent :

$A = \{(x, y) : x + y = 11\}$ and $B = \{(x, y) : x \neq 5\}$

where (x, y) denotes a typical sample point.

26. Write the following relation in roster from

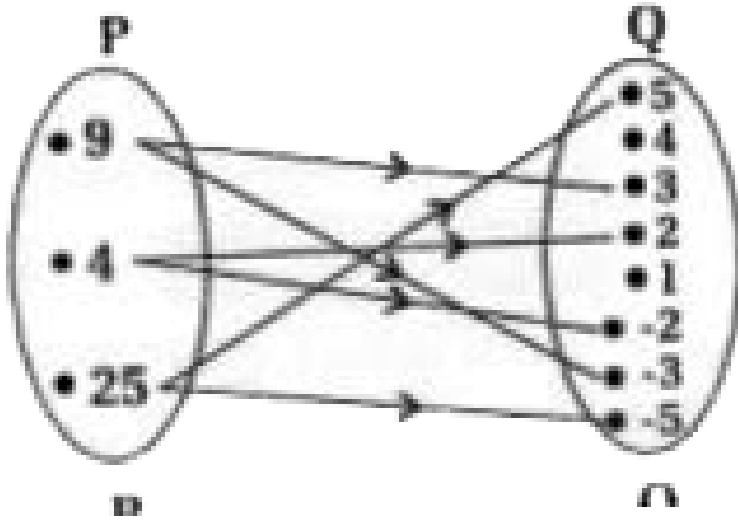$R = \{(x, y) : 2x + 3y = 12, x \in A, y \in A\}$ where

$A = \{0, 1, 2, 3. \ldots \ldots 10\}$

27. Write the following relation in roster from

R= {(x,y): $x \in A, y \in B$. Y is divisible by x} where A= {5, 6,7, 8} B= {10, 12, 15, 16, 18}

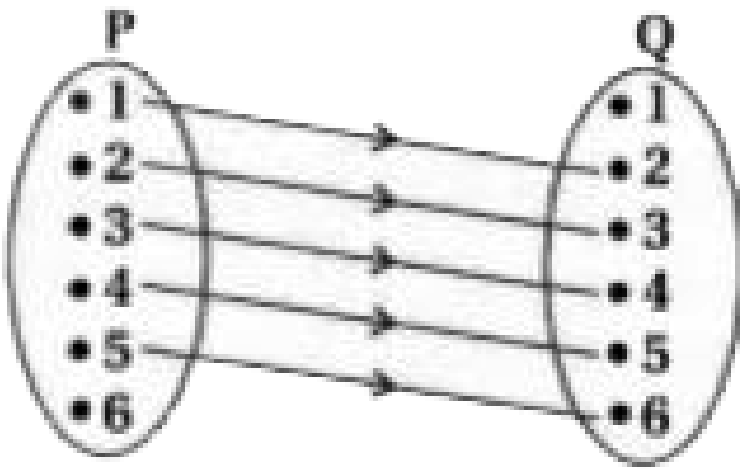**28.** The figure shows a relation between the sets P and Q. write this relation (i) in set builder form (ii) roster form.

29. The figure shows a relation between the sets P and Q. write this relation (i) in set builder form (ii) roster form.

30. $R = \{(x, y) : x, y \in N, x + y = 8\}$. Find the domain and range of R.

31. $R = \{(x, x^2) : x$ is a prime number less then 15$\}$ Express R in roster form.

32. The set A has 3 elements how many relations are there from A to A.

33. The set A has 4 elements and set B has 2 elements how many relations are there from A to B

34. A= {2, 4, 6, 9} B= {4, 6, 18, 27, 54}

R= $\{(a, b) : a \in A, b \in B, a < b, a$ is a factor of b} Find domain and range of R

35. Which of the following relations are functions? Give reason

$\{(3, 3)(4, 2)(5, 1)(6, 0)(7, 7)\}$

36. Which of the following relations are functions? Give reason

{(2,0), (4,8), (2,1), (3,6)}

37. $x = \{1, 2, 3, 4\}, \quad y = \{1, 5, 9, 11, 15, 16\}$ which of the following relations are functions from x to y ?

(1) $f_1 = \{(1, 1)(2, 11)(3, 1)(4, 15)\}$

(2) $f_2 = \{(1, 1)(2, 7)(3, 5)\}$

(3) $f_3 = \{(1, 5)(2, 9)(3, 1)(4, 5)(2, 11)\}$

38. Find the domain and range of the following function
$$f(x) = \frac{1}{\sqrt{x - 5}}$$

39. Find the domain and range of the following function

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

40. Find the domain and range of the following function

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

41. Find the domain and range of the following function

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

42. If $f(x) = x^2 + 2x + 3$ then find f(1), f(2), f(3)

43. If $f(x) = \dfrac{1-x}{1+x}$ then $x = $ ..... .

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44. If $f(x) = (x-a)^2(x-b)^2$ then find $f(a+b)$

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45. $f(x) = x^2 - 3x + 4$ If $f(x) = f(2x+1)$ find the value of x.

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46. If $f(x) = x^3 - \dfrac{1}{x^3}$ then show that $f(x) + f\left(\dfrac{1}{x}\right) = 0$

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47. Find the range of the following function

$$f(x) = \sqrt{x - 3}, \, x \in R$$

48. Find the range of the following function

$$f(x) = |x - 1|, \, x \in R$$

49. Find the range of the following function

$$f(x) = \frac{4 - x}{x - 4}, \, x \in R$$

50. Find the range of the following function

$$f(x) = 1 - |x - 2|, \, x \in R$$

51. Find the range of the following function

$$f: N \rightarrow R, \ f(x) = \frac{1}{x}$$

52. Find the range of the following function

$$h: N \rightarrow R, \ h(x) = x - [x]$$

53. Let R be a relation on $N \times N$ defined by (a,b)

$R(c, d) \Leftrightarrow a + d = b + c$ for all $(a, b)(c, d) \in N \times N$ show that,

(a, b) R (a,b) for all $(a, b) \in N \times N$

54. Let R be a relation on $N \times N$ defined by (a,b)

$R(c, d) \Leftrightarrow a + d = b + c$ for all $(a, b)(c, d) \in N \times N$ show that,

$(a, b)R(c, d) \Rightarrow (c, d)R(a, b)$ for all $(a, b)(c, d) \in N \times N$

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$(a, b)R(c, d) \Rightarrow (c, d)R(a, b)$ for all $(a, b)(c, d) \in N \times N$

56. $f : R^+ \rightarrow R^+$, $f(x) = x^2 + 4(\sqrt{x}) + 3$ then f(4) = 24.

57. $f : R - \{0\} \rightarrow R$, $f(x) = \dfrac{1}{x} + px$ and $f\left(\dfrac{1}{5}\right) = \dfrac{28}{5}$ then p = ...

58. Find the domain of the following functions.

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

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59. Find the domain of the following functions.

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

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60. Find the domain of the following functions.

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

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61. Find the domain of the following functions.

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

62. Find the range and domain of the function defined by

$$f(x) = \frac{1}{2 - \sin 3x}$$

63. Let $f(x) = x^2$ and $g(x) = 2x + 1$ be two real functions. Find

$(f + g)(x)$, $(f - g)(x)$, $(fg)(x)$, $\left(\dfrac{f}{g}\right)(x)$.

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

67. $f(x) = \begin{cases} \dfrac{2^{x+2} - 16}{4^x - 16}, & x \neq 2 \\ k, & x = 2 \end{cases}$ f(x) is continuous at x=2 then find k

68. If $f(x) = 3x^4 - 5x^2 + 9$ then find $f(x - 1)$.

69. If $f(x) = \dfrac{x+1}{x-1}$ then show that $f[f(x)] = x$.

70. $R = \{(a, b) : b = |a - 1|, a \in Z \text{ and } |a| \leq 3\}$. Find the domain and Range of R

Exercise 2 1

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

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

3. If G =(7, 8) and H=(5,4,2), find $G \times H$ and $H \times G$.

4. State whether each of the following statements are true or false. If the statement is false, rewrite the given statement correctly.

(i) If P= {m, n} and Q = {n, m}, then $P \times Q = \{(m, n), (n, m)\}$.

(ii) 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 $y \in B$.

(iii) If A={1,2}, B={3,4} then $A \times (B \cap \phi) = \phi$

5. State whether each of the following statements are 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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6. State whether each of the following statements are true or false. If the statement is false, rewrite the given statement correctly.

(i) If P= {m, n} and Q = {n, m}, then $P \times Q = \{(m, n), (n, m)\}$.

(ii) 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 $y \in B$.

(iii) If A={1,2}, B={3,4} then $A \times (B \cap \phi) = \phi$

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

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

9. Let A={1,2}, B={1,2,3,4}, C={5,6} and D={5,6,7,8}. Verify that (i) $A \times (B \cap C) = (A \times B) \cap (A \times C), (ii) A \times C$ is a subset of $B \times D$

10. Let A={1,2}, B={1,2,3,4}, C={5,6} and D={5,6,7,8}. Verify that (i) $A \times (B \cap C) = (A \times B) \cap (A \times C), (ii) A \times C$ is a subset of $B \times D$

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

12. 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.

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

Exercise 2 2

1. Let A={1,2,3....14}. Define a relation R from A to A by $R = \{(x, y) : 3x - y = 0, \quad \text{where} \quad x, y \in A\}$. Write down its domain, condomain and range.

2. 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 roster form. Write down the domain and the range.

3. A =(1, 2, 3, 5) and B= {4, 6, 9}. Define a relation R from 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.

4. The Fig 2.7 shows a relationship between the sets P and Q. Write this relation

(i) in set-builder form (ii) roster form. What is its domain and range?

આકૃતિ 2.7
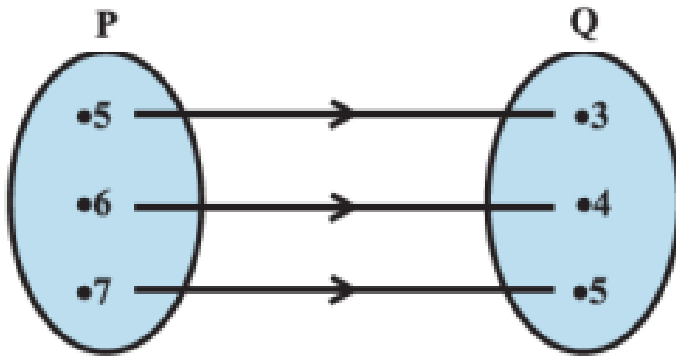
5. Let A= (1, 2, 3, 4, 6). Let R be the relation on A defined by $\{(a, b)a, b \in A, b$ is exactly divisible by a]

(i) Write R in roster form

(ii) Find the domain of R

(iii) Find the range of R.

6. Let A= (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]

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7. Let A= (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]

(i) Write R in roster form

(ii) Find the domain of R

(iii) Find the range of R.

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

9. Write the relation $R = \left\{\left(x, x^3\right) : x \right.$ is a prime number less than 10) in roster form.

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

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

Exercise 2 3

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

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

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

(iii) {(1,3),(1,5),(2,5)}

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

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

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

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

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

(iii) {(1,3),(1,5),(2,5)}

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4. Find the domain and range of the following real functions:

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

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5. Verify Rolle's theorem for the following functions:

$$f(x) = \sqrt{9 - x^2}, \, x \in [-3, 3]$$

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6. A functionfis defined by f(x)=2x-5. Write down the values of (i) f(0), (ii) f(7), (iii) f(-3)

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8. A functionfis defined by f(x)=2x-5. Write down the values of (i) f(0), (ii) f(7), (iii) f(-3)

9. The function 't' which maps temperature in degree Celsius into temperature in degree Fahrenheit is defined by $t(C) = \dfrac{9C}{5} + 32$

Find (i) t(0) (ii) t(28) (iii) t(-10) (iv) The value of C, when t(C)=212.

10. The function 't' which maps temperature in degree Celsius into temperature in degree Fahrenheit is defined by $t(C) = \dfrac{9C}{5} + 32$

Find (i) t(0) (ii) t(28) (iii) t(-10) (iv) The value of C, when t(C)=212.

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Find (i) t(0) (ii) t(28) (iii) t(-10) (iv) The value of C, when t(C)=212.

12. The function 't' which maps temperature in degree Celsius into temperature in degree Fahrenheit is defined by t(c) $= \dfrac{9(c)}{5} + 32$. If t(c)=212 then c = ...

13. Find the range of each of the following functions.

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

(ii) $f(x) = x^2 + 2x$, x is a real number.

(iii) f(x) = x, x is a real number

14. Find the range of each of the following functions.

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

(ii) $f(x) = x^2 + 2x$, x is a real number.

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15. Find the range of each of the following functions.

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

(ii) $f(x) = x^2 + 2x$, x is a real number.

(iii) f(x) = x, x is a real number

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1. The relation f is defined by $f(x) = \begin{cases} x^2 & 0 \le x \le 3 \\ 3x & 3 \le x \le 10 \end{cases}$

The relation g is defined by $g(x) = \begin{cases} x^2 & 0 \le x \le 2 \\ 3x & 2 \le x \le 10 \end{cases}$

Show that f is a function and g is not a function.

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

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

4. Find the domain and the range of the real function f defined by $f(x) = \sqrt{x - 1}$.

5. Find the domain and the range of the real function f defined by $f(x) = |x - 1|$

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

7. Let $f, g: R \to R$ be defined, respectively byt f(x)=x+1, g(x)=2x-3. Find $f + g,\ f - g$ and $\dfrac{f}{g}$.

8. 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,

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

(i) $(a, a) \in R,$ for all $a \in N$ (ii) $(a, b) \in R,$ implies $(b, a) \in R$

(iii) $(a, b) \in R, (b, c) \in R$ implies $(a, c) \in R.$

Justify your answer in each case.

10. Let R be a relation from N to N defined by

$R = \{(a, b) : a, b \in N \text{ and } a = b^2\}$. Are the following true?

(i) $(a, a) \in R$, for all $a \in N$ (ii) $(a, b) \in R$, implies $(b, a) \in R$

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(iii) $(a, b) \in R, (b, c) \in R$ implies $(a, c) \in R$.

Justify your answer in each case.

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12. 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)} Are the following true?

(i) f is a relation from A to B (ii) f is a function from A to B. Justify your

answer in each case.

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13. 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)} Are the

following true?

(i) f is a relation from A to B (ii) f is a function from A to B. Justify your

answer in each case.

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

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1. n(A)= m, n (B) = n. The total number of non empty relation from A to B is........

    A. mn

    B. 2^{mn}

    C. $2^{mn} - 1$

    D. 2mn

Answer: C

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2. U= {1, 2, 3, 4} and relation $R = \{(x, y) : y > x, x, y \in U\}$ then range of

R is ....

A. {1, 2, 3,4}

B. {2,3,4}

C. {4}

D. ϕ

Answer: B

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3. Out of the following which is not function?

A. $\{(x, y) : x, y \in R \quad x^2 = y\}$

B. $\{(x, y) : x, y \in R \quad y^2 = x\}$

C. $\{(x, y) : x, y \in R \quad x = y^3\}$

D. $\{(x, y) : x, y \in R \quad y = x^3\}$

Answer: B

4. Out of the following which is a function?

A. $\{(x, y) : x, y \in R \quad y^2 = x\}$

B. $\{(x, y) : y = |x|, xy \in R\}$

C. $\{(x, y) : x^2 + y^2 = 1, x, y \in R\}$

D. $\{(x, y) : x^2 - y^2 = 1, x, y \in R\}$

Answer: B

5. If $f : R \to R$, $f(x) = \dfrac{4^x}{4^x + 2}$ then,

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

B. $f(x) + f(1 - x) = 0$

C. $f(x) + f(1 - x) = 1$

D. $f(x) + f(x - 1) = 1$

Answer: C

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6. Domain of the function defined by $f(x) = \sqrt{4x - x^2}$ is......

A. $R - [0, 4]$

B. $R - (0, 4)$

C. $(0, 4)$

D. $[0, 4]$

Answer: D

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7. Domain of the function defined by $f(x) = \sqrt{5|x|} = x^2 - 6$ is.......

A. $(-3, -2) \cup (2, 3)$

B. $[-3, -2) \cup [2, 3)$

C. $[-3, -2) \cup [2, 3]$

D. None of these

Answer: C

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8. Range of $f(x) = \dfrac{x^2 - x}{x^2 + 2x}$ is ....

A. R

B. $R - \{1\}$

C. $R - \left\{ -\dfrac{1}{2}, 1 \right\}$

D. None of these

Answer: B

---

9. Range of the function $f(x) = \dfrac{x^2 + x + 2}{x^2 + x + 1}$ is......

A. $[1,3]$

B. $(3,5)$

C. $\left[1, \dfrac{7}{3}\right]$

D. $\left[1, \dfrac{7}{5}\right]$

Answer: C

---

10. $f(x) = bx^2 + cx$ and d and $f(x+1) - f(x) = 8x + 3$ then.......

A. $b = 2, c = 1$

B. $b = 4, c = -1$

C. $b = -1, c = 4$

D. $b = -1, c = 1$

Answer: B

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11. $f(x) = 2x^n + a$. If $f(2) = 26$ and f(4)= 138 then the value of f(3) is........

A. 56

B. 82

C. 64

D. 122

Answer: C

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12. Domain of the function defined by $f(x) = \sqrt{x-1} + \sqrt{3-x}$ is.....

A. $[1, \infty)$

B. $(-\infty, 3)$

C. $(1,3)$

D. $[1, 3]$

Answer: D

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13. Range of the function $f(x) = \dfrac{x+2}{|x+2|}, x \neq -2$ is......

A. $\{-1, 1\}$

B. $\{-1, 0, 1\}$

C. $\{1\}$

D. $(0, \infty)$

Answer: A

---

14. If $2f(x) - 3f\left(\dfrac{1}{x}\right) = x^2 (x \neq 0)$ then f(2)= ......

A. $-\dfrac{7}{4}$

B. $\dfrac{5}{2}$

C. -1

D. None of these

Answer: A

---

15. The graph of an identity function $I_R : R \to R$ is.........

A. Line

B. Finite points

C. Circle

D. Graph

Answer: A

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16. Range of the function $f: R \rightarrow R$, $f(x) = x^2$ is.........

A. R

B. Z

C. $R^+ \cup \{0\}$

D. $R - \{0\}$

Answer: C

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17. If $f: R \to R, f(x) = x - 2, g: R \to R, g(x) = x + 2$ then

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

A. x

B. $x^2 - 4$

C. 2x

D. 4

Answer: C

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18. $f(x) = x$, $g(x) = \dfrac{1}{x}$ and h(x)= f(x) g(x). If h(x) = 1 then.......

A. $x \in R$

B. $x \in Q$

C. $x \in R - Q$

D. $x \in R, x \neq 0$

Answer: D

---

19. If $f(x) = \dfrac{x - 3}{x + 1}$ then $f[f\{f(x)\}]=$ ....

A. $\dfrac{x}{2}$

B. x

C. $-x$

D. $\perp$

Answer: B

---

20. If $f(x) = 64x^3 + \dfrac{1}{x^3}$ and α and β are roots of the equation $4x + \dfrac{1}{x} = 3$ then..........

A. $f(\alpha) = f(\beta) = -9$

B. $f(\alpha) = f(\beta) = 63$

C. $f(\alpha) \neq f(\beta)$

D. None of these

Answer: A

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21. Range of greatest integer function is……..

A. N

B. Z

C. Q

D. R

Answer: B

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22. $f(x) = 3x^2 - 1$ and $g(x) = 3 + x$. If f= g then the value of x is.......

A. 1

B. $\dfrac{4}{3}$

C. $-\dfrac{4}{3}$

D. $\dfrac{3}{4}$

Answer: B

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23. The function 't' which maps temperature in degree Celsius into temperature in degree Fahrenheit is defined by $t(C) = \dfrac{9C}{5} + 32$

Find (i) t(0) (ii) t(28) (iii) t(-10) (iv) The value of C, when t(C)=212.

A. 14

B. 41

C. 50

D. None of these

Answer: A

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24. A and B are non null sets. Any one out of A and B is infinite then $A \times B$ is .....

A. not defined

B. singleton

C. Universal set

D. Empty set

Answer: C

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25. Domain of $f(x) = \sqrt{2 - 2x - x^2}$ is.........

A. $\left[-\sqrt{3}, \sqrt{3} \right]$

B. $\left[-1 - \sqrt{3}, -1 + \sqrt{3} \right]$

C. $\left[-2, 2 \right]$

D. $\left[-2 - \sqrt{3}, -2 + \sqrt{3} \right]$

Answer: B

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Textbook Illustrations For Practice Work

1. If (x+1, y-2)=(3,1), find the values of x and y.

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2. If P={a,b,c} and Q={r}, form the sets $P \times Q$ and $Q \times P$. Check if the products are equal or not?

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3. Let A= {1, 2, 3}, B= {3, 4} and C= {4, 5, 6}. Find

$A \times (B \cap C)$

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4. Let A= {1, 2, 3}, B= {3, 4} and C= {4, 5, 6}. Find

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

> ▶ Watch Video Solution

5. Let A= {1, 2, 3}, B= {3, 4} and C= {4, 5, 6}. Find

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

6. Let A= {1, 2, 3}, B= {3, 4} and C= {4, 5, 6}. Find

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

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

8. If R is the set of all real numbers, what do the cartesian products

$R \times R$ and $R \times R \times R$ represent?

9. If $A \times B = \left\{ \begin{array}{cc} (p, q) & (p, r) \\ (m, q) & (m, r) \end{array} \right\}$, find A and B.

10. Let A={1,2,3,4,5,6}. Define a relation R form A to A by R= {(x,y) : y=x+1}

(i) Depict this relation using an arrow diagram.

(ii) Write down the domain, codmain and range of R.

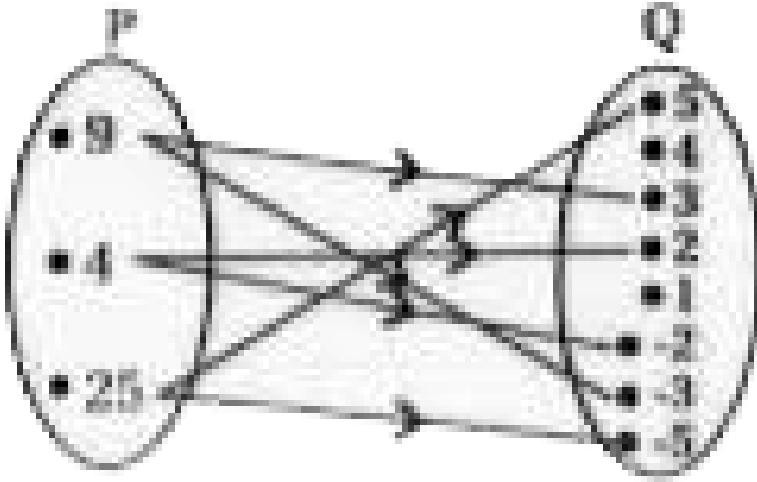**11.** Let A={1,2,3....14}. Define a relation R from A to A by $R = \{(x, y) : 3x - y = 0, \quad \text{where} \quad x, y \in A\}$. Write down its domain, condomain and range.

12. The figure shows a relation between the sets P and Q. Write this relation (i) in set-builder form, (ii) in roster form. What is its domain and

range?

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

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14. Let N be the set of natural numbers and the relation R be defined on

N such that $R = \{(x, y) : y = 2x, y \in N\}$,

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15. Examine each of the following relations given below and state in each case, giving resons whether it is function or not?

(i) R={(2,1), (3,1), (4,2)}, (ii) R={(2,2), (2,4) ,(3,3),(4,4)}

(ii) R={(1,2),(2,3),(3,4),(4,5),(5,6),(6,7)}

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(i) R={(2,1), (3,1), (4,2)}, (ii) R={(2,2), (2,4) ,(3,3),(4,4)}

(ii) R={(1,2),(2,3),(3,4),(4,5),(5,6),(6,7)}

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(i) R={(2,1), (3,1), (4,2)}, (ii) R={(2,2), (2,4) ,(3,3),(4,4)}

(ii) R={(1,2),(2,3),(3,4),(4,5),(5,6),(6,7)}

18. Let N be the set of natural numbers. Define a real valued function $f: N \to n$ by f(x)=2x+1. Using this defination, complete the table given below,

x	1	2	3	4	5	6	7
y	$f(1) = ...$	$f(2) = ...$	$f(3) = ...$	$f(4) = ...$	$f(5) = ...$	$f(6) = ...$	$f(7) = ...$

19. Define the function $f: R \to R$ by $y = f(x) = x^2, x \in R$. Complete the Table given below by using this defination. What is the domain and range of this function? Draw the graph of f.

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

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

21. Define the real valued function $f: R - \{0\} \to R$ defined by $f(x) = \dfrac{1}{2}x \in R - \{0\}.$ 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
$y = \dfrac{1}{x}$		...	...	...	...	...	...		...	...

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

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

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24. Let R be the set of real numbers. Define the real function $f : R \to R$ by $f(x) = x + 10$ and sketch the graph of this function.

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

(i) $(a, a) \in R$ for all $a \in Q$

(ii) $(a, b) \in R$ implies that $(b, a) \in R$

(iii) $(a, b) \in R$ and $(b, c) \in R$ implies that $(a, c) \in R$

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26. Let R be a relation from Q to Q defined by

$R = \{(a, b) : a, b \in Q \text{ and } a - b \in Z\}$. Show that

(i) $(a, a) \in R$ for all $a \in Q$

(ii) $(a, b) \in R$ implies that $(b, a) \in R$

(iii) $(a, b) \in R$ and $(b, c) \in R$ implies that $(a, c) \in R$

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27. Let R be a relation from Q to Q defined by

$R = \{(a, b) : a, b \in Q \text{ and } a - b \in Z\}$. Show that

(i) $(a, a) \in R$ for all $a \in Q$

(ii) $(a, b) \in R$ implies that $(b, a) \in R$

(iii) $(a, b) \in R$ and $(b, c) \in R$ implies that $(a, c) \in R$

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

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30. 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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Solutions Of Ncert Exemplar Problems

1. If $A = \{ -1, 2, 3\}$ and $B = \{1, 3\}$, the determine

$A \times B$

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2. If $A = \{-1, 2, 3\}$ and $B = \{1, 3\}$, the determine

$B \times A$

3. If $A = \{-1, 2, 3\}$ and $B = \{1, 3\}$, the determine

$B \times B$

4. If $A = \{-1, 2, 3\}$ and $B = \{1, 3\}$, the determine

$A \times A$

5. If $P = \{x : x < 3, x \in N\}, Q = \{x : x \leq 2, x \in W\}$ then find

$(P \cup Q) \times (P \cap Q)$, where W is the set of whole numbers.

6. If

$A = \{x : x \in W, x < 2\}, B = \{x : x \in N, 1 < x < 5\}$ and $C = \{3, 5\}$,

then find $A \times (B \cap C)$

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7. If

$A = \{x : x \in W, x < 2\}, B = \{x : x \in N, 1 < x < 5\}$ and $C = \{3, 5\}$,

then find $A \times (B \cup C)$.

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8. In each of the following cases, find a and b.

$(2a + b, a - b) = (8, 3)$

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9. In each of the following cases, find a and b.

$$\left(\frac{a}{4}, a - 2b\right) = (0, 6 + b)$$

10. $A = \{1, 2, 3, 4, 5\}, S = \{(x, y) : x \in A, y \in A\}$, then find the ordered which satisfy the conditions given below.

$x + y = 5$

11. $x + y < 5$

12. $A = \{1, 2, 3, 4, 5\}, S = \{(x, y) : x \in A, y \in A\}$, then find the ordered which satisfy the conditions given below.

$x + y > 8$

13. If $R = \{(x, y) : x, y \in W, x^2 + y^2 = 25\}$, then find the domain and range of R.

14. $R_1 = \{(x, y) \mid y = 2x + 7, y \in R \text{ and } x \in [-5, 5]\}$ Then range of R_1 ....

15. If $R_2 = \{(x, y) \mid x \text{ and } y \text{ are integers and } x^2 + y^2 = 64\}$ is a relation, then find the value of R_2.

16. If $R_3 = \{(x, |x|), x \text{ is a real number}\}$ is a relation, then find domain and range of R_3.

17. Is the given relation a function? Give reason for your answer.

$h = \{(4, 6), (3, 9), (-11, 6), (3, 11)\}$

18. Is the given relation a function? Give reason for your answer.

$f = \{(x, x)|x \text{ is a real number}\}$

19. Is the given relation a function? Give reason for your answer.

$g = \left\{ \left(x, \dfrac{1}{x} \right) \mid x \text{ is a positive integer} \right\}$

20. Is the given relation a function? Give reason for your answer.

s= $\{(x, x^2) \mid x$ is a positive integer}

21. Is the given relation a function? Give reason for your answer.

t= $\{(x, 3) \mid x$ is a real number}

22. If f and g are real functions defined by $f(x) = x^2 + 7$ and $g(x) = 3x + 5$. Then, find each of the following

$f(3) + g(-5)$

23. If f and g are real functions defined by $f(x) = x^2 + 7$ and $g(x) = 3x + 5$. Then, find each of the following

$f\left(\dfrac{1}{2}\right) \times g(14)$

24. If f and g are real functions defined by $f(x) = x^2 + 7$ and $g(x) = 3x + 5$. Then, find each of the following

$f(-2) + g(-1)$

25. If f and g are real functions defined by $f(x) = x^2 + 7$ and $g(x) = 3x + 5$. Then, find each of the following

$f(1) - f(-2)$

26. If f and g are real functions defined by $f(x) = x^2 + 7$ and $g(x) = 3x + 5$. Then, find each of the following

$\dfrac{f(t) - f(5)}{t - 5}$, if $t \neq 5$

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27. f and g are real functions defined by f(x)= 2x + 1 and g(x) =4x -7. If f(x) = g(x) then x = ...

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28. Let f and g be real functions defined by $f(x) = 2x + 1$ and $g(x) = 4x - 7$.

For what real numbers x, $f(x) < g(x)$?

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29. If f and g are two real valued functions defined as $f(x) = 2x + 1$ and $g(x) = x^2 + 1$, then find $f + g$

30. If f and g are two real valued functions defined as $f(x) = 2x + 1$ and $g(x) = x^2 + 1$, then find $f - g$

31. If f and g are two real valued functions defined as $f(x) = 2x + 1$ and $g(x) = x^2 + 1$, then find fg

32. If f and g are two real valued functions defined as $f(x) = 2x + 1$ and $g(x) = x^2 + 1$, then find $\dfrac{f}{g}$.

33. Express the following functions as set of ordered pairs and determine their range.

$f: x \to R, f(x) = x^3 + 1$, where $x = \{-1, 0, 3, 9, 7\}$

34. Find the values of x for which the functions $f(x) = 3x^2 - 1$ and $g(x) = 3 + x$ are equal

Solutions Of Ncert Exemplar Problems Long Answer Type Questions

1. Is $g = \{(1, 1), (2, 3), (3, 5), (4, 7)\}$ a function, justify. If this is described by the relation, $g(x) = \alpha x + \beta$, then what values should be assigned to α and β ?

2. Find the domain of each of the following functions given by

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

3. Find the domain of the following functions.

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

4. Find the domain of each of the following functions given by

$$f(x) = x|x|$$

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5. Find the domain of each of the following functions given by

$$f(x) = \frac{x^3 - x + 3}{x^2 - 1}$$

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6. Find the domain of each of the following functions given by

$$f(x) = \frac{3x}{28 - x}$$

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7. Find the range of the following functions given by

$$f(x) = \frac{3}{2 - x^2}$$

8. Find the range of the following function

$$f(x) = 1 - |x - 2|, x \in R$$

9. Find the range of the following functions given by

$$f(x) = |x - 3|$$

10. Find the range of the following functions given by

$$f(x) = 1 + 3\cos 2x$$

11. Redefine the function $f(x) = |x - 2| + |2 + x|, \ -3 \le x \le 3$

12. If $f(x) = \dfrac{x - 1}{x + 1}$, Then show that

$$f\left(\dfrac{1}{x}\right) = -f(x)$$

13. If $f(x) = \dfrac{x - 1}{x + 1}$, Then show that

$$f\left(-\dfrac{1}{x}\right) = \dfrac{-1}{f(x)}$$

14. If $f(x) = \sqrt{x}$ and $g(x) = x$ be two functions defined in the domain $R^+ \cup \{0\}$, then find the value of $(f + g)(x)$.

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

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

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

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18. Find the domain and range of the following function

$$f(x) = \frac{1}{\sqrt{x-5}}$$

19. If $f(x) = y = \frac{ax-b}{cx-a}$, then prove that $f(y) = x$

Solutions Of Ncert Exemplar Problems Objective Type Questions

1. n(A)= m, n (B) = n. The total number of non empty relation from A to B is........

A. m^n

B. $n^m - 1$

C. $mn - 1$

D. $2^{mn} - 1$

2. If $[x]^2 - 5[x] + 6 = 0$, where [.] denote the greatest integer function, then

  A. $x \in [3, 4]$

  B. $x \in [2, 3]$

  C. $x \in [2, 3]$

  D. $x \in [2, 4]$

3. Range of $f(x) = \dfrac{1}{1 - 2\cos x}$ is

A. $\left[\dfrac{1}{3}, 1\right]$

B. $\left[-1, \dfrac{1}{3}\right]$

C. $(-\infty, -1) \cup \left[\dfrac{1}{3}, \infty\right)$

D. $\left[-\dfrac{1}{3}, 1\right]$

Answer: B

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4. Let $f(x) = \sqrt{1 + x^2}$ then,

A. $f(xy) = f(x) \cdot F(y)$

B. $f(xy) \geq f(x) \cdot f(y)$

C. $f(xy) \leq f(x) \cdot f(y)$

D. None of these

Answer: C

---

5. Domain of $f(x) = \sqrt{a^2 - x^2}\,(a > 0)$ is

A. $(-a, a)$

B. $[-a, a]$

C. $[0, a]$

D. $(-a, 0]$

Answer: B

---

6. f(x) is linear function of the type mx + c and f(-1) = -5 and f(3) = 3 then

values of m and c are ....and ....

A. $a = -3, b = -1$

B. $a = 2, b = -3$

C. $a = 0, b = 2$

D. $a = 2, b = 3$

Answer: B

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7. The domain of the function f defined by $f(x) = \sqrt{4 - x} + \dfrac{1}{\sqrt{x^2 - 1}}$ is equal to

A. $(-\infty, -1) \cup (1, 4]$

B. $(-\infty, -1) \cup (1, 4]$

C. $(-\infty, -1) \cup [1, 4]$

D. $(-\infty, -1) \cup [1, 4)$

Answer: A

8. The domain and range of the real function f defined by $f(x) = \dfrac{4 - x}{x - 4}$ is given by

    A. Domain = R, Range $= \{-1, 1\}$

    B. Domain $= R - \{1\}$, Range = R

    C. Domain = $R - \{4\}$, Range $= \{-1\}$

    D. Domain $= R - \{-4\}$, Range $= \{-1, 1\}$

Answer: C

9. Find the domain and the range of the real function f defined by $f(x) = \sqrt{x - 1}.$

    A. Domain = $(1, \infty)$, Range $= (0, \infty)$

B. Domain $= [1, \infty)$, Range $= (0, \infty)$

C. Domain $= (1, \infty)$, Range $= [0, \infty)$

D. Domain $= [1, \infty)$, Range $= [0, \infty)$

Answer: D

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10. The domain of the function f given by $f(x) = \dfrac{x^2 + 2x + 1}{x^2 - x - 6}$

A. $R - \{3, \, -2\}$

B. $R - \{-3, 2\}$

C. $R - \{3, \, -2\}$

D. $R - \{3, \, -2\}$

Answer: A

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11. The domain and range of the function f given by $f(x) = 2 - |x - 5|$ is

A. Domain $= R^+$, Range $= (-\infty, 1]$

B. Domain = R, Range $= (-\infty, 2]$

C. Domain = R, Range $= (-\infty, 2)$

D. Domain $= R^+$, Range $= (-\infty, 2]$

Answer: B

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12. Find the values of x for which the functions $f(x) = 3x^2 - 1$ and $g(x) = 3 + x$ are equal

A. $\left[-1, \dfrac{4}{3}\right]$

B. $\left[1, \dfrac{4}{3}\right]$

C. $\left[-1, -\dfrac{4}{3}\right]$

D. $\left[-2, -\dfrac{4}{3}\right]$

Answer: A

Solutions Of Ncert Exemplar Problems Fillers

1. Let f and g be two real functions given by

$f = \{(0, 1), (2,), (3, -4), (4, 2), (5, 1)\}$ and

$g = \{(1, 0), (2, 2), (3, -1), (4, 4), (5, 3)\}$. Find Domain.

2. Let

$f = \{(2, 4), (5, 6), (8, -1), (10, -3)$ and $g\{(2, 5)(7, 1), (8, 4), (10, 13),$ (

be two real functions. Then, match the following.

Column-I	Column-II
(i) $f - g$	(a) $\left\{\left(2, \frac{4}{5}\right), \left(8, \frac{-1}{4}\right), \left(10, \frac{-3}{13}\right)\right\}$
(ii) $f + g$	(b) $\{(2, 20), (8, -4), (10, -39)\}$
(iii) $f \cdot g$	(c) $\{(2, -1), (8, -5), (10, -16)\}$
(iv) $\dfrac{f}{g}$	(d) $\{(2, 9), (8, 3), (10, -10)\}$

The domain of $f - g$, $f + g$, $f. g$, $\dfrac{f}{g}$ is domain of $f \cap$ domain of g. Then, find their images.

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1. The ordered pair (5,2) belongs to the relation

$R = \{(x, y) : y = x - 5, x, y \in Z\}$

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

3. If A= {1, 2, 3}, B= {3, 4} and C= {4, 5, 6}, then

$(A \times B) \cup (A \times C) = \{(1, 3), (1, 4), (1, 5), (1, 6), (2, 3), (2, 4), (2, 5),$

$(2, 6), (3, 3), (3, 4), (3, 5), (3, 6)\}$

4. If $(x - 2, y + 5) = \left(-2, \dfrac{1}{3} \right)$ are two equal ordered pairs, then

$x = 4, y = \dfrac{-14}{3}$

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

1. $A = \{-1, 0\}, B = \{-1, 0, 1\},$ then find $A \times B$ and $B \times A$

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2. A and B are not singleton sets. $n(A \times B) = 21.$ If $A \subset B$ then $n(B) = \ldots\ldots\ldots$

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3. $A = \{2, 3\}, B = \{-1, 2, 5\}$ then find the number of elements in the power set of $A \times B$.

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4. Let A={1,2,3....14}. Define a relation R from A to A by $R = \{(x, y) : 3x - y = 0, \text{ where } x, y \in A\}.$ Write down its domain,

condomain and range.

5. A = {2, 3, 4, 5} , B= {3, 6,7}. A relation from A to B is R defined as, $x\,Ry \Leftrightarrow x$ and y are prime numbers. Find domain and range of R.

6. A= {a, b, c}. Find the number of relations defined on A.

7. $f: Z \rightarrow Z,\ f(n) = (-1)^n$. Find the range of f.

8. f(x) is a real valued function $f(x) = \dfrac{1}{\sqrt{5x - 3}}$. Find the domain of f(x).

9. The function f which maps temperature in degree Celsius into temperature in degree Fahrenheit is defined by $f(c) = \dfrac{9c}{5} + 32$. Find the image of 40 and preimage of 122.

10. Find the range of the function $f(x) = \sqrt{25 - x^2}$

11. A= {5, 10, 15, 20}, B= {2,4,6,8, 10}. Out of the following, which is a function?

(a) {(5, 2), (10, 4), (15,6), (20, 9)}

(b) {(5, 2), (10, 4)}

(c) {(5, 2), (10, 4), (15,6), (20), 10)}

(d) {(5, 1), (5, 10), (15, 6), (20,9)}

12. Find the range of $f(x) = \dfrac{x + 5}{|x + 5|}$, $x \neq -5$.

13. Find the range of $f: R \rightarrow R$, $f(x) = x^2 - 6x + 7$

14. $f: R \rightarrow R$, $f(x) = |x + 2|$. Draw the graph of f(x) and hence find its range.

15. A= {1, 2, 3, 4, 5} R $= \left\{ (x, y) \mid \left| x^2 - y^2 \right| < 16 \right\}$ Find R.

16. Find the range of the given function defined as $f(x) = \dfrac{x - [x]}{1 + x - [x]}$