MATHS

BOOKS - PSEB

RELATIONS AND FUNCTIONS

Exercise

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

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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 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)}.

5. 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 $y \in B$.

6. 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 $A \times (B \cap \phi) = \phi$.

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

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} andD = {5, 6, 7, 8}. Verify that

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

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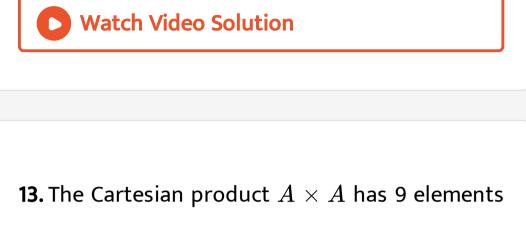
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11. Let A = {1, 2} and B = {3, 4}. Write $A \times B$. How many subsets will $A \times B$ have? List them.

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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 setA and the remaining elements of $A \times A$.

14. 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}. Write

down its domain, codomain and range.

15. 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.

16. 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.

17. The Fig2.7 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?

18. 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

19. 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

20. 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.

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

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

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

24. Let R be the relation on Z defined by R = {(a,b): a, b ∈ Z, a-b is an integer}. Find the domain

and range of R.

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

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

26. Which of the following relations are functions? Give reasons. 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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27. 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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28. Find the domain and range of the following real function:- $f(x) = -|x|$

29. Find the domain and range of the following real function:- $f(x) = \sqrt{9 - x^2}$

30. A function f is defined by f(x)= 2x -5. Write down the values of f(0)

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31. A function f is defined by f(x)= 2x -5. Write down the values of f(7)

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32. A function f is defined by f(x)= 2x -5. Write down the values of f(-3)

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

t(0)

34. The function 't' which maps temperature in degree Celsius into temperature in degree

Fahrenheit is defined by $t(C) = \dfrac{9C}{5} + 32$.Find:-

t(28)

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

t(-10)

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

The value of C, when t(C) = 212.

37. Find the range of the following function:-

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

38. Find the range of the following function:-

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

39. Find the range of the following function:-

$f(x) = x$, x is a real number.

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

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42. Find the domain of the function

$f(x) = \dfrac{x^2 + 2x + 1}{x^2 - 8x + 12}$.

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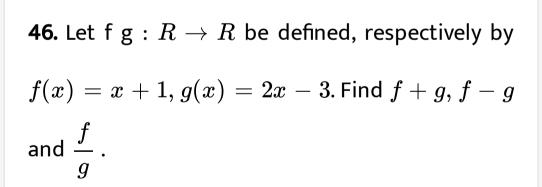**43.** Find the domain and the range of the real function 'f' defined by $f(x) = \sqrt{(x-1)}$.

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

45. 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'.

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

47. 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.

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

49. 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

50. 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

51. 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

52. 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.

53. 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.

54. 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.