Ch-2 Relations and Functions
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1. $A = \{1, 3, 5\}, B = \{2, 5\}$. Find $A \times B$, $B \times A$. Show $A \times B \neq B \times A$. How many relations from A to B exists?

2. Find a, b; when (2a+b,11) = (1,a-3b).

3. If A={1,2,3}, B= {3,4}, C= {4,5,6}. Find:

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

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

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

4. $A \times B$ has 4 elements. Two of those elements are (3,2), (5,4). Find A, B, $A \times B$.

5. What does $\mathbb{R}$, $\mathbb{R} \times \mathbb{R}$, $\mathbb{R} \times \mathbb{R} \times \mathbb{R}$ represent, where $\mathbb{R}$= Set of real numbers? Write each one in set-builder form.

6. Express $\{(x, y) : x^2 + y^2 = 25,\ \text{where x,y} \in \mathbb{N}\}$ as a set of ordered pairs.

7. Let $A = \{x : x^2 - 5x + 6 = 0\ \&\ x \in \mathbb{N}\}$, $B = \{x : 0 \leq x \leq 2\ \&\ x \in \mathbb{N}\}$ and $C = \{\ x : x < 3\ \&\ x \in \mathbb{N}\}$. Evaluate:

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

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

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

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

   What is the relation between a) and b). What about c) and d)?

8. A={-1,1}. Find A^3.

9. $R = \{(a, b) : a, b \in \mathbb{N}\ \text{and}\ 2a + b = 10\}$. Mention domain, co-domain and range of relation R.

10. If A & B are two sets containing m and n elements resp. how many different relations can be defined on A to B?

11. A={-1,1,2,3,4,5}, B={1,4,9,16,25,36}. Let $f = \{(x, y) : x \in A, y \in B\ \text{and}\ y = x^2\}$.

    Is f a function from A to B? Why or Why not? Mention its domain and range if f is a function.

12. Let $f = \{(x, y) : x, y \in \mathbb{N},\ y = 2x\}$ be a relation on $\mathbb{N}$. Find its domain, co-domain and range. Is this relation a function? Why or why not?

13. Let $f = (-1, -3), (0, -1), (1, 1), (2, 3)$ be a linear function from $\mathbb{Z}$ to $\mathbb{Z}$. Find f.

14. Which of the following relations are functions? Give reasons.

    In case of a function, find its domain and range.

    a) $f = \{(1,3), (1,5), (2,3), (2,5)\}$

    b) $g = \{(2,1), (5,1), (8,1), (11,1)\}$

    c) $h = \{(6,3), (2,1), (4,2), (8,4), (10,5)\}$.

15. What is the domain of the rational function $f(x) = \frac{x^2+2x+1}{x^2-8x+12}$.

16. $f = \{(x, \frac{2x}{1+2x}) : x \in \mathbb{R}\}$ be a function from $\mathbb{R} \to \mathbb{R}$. Determine the range of f.

17. $f(x) = \sqrt{(x-3)(x-7)}$. Find its domain and range such that the f is a real valued function.

18. If $f(x) = x + \frac{1}{x}, x \neq 0$. Show that $f(x) = f(\frac{1}{x})$.