# MATHS

# NCERT - NCERT MATHEMATICS(TELUGU)

# RELATIONS AND FUNCTIONS

## Example

**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 $Q \times P$.

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

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

B.

C.

D.

**Answer:**

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

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**5.** 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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**6.** If $A \times B = \left\{ \begin{matrix} (p, q) & (p, r) \\ (m, q) & (m, r) \end{matrix} \right\}$, find A and B.

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**7.** 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.

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

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

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**10.** 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)},

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**11.** 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 |
|---|---|---|---|---|---|---|---|
| $y$ | $f(1) = \ldots$ | $f(2) = \ldots$ | $f(3) = \ldots$ | $f(4) = \ldots$ | $f(5) = \ldots$ | $f(6) = \ldots$ | $f(7) = \ldots$ |

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**12.** Define the function $f: R \to Rbyy = f(x) = x^2, x \in R.$ Complete the Table given below by using this definition. What is the domain and range of this function?

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

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

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**14.** Define the real valued function $f: R - \{0\} \to R$ 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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**15.** Let R be the set of real numbers. Define the real function $f: R \to Rbyf(x) = x + 10$ and sketch the graph of this function.

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**16.** 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 $a \in Q$

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**17.** 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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**18.** Find the domain of the function

$$f(x) = \frac{x^2 + 3x + 5}{x^2 - 5x + 4}$$

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**19.** 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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Exercise 2 1

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

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

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

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**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 $P \times Q = \{(m, n), (n, m)\}$.

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

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

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**7.** Let A={1,2}, B={1,2,3,4}, C={5,6} and D={5,6,7,8}. Verify that

(i)A×(B∩C)=(A×B)∩(A×C)

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**8.** 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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**9.** 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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**10.** 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 $A \times A$.

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## 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.

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**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.

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**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.

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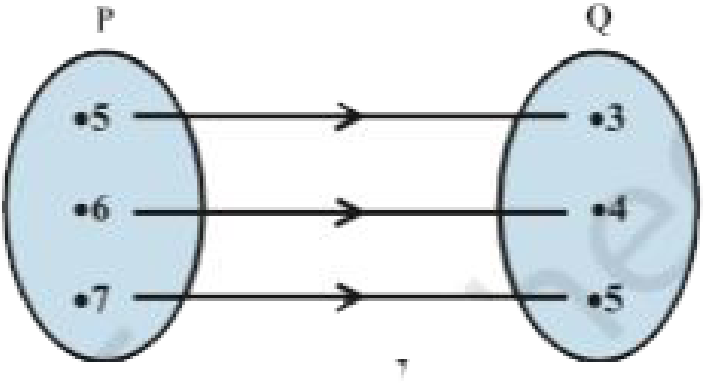
**4.** The Fig 2.7 shows a relationship between the sets P and Q. Write this relation

(i) in set-builder form (ii) roster form. What is its

domain and range?

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**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.

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**6.** 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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**7.** Write the relation $R = \left\{\left(x, x^3\right) : x\right.$ is a prime number less than 10

1) write in roster form.

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

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

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## 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.** Find the domain and range of the following real functions:

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

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

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

Find the value of C, when t(C)=212.

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**5.** Find the range of each of the following functions.

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

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

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

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## Miscellaneous Exercise On Chapter 2

**1.** 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

$$g(x) = \begin{cases} x^2 & 0 \le x \le 2 \\ 3x & 2 \le x \le 10 \end{cases}$$

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

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

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

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

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**6.** 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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**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 $\frac{f}{g}$.

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**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,

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**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.

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**10.** 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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**11.** 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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**12.** 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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