FREE NCERT SOLUTIONS

CLASS - 11

RELATIONS AND FUNCTIONS

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EXERCISE 2.1 - Question No. 1

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

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EXERCISE 2.1 - Question No. 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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EXERCISE 2.1 - Question No. 3

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

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EXERCISE 2.1 - Question No. 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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EXERCISE 2.1 - Question No. 5

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

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EXERCISE 2.1 - Question No. 6

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

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EXERCISE 2.1 - Question No. 7

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)

$A \times C$ isasubsetof$B \times D$.

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EXERCISE 2.1 - Question No. 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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EXERCISE 2.1 - Question No. 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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EXERCISE 2.1 - Question No. 10

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

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EXERCISE 2.2 - Question No. 1

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

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EXERCISE 2.2 - Question No. 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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EXERCISE 2.2 - Question No. 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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EXERCISE 2.2 - Question No. 4

The Figure 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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EXERCISE 2.2 - Question No. 5

Let $A = \{1, 2, 3, 4, 6\}$. Let R be the relation on A defined by $\{(ab) : a, b \in A, b \text{ is exactly divisible by } a\}$. (i) Write R in roster form (ii) Find the domain of R (iii) Find the range of R.

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EXERCISE 2.2 - Question No. 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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EXERCISE 2.2 - Question No. 7

Write the relation $R = \{(x, x^3) : x$ is a prime number less than $10\}$

in roster form.

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EXERCISE 2.2 - Question No. 8

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

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EXERCISE 2.2 - Question No. 9

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

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EXERCISE 2.3 - Question No. 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),

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EXERCISE 2.3 - Question No. 2

Find the domain and range of the following real functions: (i) $f(x) = -|x|$ (ii) $f(x) = \sqrt{9 - x^2}$

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EXERCISE 2.3 - Question No. 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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EXERCISE 2.3 - Question No. 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 (i) t (0) (ii) t(28) (iii) t(10) (iv) The value of C, when $t(C) = 212$.

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EXERCISE 2.3 - Question No. 5

Find the range of each of the following functions. (i)

$f(x) = 23x, x \in R, x$ and $> ; 0$ (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 - Question No. 1

The relation f is defined by $f(x) = \{x^2, 0 \leq x \leq 33x, 3 \leq x \leq 10$

The relating g is defined by $g(x) = \{x^2, 0 \leq x \leq 33x, 2 \leq x \leq 10$

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

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MISCELLANEOUS EXERCISE - Question No. 2

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

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MISCELLANEOUS EXERCISE - Question No. 3

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

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MISCELLANEOUS EXERCISE - Question No. 4

Find the domain and the range of the real function f defined by

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

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MISCELLANEOUS EXERCISE - Question No. 5

Find the domain and the range of the real function/defined by

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

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MISCELLANEOUS EXERCISE - Question No. 6

Let $f = \{(x, \frac{x^2}{1 + x^2}) : x \in R\}$ be a function from R into R.

Determine the rage of f.

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MISCELLANEOUS EXERCISE - Question No. 7

Let f, g : R $\rightarrow$ R be defined, respectively by f(x) = x + 1 ,

g(x) = 2x3 . Find f + g, fg and $\frac{f}{g}$.

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MISCELLANEOUS EXERCISE - Question No. 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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MISCELLANEOUS EXERCISE - Question No. 9

Let R be a relation from N to N defined by $R = \{(a, b) : ab \in N$ and $a = b^2\}$. Are the following true? (i) $(a, a) \in R$, f or alla $\in N$ (ii) $(a, b) \in R$, implies$(b, a) \in R$ (iii) `(a ,

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MISCELLANEOUS EXERCISE - Question No. 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 y

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MISCELLANEOUS EXERCISE - Question No. 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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MISCELLANEOUS EXERCISE - Question No. 12

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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SOLVED EXAMPLES - Question No. 1

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

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SOLVED EXAMPLES - Question No. 2

If $P = \{a, b, c\}$ and $A \times B = \{(p, q), (p, r), (m, q), (m, r)\}$ $Q = \{r\}$,

form the sets $P \times Q$ and $Q \times P$. Are these two products equal?

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SOLVED EXAMPLES - Question No. 3

Let $A = \{1, 2, 3\}$, $B = \{3, 4\}$ and $C = \{4, 5, 6\}$. Find (i)

$A \times (B \cap C)$ (ii) $(A \times B) \cap (A \times C)$ (iii) $A \times (B \cup C)$ (iv)

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

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SOLVED EXAMPLES - Question No. 4

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

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SOLVED EXAMPLES - Question No. 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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SOLVED EXAMPLES - Question No. 6

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

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SOLVED EXAMPLES - Question No. 7

Let A = {1, 2, 3, 4, 5, 6} . Define a relation R from A to A by R = {(x, y) : y = x + 1} (i) Depict this relation using an arrow diagram. (ii) Write down the domain, co-domain and range of R.

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SOLVED EXAMPLES - Question No. 8

The Fig 2.6 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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SOLVED EXAMPLES - Question No. 9

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

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SOLVED EXAMPLES - Question No. 10

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, codomain and range of R? Is this relation a function?

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SOLVED EXAMPLES - Question No. 11

Examine each of the following relations given below and state in each case, giving reasons whether it is a function or not? (i) $R = \{(2, 1), (3, 1), (4, 2)\}$, (ii) $R = \{(2, 2), (2, 4), (3, 3), (4, 4)\}$ (iii) `R= {(1, 2

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SOLVED EXAMPLES - Question No. 12

Let N be the set of natural numbers. Define a real valued function $f: N -$ and $>$; N by $f(x) = 2x + 1$. Using this definition, complete the table given below.

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SOLVED EXAMPLES - Question No. 13

Define the function f : R − and > ; R by $y = f(x) = x^2$, $x \in R$.

Complete the Table given below by using this definition. What is

the domain and range of this function? Draw the graph of f.

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SOLVED EXAMPLES - Question No. 14

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

$x \in R$.

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SOLVED EXAMPLES - Question No. 15

Define the real valued function $f: R\{0\} -$ and $>$; 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? $y = \frac{1}{x}$

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SOLVED EXAMPLES - Question No. 16

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

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SOLVED EXAMPLES - Question No. 17

Let $f(x) = \sqrt{x}$ and $g(x) = x$ be two functions defined over the set of nonnegative real numbers. Find $(f + g)(x)$, $(fg)(x)$, $(fg)(x)$ and $(\frac{f}{g})(x)$.

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SOLVED EXAMPLES - Question No. 18

Let R be the set of real numbers. Define the real function

$f: R \rightarrow Rbyf(x) = x + 10$ and sketch the graph of this function.

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SOLVED EXAMPLES - Question No. 19

Let R be a relation from Q to Q defined by

$R = \{(a, b) : a, b \in Q \text{ and } a, b \in Z\}$. Showt^{a,a) in R for all a in

Q ,$\{a, b\} \in R \Rightarrow$ that

$\{b, a\} \in R, \{a, b\} \in R$ and $\{b, c\} \in R \Rightarrow$ tâ, $c \in R$ `

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SOLVED EXAMPLES - Question No. 20

Let $f = \{(1, 2), (2, 3), (0, 1), (1, 3)\}$ be a linear function from Z into

Z. Find f(x).

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SOLVED EXAMPLES - Question No. 21

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

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SOLVED EXAMPLES - Question No. 22

The function f is defined by

$f(x) = \{1 - x, x < 01, x = 0x + 1, x > 0$ Draw the graph of f(x).

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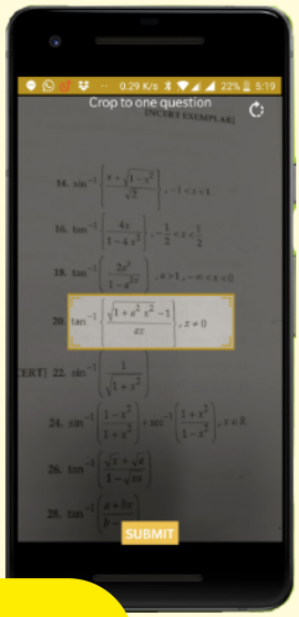

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