



MATHS

BOOKS - NCERT MATHS (ENGLISH)

RELATIONS AND FUNCTIONS

Short Answer Type Questions

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

(i) $A \times B$ (ii) $B \times A$ (iii) $B \times B$ (iv) $A \times A$



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

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



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3.

If

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

then find

$$(i) A \times (B \cap C) \quad (ii) A \times (B \cup C)$$



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

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

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



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

$$(i) x + y = 5 \quad (ii) x + y < 5$$

$$(iii) x + y > 8$$



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



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7. If $R_1 = \{(x, y) \mid y = 2x + 7, \text{ where } x \in R \text{ and } -5 \leq x \leq 5\}$ is a relation. Then, find the domain and range of R_1



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8. If $R_2 = \{(x, y) \mid x \text{ and } y \text{ are integers and } x^2 + y^2 = 64\}$ is a relation. Then find R_2 .



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

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10. If the given relation a function? Give reason for your answer.

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

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

(iii) $g = \left\{ \left(x, \frac{1}{x} \right) | x \text{ is a positive integer} \right\}$

(iv) $s = \{(x, x^2) | x \text{ is positive integer}\}$

(v) $t = \{(x, 3) | x \text{ is a real number}\}$

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11. 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.

(i) $f(3) + g(-5)$ (ii) $f\left(\frac{1}{2}\right) \times g(14)$

(iii) $f(-2)+g(-1)$ (iv) $f(t)-f(-2)$

(v) $\frac{f(t) - f(5)}{t - 5}$ if $t \neq 5$

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

(i) For what real number x , $f(x) = g(x)$?

(ii) for what real number x , $f(x) < g(x)$?

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

(i) $f+g$ (ii) $f-g$ (iii) fg (iv) $\frac{f}{g}$

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14. Express the function $f: \overrightarrow{X \rightarrow R}$ given by $f(x) = x^3 + 1$ as set of ordered pairs, where $X = \{-1, 0, 3, 9, 7\}$.

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

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Long Answer Type Questions

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

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

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

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

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

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

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



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3. Find the range of the following functions given by

$$f(x) = \frac{3}{2 - x^2} \quad (ii) f(x) = 1 - |x - 2|$$

$$(iii) f(x) = |x - 3| \quad (iv) f(x) = 1 + 3 \cos 2x$$



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4. Re define the function $f(x) = |x - 2| + |2 + x|$, $-3 \leq x \leq 3$



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5. If $f(x) = \frac{x-1}{x+1}$, then show that $f\left(\frac{1}{x}\right) = -f(x)$ (ii)

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

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

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

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8. $y = f(x) = \frac{ax-b}{cx-a}$ then $f(y) = ?$

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Objective Type Questions

1. Let $A = \{x_1, x_2, \dots, x_m\}$, $B = \{y_1, y_2, \dots, y_n\}$ then total number of non-empty relations that can be defined from A to B, is (i) m^n (ii) n^{m-1} (iii) $mn - 1$ (iv) $2^{(mn)-1}$

A. m^n

B. $n^m - 1$

C. $mn-1$

D. $2^{mn} - 1$

Answer: D



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2. If $[x]^2 - 5[x] + 6 = 0$, $[x]$ denote the greatest integer function, then $x \in [3, 4]$ (ii) $x \in (2, 3]$ (iii) $x \in [2, 4)$ (iv) $x \in [2, 4]$

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

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

C. $x \in [2, 4)$

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

Answer: C



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3. Range of $f(x) = \frac{1}{1 - 2 \cos x}$ is (i) $[1/3, 1]$ (ii) $\left[-1, \frac{1}{3}\right]$ (iii) $(-\infty, -1) \cup \left[\frac{1}{3}, \infty\right)$ (iv) $\left[-\frac{1}{3}, 1\right]$

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

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

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

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

Answer: B



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4. let $f(x) = \sqrt{1+x^2}$ then (i) $f(xy)=f(x)*f(y)$ (ii) $f(xy) \geq f(x) \cdot f(y)$ (iii) $f(xy) \leq f(x) \cdot f(y)$ (iv) None of these

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



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5. Domain of $\sqrt{a^2 - x^2}$ ($a > 0$) is (i) $[-a,a]$ (ii) $(-a,a)$ (iii) $[0,a]$ (iv) $[-a,0]$

A. $[-a, a]$

B. $(-a, a)$

C. $[0, a]$

D. $[-a, 0]$

Answer: A



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6. If $f(x) = ax + b$, where a and b are integers, $f(-1)=-5$ and $f(3)=3$ then a and b are equal to

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. Find the domain of the function $f(x)$ defined by

$$f(x) = \sqrt{4-x} + \frac{1}{\sqrt{x^2-1}}.$$

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



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

is (a) Domain = \mathbb{R} , Range = $\{-1, 2\}$ (b) Domain = $\mathbb{R} - \{1\}$, Range \mathbb{R} (c) Domain = $\mathbb{R} -$

$\{4\}$, Range = $\{-1\}$ (d) Domain = $\mathbb{R} - \{-4\}$, Range = $\{-1, 1\}$

A. Domain = \mathbb{R} , Range = $\{-1, 2\}$

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

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

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

Answer: C



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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 = $[0, \infty)$

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 $f(x) = \frac{x^2 + 2x + 1}{x^2 - x - 6}$

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

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

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

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

Answer: A



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

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

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

then the domain of $f \cdot g$ is given by

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2. Let $f = \{(2, 4), (5, 6), (8, -1), (10, -3)\}$

$$\text{and } g = \{(2, 5), (7, 1), (8, 4), (10, 13), (11, 5)\}$$

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) $\{(2, 20), (8, -4), (10, -39)\}$
(c) $f \cdot g$	(c) $\{(2, -1), (8, -5), (10, -16)\}$
(d) $\frac{f}{g}$	(d) $\{(2, 9), (8, 3), (10, -10)\}$

The domain of $f - g, f + g, f \cdot g, \frac{f}{g}$ is domain of $f \cap$ domain of g . Then,

find their images.

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True False

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

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

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2. If $P = \{1, 2\}$ then

$$P \times P \times P = \{(1, 1, 1), (2, 2, 2), (1, 2, 2), (2, 1, 1)\}$$

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3. If

$$A = \{1, 2, 3\}, B = \{3, 4\} \text{ and } C = \{4, 5, 6\}, \text{ then prove that } (A \times B) \cup (A \times C) \\ = \{(1, 3), (1, 4), (1, 5), (1, 6), (2, 3), (2, 4), (2, 5), (2, 6), (3, 3), (3, 4), (3, 5), (3, 6)\}$$

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4. If $(x - 2, y + 5) = \left(2, \frac{1}{3}\right)$ are two equal ordered pairs, then
 $x = 4, y = \frac{-14}{3}$



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5. IF $A \times B = \{(a, x), (a, y), (b, x), (b, y)\}$ then prove that
 $A = \{a, b\}$ and $B = \{x, y\}$



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