THINK ACADEMY
MATH CLASSES By O.P. GUPTA
Class XI - Mathematics (041)
Topics - Relations & Functions

VISHWAS TEST SERIES - 2
(For Academic session 2024-25)

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Max. Marks - 30
Time - 60 Minutes

Followings are of 2 Marks each (Q01-05).

Q01. If $(x+2y, 3x) = (-28, y)$, then find the values of x and y. Hence write the value of $(-x)^{\frac{y}{3}}$.

Q02. Let A and B be two sets such that $n(A) = 3$ and $n(B) = 2$. If (p, 1), (q, 2) and (r, 1) are in $A \times B$, then find the sets A and B, where p, q and r are distinct elements. Also write the set of remaining elements of $A \times B$.

Q03. Let $f = \{(1,3),(2,4),(3,5),(4,6)\}$ be a linear function given by $f(x) = ax + b$, for some real numbers 'a' and 'b'. Determine the values of 'a' and 'b'. Hence write the function f(x).

Q04. Define signum function and write its domain and range. Also sketch the graph.

Q05. Let $A = \{x : x \text{ is the name of month in a non leap year}\}$, $B = \{28, 29, 30, 31\}$.

Let $R : A \to B$ is defined by $R = \{(a, b) :$ 'a' month has 'b' number of days$\}$. Write the roster form of this relation. Hence write its domain and range.

OR

A relation R is defined from a set $A = \{2,3,4,5\}$ to a set $B = \{3,6,7,10\}$ as follows :

$(x, y) \in R \Leftrightarrow x$ is relatively prime to y.

Express the relation R as a set of ordered pairs and determine its domain and range. Depict the arrow diagram for the relation. $[2 \times 5 = 10$

Followings are of 3 Marks each (Q06-07).

Q06. 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?

(a) f is a relation from A to B.

(b) f is a function from A to B.

Justify your answer in each case.

Q07. If $f(x) = \frac{1-x}{1+x}$, $x \neq -1$, then find the value of $\frac{f(x).f(x^2)}{1+[f(x)]^2}$.

OR

Find the domain of $f(x) = \frac{3x^2+x+5}{\sqrt{x^2-6x-7}}$. Also show it on the number line. $[3 \times 2 = 6$

Following is of 4 Marks (Q08).

Q08. **CASE STUDY :** To make herself self-dependent and to earn her living, a college student decided to setup a small scale business of manufacturing hand sanitizers.

She estimated a fixed cost of ₹15000 per month and a cost of ₹30 per unit to manufacture.

Based on the above information, answer the following questions.

(a) Let x units of hand sanitizers are manufactured per month. What is the function of cost?

(b) If each unit is sold for ₹45, then what is the selling (revenue) function?

(c) How many units should be manufactured and sold, for break-even (a condition of no profit, no loss situation) in a month?

(d) What is the monthly cost borne by the student, if the student decided to manufacture 1500 units in a month? $[1 \times 4 = 4$

Followings are of 5 Marks each (Q09-10).

Q09. Let $f = \left\{\left(x, \frac{x}{1+x^2}\right) : x \in \mathbb{R}\right\}$ be a function from $\mathbb{R}$ into $\mathbb{R}$. Determine the range of function f.

OR

Find the domain of function $f(x) = \frac{1}{\sqrt{[x]^2 - 2[x] - 8}}$.

Q10. Redefine the function $f(x) = |x-2| + |x+2|$, $-3 \le x \le 4$ and, hence draw its graph. [5×2 = 10

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O.P. GUPTA
Author & Math Mentor
Indira Award Winner

The O.P. Gupta Advanced Math Classes
@ **Think Academy**, Near Dhansa Bus Stand
Metro Station Gate No.3, Najafgarh, Delhi

Telegram / WhatsApp : +919650350480

YouTube.com/@theopgupta

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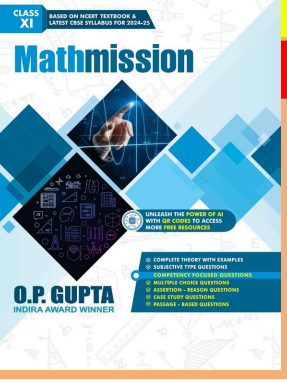

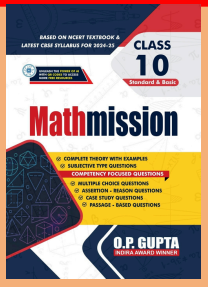

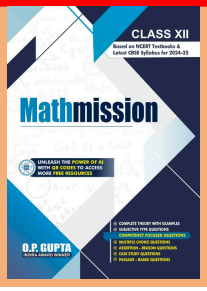

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