# EDUCATION DEPARTMENT, VILLUPURAM DISTRICT.

Class : X
Subject: Mathematics

## UNIT TEST

**UNIT 1 - Relations and Functions**

Marks: 50
Time: 1½ hrs.

**I Choose the correct answer.** **7×1=7**

1. **If $n(A \times B) = 6$ and $A = \{1, 3\}$ then $n(B)$ is**
   a) 1 b) 2 c) 3 d) 6

2. **If $A = \{1, 2\}$, $B = \{1, 2, 3, 4\}$, $C = \{5, 6\}$ and $D = \{5, 6, 7, 8\}$ then state which of the following statement is true.**
   a) $(A \times C) \subset (B \times D)$ b) $(B \times D) \subset (A \times C)$ c) $(A \times B) \subset (A \times D)$ d) $(D \times A) \subset (B \times A)$

3. **If the ordered pairs $(a+2, 4)$ and $(5, 2a+b)$ are equal then $(a, b)$ is**
   a) $(2, -2)$ b) $(5, 1)$ c) $(2, 3)$ d) $(3, -2)$

4. **Let $A = \{1, 2, 3, 4\}$ and $B = \{4, 8, 9, 10\}$. A function $f : A \to B$ given by $f = \{(1, 4), (2, 8), (3, 9), (4, 10)\}$ is a**
   a) Many-one function b) Identity function c) One-to-one function d) Into function

5. **If $f : A \to B$ is a bijective function and if $n(B) = 7$, then $n(A)$ is equal to**
   a) 7 b) 49 c) 1 d) 14

6. **Let $f(x) = 1 + x^2$ then**
   a) $f(xy) = f(x) \cdot f(y)$ b) $f(xy)^3 \geq f(x) \cdot f(y)$ c) $f(xy) \leq f(x) \cdot f(y)$ d) None of these

7. **$f(x) = (x + 1)^3 - (x - 1)^3$ represents a function which is**
   a) linear b) cubic c) reciprocal d) quadratic

**II Answer the following questions. (any 5)** **5×2=10**

1. Find A × B and B × A. A = {2, −2, 3} and B = {1, −4}
2. If B × A = {(−2, 3), (−2, 4), (0, 3), (0, 4), (3, 3), (3, 4)} find A and B.
3. A Relation R is given by the set $\{(x, y) / y = x + 3, x \in \{0, 1, 2, 3, 4, 5\}\}$. Determine its domain and range.
4. A function $f$ is defined by $f(x) = 3 - 2x$. Find $x$ such that $f(x)^2 = (f(x))^2$.
5. If A = {−2, −1, 0, 1, 2} and $f : A \to B$ is an onto function defined by $f(x) = x^2 + x + 1$ then find B.
6. Show that the function $f : \mathbb{N} \to \mathbb{N}$ defined by $f(x) = 2x - 1$ is one-one but not onto.
7. If $f(x) = 2x + 3$, $g(x) = 1 - 2x$ and $h(x) = 3x$. Prove that $f \circ (g \circ h) = (f \circ g) \circ h$

**III Answer the following questions. (any 5)** 5×5=25

1. Let $A = \{x \in \mathbb{N} \mid 1 < x < 4\}$, $B = \{x \in W \mid 0 \leq x < 2\}$ and $C = \{x \in \mathbb{N} \mid x < 3\}$. Then verify that (ii) $A \times (B \cap C) = (A \times B) \cap (A \times C)$
2. Let A = The set of all natural numbers less than 8, B = The set of all prime numbers less than 8, C = The set of even prime number. Verify that $A \times (B - C) = (A \times B) - (A \times C)$

3. Let A = {3, 4, 7, 8} and B = {1, 7, 10}. Which of the following sets are relations from A to B?
   (i) $R_1$ ={(3, 7), (4, 7), (7, 10), (8, 1)}
   (ii) $R_2$ = {(3, 1), (4, 12)}
   (iii) $R_3$= {(3, 7), (4, 10), (7, 7), (7, 8), (8, 11), (8, 7), (8, 10)}

4. A function $f$ is defined by $f(x) = 2x - 3$
   (i) find $\frac{f(0)+f(1)}{2}$ (ii) find $x$ such that $f(x) = 0$.
   (iii) find $x$ such that $f(x) = x$. (iv) find $x$ such that $f(x) = f(1 - x)$.

5. Let A = {1, 2, 3, 4} and B = {2, 5, 8, 11, 14} be two sets. Let $f: A \to B$ be a function given by $f(x) = 3x - 1$. Represent this function
   (i) by arrow diagram (ii) in a table form (iii) as a set of ordered pairs (iv) in a graphical form

6. A function $f: [-5, 9] \to \mathbb{R}$ is defined as follows:

$$f(x) = \begin{cases} 6x+1; & -5 \le x < 2 \\ 5x^2 - 1; & 2 \le x < 6 \\ 3x - 4; & 6 \le x \le 9 \end{cases}$$

   Find (i) $f(-3) + f(2)$ (ii) $f(7) - f(1)$ (iii) $2f(4) + f(8)$ (iv) $\frac{2f(-2) - f(6)}{f(4) + f(-2)}$

7. Consider the functions $f(x)$, $g(x)$, $h(x)$ as given below. Show that
   $f(x) = x - 4$, $g(x) = x^2$ and $h(x) = 3x - 5$

**IV Answer the following question.** **1×8=8**

1. a) Draw the graph of $xy = 24$, $x, y > 0$. Using the graph find,
   (i) $y$ when $x = 3$ and (ii) $x$ when $y = 6$.

**(OR)**

   b) Draw the graph of $y = x^2 + 3x - 4$ and hence use it to solve $x^2 + 3x - 4 = 0$

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