# Unit test 1

## MATHEMATCS

## Exercise 1.1 to 1.6

**STD 10** **Max Marks 100**

## Part A

**Answer all the question**

**Each question carries one mark** **1 x 1 0=10**

**1.**

Let $n(A) = m$ and $n(B) = n$ then the total number of non-empty relations that can be defined from $A$ to $B$ is

(1) $m^n$ (2) $n^m$ (3) $2^{mn} - 1$ (4) $2^{mn}$

**2.**

$A = \{a, b, p\}$, $B = \{2, 3\}$, $C = \{p, q, r, s\}$ then $n[(A \cup C) \times B]$ is

(1) 8 (2) 20 (3) 12 (4) 16

**3.**

If $f(x) = 2x^2$ and $g(x) = \frac{1}{3x}$, then $f \circ g$ is

(1) $\frac{3}{2x^2}$ (2) $\frac{2}{3x^2}$ (3) $\frac{2}{9x^2}$ (4) $\frac{1}{6x^2}$

**4.**

If $\{(a, 8), (6, b)\}$ represents an identity function, then the value of $a$ and $b$ are respectively

(1) (8,6) (2) (8,8) (3) (6,8) (4) (6,6)

**5.**

If there are 1024 relations from a set $A = \{1, 2, 3, 4, 5\}$ to a set $B$, then the number of elements in $B$ is

(1) 3 (2) 2 (3) 4 (4) 8

6.

If the ordered pairs $(a+2,4)$ and $(5,2a+b)$ are equal then $(a,b)$ is

(1) (2, –2) (2) (5,1) (3) (2,3) (4) (3, –2)

7.

If $g=\{(1,1),(2,3),(3,5),(4,7)\}$ is a function given by $g(x)=\alpha x+\beta$ then the values of $\alpha$ and $\beta$ are

(1) (–1,2) (2)(2, –1) (3) (–1, –2) (4) (1,2)

8.

If $n(A\times B)=6$ and $A=\{1,3\}$ then $n(B)$ is

(1) 1 (2) 2 (3) 3 (4) 6

9.

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

(1) Many-one function (2) Identity function
(3) One-to-one function (4) Into function

10.

Let $f$ and $g$ be two functions given by

$f=\{(0,1),(2,0),(3,-4),(4,2),(5,7)\}$

$g=\{(0,2),(1,0),(2,4),(-4,2),(7,0)\}$ then the range of $f\circ g$ is

(1) {0,2,3,4,5} (2) {–4,1,0,2,7} (3) {1,2,3,4,5} (4) {0,1,2}

## Part B

**Answer 10 questions** **1 x 2 = 20**

11.

If $A=\{-1,1\}$ and $B=\{-1,1\}$ then geometrically describe the set of points of $A\times B$.

12.

If $B\times A=\{(-2,3),(-2,4),(0,3),(0,4),(3,3),(3,4)\}$ find $A$ and $B$.

13.

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) $R_2 = \{(3,1), (4,12)\}$

14.

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.

15.

A relation '$f$ is defined by $f(x) = x^2 - 2$ where, $x \in \{-2,-1,0,3\}$

(i) List the elements of $f$ (ii) Is $f$ a function?

16.

A function $f$ is defined by $f(x) = 3 - 2x$. Find $x$ such that $f(x^2) = (f(x))^2$.

17.

Let $f$ be a function $f : \mathbb{N} \to \mathbb{N}$ be defined by $f(x) = 3x + 2, x \in \mathbb{N}$

(i) Find the images of 1, 2, 3 (ii) Find the pre-images of 29, 53

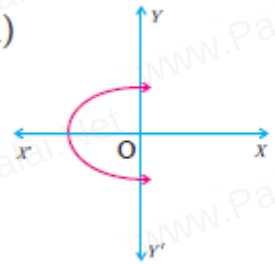
18.

Let $f$ be a function from $\mathbb{R}$ to $\mathbb{R}$ defined by $f(x) = 3x - 5$. Find the values of $a$ and $b$ given that $(a, 4)$ and $(1, b)$ belong to $f$.

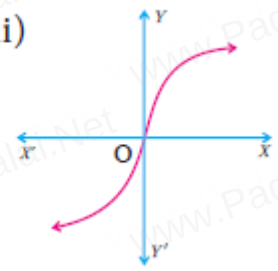
19.

Determine whether the graph given below represent functions. Give reason for your answers concerning each graph.

(i)




(ii)



20.

Find $k$ if $f \circ f(k) = 5$ where $f(k) = 2k - 1$.

## Part C

**Answer 10 questions** **10x3=30**

21.

Write the domain of the following real functions

(i) $f(x) = \frac{2x+1}{x-9}$ (ii) $p(x) = \frac{-5}{4x^2+1}$ (iii) $g(x) = \sqrt{x-2}$

22.

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

23.

If the ordered pairs $(x^2 - 3x,\ y^2 + 4y)$ and $(-2,5)$ are equal, then find $x$ and $y$.

24.

Let $f = \{(-1,3),(0,-1),(2,-9)\}$ be a linear function from $\mathbb{Z}$ into $\mathbb{Z}$. Find $f(x)$.

25.

If $f : \mathbb{R} \to \mathbb{R}$ and $g : \mathbb{R} \to \mathbb{R}$ are defined by $f(x) = x^5$ and $g(x) = x^4$ then check if $f$, $g$ are one-one and $f \circ g$ is one-one?

26.

(i) If $f(x) = x^2 - 1$, $g(x) = x - 2$ find $a$, if $g \circ f(a) = 1$.

(ii) Find $k$, if $f(k) = 2k - 1$ and $f \circ f(k) = 5$.

27.

Given that $h(x) = f \circ g(x)$, fill in the table for $h(x)$

| $x$ | $f(x)$ |
|---|---|
| 1 | 2 |
| 2 | 3 |
| 3 | 1 |
| 4 | 4 |

| $x$ | $g(x)$ |
|---|---|
| 1 | 2 |
| 2 | 4 |
| 3 | 3 |
| 4 | 1 |

| $x$ | $h(x)$ |
|---|---|
| 1 | 3 |
| 2 | - |
| 3 | - |
| 4 | - |

**28.**

The distance $S$ an object travels under the influence of gravity in time $t$ seconds is given by $S(t) = \frac{1}{2}gt^2 + at + b$ where, ($g$ is the acceleration due to gravity), $a$, $b$ are constants. Check if the function $S(t)$ is one-one.

**29.**

Represent the function $f = \{(1,2),(2,2),(3,2),(4,3),(5,4)\}$ through

(i) an arrow diagram (ii) a table form (iii) a graph

**30.**

Forensic scientists can determine the height (in cms) of a person based on the length of their thigh bone. They usually do so using the function $h(b) = 2 \cdot 47b + 54 \cdot 10$ where $b$ is the length of the thigh bone.

(i) Check if the function $h$ is one – one

(ii) Also find the height of a person if the length of his thigh bone is 50 cms.

(iii) Find the length of the thigh bone if the height of a person is $147 \cdot 96$ cms.

## Part D

**Answer eight question** **8 x 5=40**

**31.**

Describing domain of a function

(i) Let $f(x) = \frac{1}{x+1}$ . If $x = -1$ then $f(-1)$ is not defined. Hence $f$ is defined for all real numbers except at $x = -1$. So domain of $f$ is $\mathbb{R} - \{-1\}$ .

(ii) Let $f(x) = \frac{1}{x^2 - 5x + 6}$; If $x = 2,3$ then $f(2)$ and $f(3)$ are not defined. Hence $f$ is defined for all real numbers except at $x = 2$ and 3. So domain of $f = \mathbb{R} - \{2,3\}$.

**32.**

1. Relations are subsets of _____. Functions are subsets of _____.
2. True or False: All the elements of a relation should have images.
3. True or False: All the elements of a function should have images.
4. True or False: If $R : A \to B$ is a relation then the domain of $R = A$.
5. If $f : \mathbb{N} \to \mathbb{N}$ is defined as $f(x) = x^2$ the pre-image(s) of 1 and 2 are _____ and _____.

**33.**

An open box is to be made from a square piece of material, 24 cm on a side, by cutting equal squares from the corners and turning up the sides Express the volume $V$ of the box as a function of $x$.

**34.**

1. Is a constant function a linear function?
2. Is quadratic function a one – one function?
3. Is cubic function a one – one function?
4. Is the reciprocal function a bijection?
5. If $f : A \to B$ is a constant function, then the range of $f$ will have _____ elements.

**35.**

Find $x$ if $gff(x) = fgg(x)$, given $f(x) = 3x + 1$ and $g(x) = x + 3$.

**36.**

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

(i) $t(0)$ (ii) $t(28)$ (iii) $t(-10)$

(iv) the value of $C$ when $t(C) = 212$

(v) the temperature when the Celsius value is equal to the Farenheit value.

**37.**

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

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

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

**38.**

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