MATHS CLASS XII

Chapter 1. Relations and Functions

General direction for the students :-Whatever be the notes provided , everything must be copied in the Maths Copy and then do the Home work in the same Copy.

Relation (R) on a set A:-

Means subset of A cross A . Where 'A' is any non-empty set.

*If a set 'A' is having 'n' elements , then the total number of relations on 'A' is $2^{n\times n}$.

Types of Relation(R) on a set A.

i) Reflexive Relation:- It is a relation of an element with itself.

For example : A triangle ' is congruent ' with itself.

Algebraically we can write xRx ie $(x\,,x)\epsilon R\ \ \forall x\epsilon A$

ii) Symmetric Relation:- It is the relation between two elements in such a way that,

$if\ \ x\ related\ y\ then\ y\ is\ also\ related\ with\ x\ with\ same\ relation.$

For example : If a line l is perpendicular to the line m, then m is also perpendicular to l.

Algebraically we can write

$If\ xRy\ \ then\ \ yRx\ \ \ ie\ \ \ If\ (x,y)\epsilon R\ \ then\ \ (y,x)\ is\ also\ belongs\ to\ R\ \ \ \forall\ \ x,y\ \epsilon A.$

iii) Transitive Relation:- It is the relation between three elements in such a way that

$if\ \ xRy\ \ and\ yRz\ then\ \ xRz\ \ \ \forall\ x\,,y\,,z\ \epsilon A\ .$

$ie\ \ \ If\ (x,y)\epsilon R\ and\ (y,z)\epsilon R\ \ then\ (x,z)\ is\ also\ belongs\ to\ R\ \ \ \forall\ x\,,y\,,z\ \epsilon A\ .$

For example : For triangle T_1 ,T_2 and T_3 . If a triangle T_1 is similar to T_2 and T_2 is similar to T_3 , then T_1 is also similar to T_3.

Equivalence Relation:- A relation (R) on a non-empty set is called Equivalence relation iff it is Reflexive , Symmetric and Transitive.

Eg; '*is similar*' in set of all triangles in a plane is an equivalence relation.

Domain:- set of all first components (x) of the ordered pairs.

Range:- Set of all second components (y) of the ordered pairs.

Codomain:- If R is from A to B , then B is called Codomain of R.

NOTE: '*x congruent y modulo m written as* $x \equiv y(mod\ m)$ means $x-y\ is\ divisible\ by\ m.\ where\ x,y\epsilon\ Z\ and\ m\epsilon\ Z^{+}.$

Exercise 1.1

Q1 i) Given $\boldsymbol{R}: \boldsymbol{Z} \rightarrow \boldsymbol{Z}$

$\boldsymbol{R = \{(x, y): x - y \ is \ an \ integer\}}$

We know, $x - x = 0 \ is \ an \ integer \ \ \forall \ x \epsilon Z$

$\Rightarrow$ R is reflexive relation.

Let $x , y \ \epsilon \ Z$

$\Rightarrow x - y \ is \ an \ integer$

Also $y - x \ is \ an \ integer$

$\Rightarrow$ R is symmetric relation.

Let $x , y , z \ \epsilon \ Z$

$\Rightarrow x - y \ \ and \ \ y - z \ are \ integers$

Also $x - z \ is \ an \ integer$

$\Rightarrow$ R is Transitive relation

Q8) We know from Geometry that , any triangle is congruent with itself.

$\Rightarrow$ the relation is Reflexive.

Let T_1 , T_2 are any two triangles in a plane

We know from Geometry that , if $T_1 \cong T_2$, then $T_2 \cong T_1$

$\Rightarrow$the relation is Symmetric.

Let $T_1 , T_2 \ and \ T_3$ are any three triangles in a plane

We know from Geometry that , if $T_1 \cong T_2$ and $T_2 \cong T_3$ then $T_1 \cong T_3$

$\Rightarrow$ the relation is Transitive .

Since the relation is Reflexive, Symmetric and Transitive , it is an Equivalence relation.

Q16) Since A is having 3 elements , number of relations on A is $2^{3\times3}$=512.

Q22) Let us consider three real numbers $\frac{1}{2} , -\frac{1}{3} \ \ and \ -4$

A/Q $1 + \frac{1}{2} \times -\frac{1}{3} = \frac{5}{6} > 0$ again $1 + -\frac{1}{3} . -4 = \frac{7}{3} > 0$

But $1+\frac{1}{2}.-4 = -1 < 0$

$\Rightarrow$ the relation is not transitive.

HOME WORK : Exercise 1.1, Question numbers 2 , 6 , 7 9 , 10 , 14 ,15, 17 , 19 ,20, 21, 24 and 25.
