MATHSGYM®

NCERT
CLASS 12
RELATIONS & FUNCTIONS

FORMULAE – v1

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FORMULAE

1. Relation is a subset of cartesian product
    - Symbolically
    - $R \subset P \times Q$ (where R = Relation, P & Q are two different sets respectively)
2. The total number of relations that can be defined from a set A to a set B is the number of possible subsets of A × B.
    - If n(A) = p and n(B) = q, then
    - n (A × B) = pq and
    - the total number of relations is 2^{pq}
3. A relation R from A to A is also stated as a relation on A.
4. The image of an element *x* under a relation R is given by *y*, where $(x, y) \in R$,
5. The domain of R is the set of all first elements of the ordered pairs in a relation R.
6. The range of the relation R is the set of all second elements of the ordered pairs in a relation R.
7. A function *f* from a set A to a set B is a specific type of relation for which every element *x* of set A has one and only one image *y* in set B.
    - We write $f: A \rightarrow B$, where f(x) = y.
    - A is the domain and B is the codomain of *f*.
8. The range of the function is the set of images.
9. A real function has the set of real numbers or one of its subsets both as its domain and as its range.

10. A real function has the set of real numbers or one of its subsets both as its domain and as its range.
11. Empty relation is the relation R in X given by R = $\phi \subset X \times X$.
12. Universal relation is the relation R in X given by R = $X \times X$.
13. Reflexive relation R in X is a relation with $(a, a) \in R\ \forall\ a \in X$.
14. Symmetric relation R in X is a relation satisfying $(a, b) \in R$ implies $(b, a) \in R$.
15. Transitive relation R in X is a relation satisfying $(a, b) \in R$ and $(b, c) \in R$ implies that $(a, c) \in R$.
16. *Equivalence relation* R in X is a relation which is reflexive, symmetric and transitive
17. A function $f : X \to Y$ is *one-one* (or *injective*) if
    - $f(x1) = f(x2) \Rightarrow x1 = x2\ \forall\ x1, x2 \in X$.
18. A function $f : X \to Y$ is *onto* (or *surjective*) if given any $y \in Y$, $\exists\ x \in X$ such that $f(x) = y$.
19. A function $f : X \to Y$ is *one-one and onto* (or *bijective*), if f is both one-one and onto.
20. Given a finite set X, a function $f : X \to X$ is one-one (respectively onto) if and only if f is onto (respectively one-one). This is the characteristic property of a finite set. This is not true for infinite set