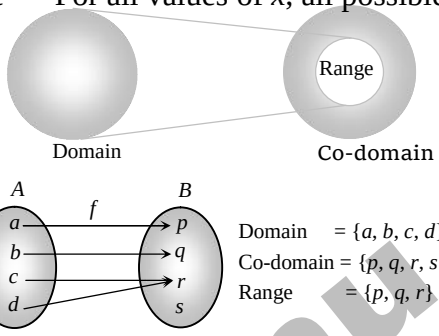
2.5 Domain, co-domain and range of function

If a function f is defined from a set A to set B then for $f: A \to B$ set A is called the domain of function f and set B is called the co-domain of function f. The set of all f-images of the elements of A is called the range of function f.

In other words, we can say

Domain = All possible values of x for which $f(x)$ exists.

Range = For all values of x, all possible values of $f(x)$.



(1) Methods for finding domain and range of function

(i) Domain

(a) Expression under even root (*i.e.*, square root, fourth root etc.) ≥ 0. Denominator $\neq 0$.

If domain of $y = f(x)$ and $y = g(x)$ are D_1 and D_2 respectively then the domain of $f(x) \pm g(x)$ or $f(x).g(x)$ is $D_1 \cap D_2$.

While domain of $\frac{f(x)}{g(x)}$ is $D_1 \cap D_2 - \{g(x) = 0\}$.

Domain of $\left(\sqrt{f(x)}\right) = D_1 \cap \{x : f(x) \geq 0\}$

(ii) **Range:** Range of $y = f(x)$ is collection of all outputs $f(x)$ corresponding to each real number in the domain.

(a) If domain $\in$ finite number of points $\Rightarrow$ range $\in$ set of corresponding $f(x)$ values.

(b) If domain $\in R$ or R – [some finite points]. Then express x in terms of y. From this find y for x to be defined (*i.e.*, find the values of y for which x exists).

(c) If domain $\in$ a finite interval, find the least and greatest value for range using monotonicity.