Shortcuts and Important Results to Remember

1. Every set is a subset of itself.
2. Null set is a subset of every set.
3. The set $\{0\}$ is not an empty set as it contains one element 0. The set $\{\phi\}$ is not an empty set as it contains one element ϕ.
4. The order of finite set A of n elements is denoted by $O(A)$ or $n(A)$.
5. Number of subsets of a set containing n elements is 2^n.
6. Number of proper subsets of a set containing n elements is $2^n - 1$.
7. If $A = \phi$, then $P(A) = \phi$; $\therefore n(P(A)) = 1$.
8. The order of an infinite set is undefined.
9. A natural number p is a prime number, if p is greater than one and its factors are 1 and p only.
10. Finite sets are equivalent sets only, when they have equal number of elements.
11. Equal sets are equivalent sets but equivalent sets may not be equal sets.
12. If A is any set, then $A \subseteq A$ is true but $A \subset A$ is false.
13. If $A \subseteq B$, then $A \cup B = B$
14. $A \subset B \Leftrightarrow A \subseteq B$ and $A \neq B$
15. $x \notin A \cup B \Leftrightarrow x \notin A$ and $x \notin B$
16. $x \notin A \cap B \Leftrightarrow x \notin A$ or $x \notin B$
17. If $A_1, A_2, \dots, A_n$ is a finite family of sets, then their union is denoted by $\bigcup_{i=1}^{n} A_i$ or $A_1 \cup A_2 \cup A_3 \cup \dots \cup A_n$.
18. If $A_1, A_2, A_3, \dots, A_n$ is a finite family of sets, then their intersection is denoted by $\bigcap_{i=1}^{n} A_i$ or $A_1 \cap A_2 \cap A_3 \cap \dots \cap A_n$.
19. $R - Q$ is the set of all irrational numbers.
20. Total number of relations from set A to set B is equal to $2^{n(A)n(B)}$.
21. The universal relation on a non-empty set is always reflexive, symmetric and transitive.
22. The identity relation on a non-empty set is always anti-symmetric.
23. The identity relation on a set is also called the diagonal relation on A.
24. For two relations R and S, the composite relations RoS, SoR may be void relations.
25. Every polynomial function $f : R \to R$ of degree odd is ONTO.
26. Every polynomial function $f : R \to R$ of degree even is INTO.
27. (i) The number of onto functions that can be defined from a finite set A containing n elements onto a finite set B containing 2 elements $= 2^n - 2$
    (ii) The number of onto functions that can be defined from a finite set A containing n elements onto a finite set B containing 3 elements $= 3^n - 3 \cdot 2^n + 3$
28. If a set A has n elements, then the number of binary relations on $A = n^{n^2}$.
29. If $fog = gof$, then either $f^{-1} = g$ or $g^{-1} = f$.
30. If f and g are bijective functions such that $f : A \to B$ and $g : B \to C$, then $gof : A \to C$ is bijective. Also, $(gof)^{-1} = f^{-1}og^{-1}$.
31. Let $f : A \to B$, $g : B \to C$ be two functions, then
    (i) f and g are injective $\Rightarrow gof$ is injective
    (ii) f and g are surjective $\Rightarrow gof$ is surjective
    (iii) f and g are bijective $\Rightarrow gof$ is bijective
32. Let $f : A \to B$, $g : B \to C$ be two functions, then
    (i) $gof : A \to C$ is injective $\Rightarrow f : A \to B$ is injective
    (ii) $gof : A \to C$ is surjective $\Rightarrow g : B \to C$ is surjective
    (iii) $gof : A \to C$ is injective and $g : B \to C$ is surjective $\Rightarrow$ $g : B \to C$ is injective
    (iv) $gof : A \to C$ is surjective and $g : B \to C$ is injective $\Rightarrow$ $f : A \to B$ is surjective
33. An injective mapping from a finite set to itself is bijective.