TIPS & TRICKS

Board Examination (2025-2026)

Class-XII

Subject: Mathematics

Chapter Name : *Relations and Functions* (Chap : 1)

PART – 1 : RELATIONS

1. If |A| = m and |B| = n then number of relation from A to B is 2^{mn}

Ex: $A = \{\alpha, \beta\}$, B = {–1, 0, 1} ⇒ number of relations from A to B is $2^{2\times3} = 2^6 = 64$

Restriction: $m \neq 0$ & $n \neq 0$.

2. If |A| = m and |B| = n then number of functions from A to B is n^m

Ex: $A = \{\alpha, \beta\}$, B = {–1, 0, 1} ⇒ number of functions from A to B is $3^2 = 9$.

3. The number of reflexive relations on a set with n elements is given by the formula 2^{n^2-n}.

Ex: Let A = {–1, 0, 1} ⇒ number of reflexive relation $2^{3^2-2} = 2^6 = 64$

4. Relation between reflexive and identity relation: The identity relation I_A on a non-empty set A is always a reflexive relation on A but the converse is not true.

Ex: Let A = {–1, 0, 1}

R = {(–1, –1), (0, 0), (1, 1), (–1, 0)} is reflexive but not identity

I_A = {(–1, –1), (0, 0), (1, 1)} is identity as well as reflexive relation.

∴ Identity ⇒ Reflexive

Reflexive ⇏ Identity.

5. The number of symmetric relation on a set with n elements is given by the formula $2^{\frac{n^2+n}{2}}$.

Ex: Let A = {–1, 0, 1} then number of symmetric relation $= 2^{\frac{3^2+3}{2}} = 2^6 = 64$.

6. For a nonempty set A with n elements number of reflexive and number of symmetric relation is same then n must be 3.

7. Let R be a relation on a set A. Then R is symmetric iff $R = R^{-1}$.

8. The total number of antisymmetric relations on a set with n elements is given by the formula:

$$\underbrace{2^n}_{\substack{\text{diagonal} \\ \text{elements}}} \times \underbrace{3^{\frac{n^2-n}{2}}}_{\substack{\text{non-diagonal} \\ \text{elements}}}$$

Ex: A = {–1, 0, 1}

∴ No. of antisymmetric relations = $2^3 \times 3^{\frac{9-3}{2}} = 2^3 \times 3^3 = 216$.

9. The identity relation I_A on a nonempty set A is both symmetric and antisymmetric.

10. Let A = {–1, 0, 1}

R = {(–1, 0), (0, 1), (0, –1)}

(0, 1) ∈R but (1, 0) ∉ R ⇒ not symmetric.

(–1, 0) ∈R and (0, –1) ∈R but 0 ≠ –1 ⇒ not antisymmetric.

∴ A relation may be neither symmetric nor antisymmetric.

11. There is no simple formula to calculate number of transitive relations. But if A contain 2 elements then out of 16 relations 13 are transitive relations.

12. If R is transitive then R^{-1} is also transitive.

13. Number of equivalence relation

Set size	No of equivalence relation
n = 1	1
n = 2	2
n = 3	5
n = 4	15
n = 5	52

14. The union of two equivalence relation on a set is not necessarily an equivalence relation on the set.

15. The intersection of two equivalence relation on a set is an equivalence relation on the set.

16. If R is an equivalence relation on a set A, then the inverse relation R^{-1} is also an equivalence relation on A.

17. a ≡ b (mod m) ⇒ m | (a – b) (read as: a is congruent to Be modulo m implies m divides a – b).

Ex: 9 ≡ –1 (mod 5) (9 is congruent to –1 as 5 divides 9 – (–1) i.e. 10)

but 10 ≢ –1 (mod 5) (10 is not congruent to –1 as 5 does not divide 10 – (–1) i.e. 11)

Note: "Congruence modulo" relation is an equivalence relation.

18. Equivalence class: Let, A be a given non empty set and R be an equivalence relation on A.

[a] = the equivalence class of an element a

= {x : x R a , x ∈ A}

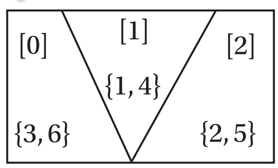
Ex: A = {1, 2, 3, 4, 5, 6}

R = {(a, b) : a ≡ b (mod 3), a, b ∈ A}

[0] = {3, 6}

[1] = {1, 4}

[2] = {2, 5}



Note: For modulo m relation there are m equivalence classes. Here m = 3 thats why we have 3 equivalence classes.