Practice Problems
(Relations)

Q.1 The number of relations on a n element set is:

(A) 2^{n^2} (B) $2^{n(n-1)}$ (C) $2^{\frac{n(n+1)}{2}}$ (D) $3^{\frac{n(n-1)}{2}}$

Q.2 The number of relations on a n element set that are reflexive is:

(A) 2^{n^2} **(B) $2^{n(n-1)}$** (C) $2^{\frac{n(n+1)}{2}}$ (D) $3^{\frac{n(n-1)}{2}}$

Q.3 The number of relations on a n element set that are symmetric is:

(A) 2^{n^2} (B) $2^{n(n-1)}$ **(C) $2^{\frac{n(n+1)}{2}}$** (D) $3^{\frac{n(n-1)}{2}}$

Q.4 The number of relations on a n element set that are asymmetric:

(A) 2^{n^2} (B) $2^{n(n-1)}$ (C) $2^{\frac{n(n+1)}{2}}$ **(D) $3^{\frac{n(n-1)}{2}}$**

Q.5 The number of relations on a n element set that are antisymmetric:

(A) $2^n 3^{\frac{n(n-1)}{2}}$ (B) $2^{n(n-1)}$ (C) $2^{\frac{n(n+1)}{2}}$ (D) $3^{\frac{n(n-1)}{2}}$

Q.6 The number of relations on a n element set that are irreflexive is:

(A) 2^{n^2} **(B) $2^{n(n-1)}$** (C) $2^{\frac{n(n+1)}{2}}$ (D) $3^{\frac{n(n-1)}{2}}$

Q.7 The number of relations on a n element set that are not reflexive is:

(A)$2^{n(n-1)}(2^n - 1)$ (B) $2^{n(n-1)}$ (C) $2^{\frac{n(n+1)}{2}}$ (D) $3^{\frac{n(n-1)}{2}}$

Q.8 How many relations are there on the power set of $X = \{\phi\}$?
(A) 2^4 (B) 2^2 **(C) 2^{16}** *(D) 2^8*

Q.9 Let R be the relation on the set of real numbers given by xRy if and only if x < y + 1.

(A) Reflexive, but not symmetric and not transitive.
(B) Reflexive, symmetric and not transitive.
(C) Not Reflexive, not symmetric and not transitive.
(D) Reflexive, but not symmetric and transitive.

Q.10 Define a relation on the integers by aRb if |a – b| < 5. Choose the most complete correct statement from the following:

(A) R is transitive **(B) R is reflexive and symmetric**

(C) R is reflexive and transitive (D) R is symmetric and transitive

Determine which of the following properties applies to each relation.

    (i) Reflexive
(ii) Irreflexive
 (iii) Symmetric
(iv) Antisymmetric
(v) Asymmetric
(vi) Transitive

Q.11 Let R be the relation on N gien by xRy iff x divides y.

(A) (i) and (vi) only   (B) (i), (iii) and (vi) only

(C) (i), (iv) and (vi) only   (D) (ii), (v), (vi) only

Q.12 Let X be a set and let R be the relation"⊆" defined on subsets of X.

(A) (i) and (vi) only   **(B) (i), (iv) and (vi) only**

(C) (ii) and (iv) only   (D) (i) only

Q.13 Let R be the relation onl the real numbers given by xRy iff x – y is rational.

(A) (i) and (vi) only   **(B) (i), (iii) and (vi) only**

(C) (ii) and (iv) only   (D) (ii), (iv), (v) only

Q.14 Let R be the relation on the real numbers given by xRy iff x – y is irrational.

(A) (i) and (iii) only   (B) (i), (iv) and (vi) only

(C) (ii), (iv) and (v) only   **(D) (ii) and (iii) only**

Q.15 Let R be the relation on the real numbers given by xRy iff $(x - y)^2 < 0$.

(A) (ii) and (vi) only   (B) (i), (iv) and (vi) only

(C) (ii), (iii) and (vi) only   **(D) (ii), (iii), (iv), (v) and (vi) only**

True or False

1. A relation which is not reflexive is always irreflexive. **(False)**
2. The properties of being symmetric and anti-symmetric are not negatives of each other. **(True)**
3. Empty set is a relation **(True)**
4. Asymmetric implies irreflexive **(True)**
5. Asymmetric implies antisymmetric **(True)**
6. A relation can be simultaneously Symmetric and antisymmetric **(True)**
7. Symmetric and antisymmetric implies transitive **(True)**
8. A relation can simultaneously be both reflexive and ir-reflexive **(True)**
9. reflexive and irreflexive implies all properties **(True)**
10. Empty relation ϕ is symmetric, antisymmetric, asymetric, transtive, irreflexive and may or may not be reflexive depending upon the domain. **(True)**