RELATION-EXERCISE

1. In the set A = {1, 2, 3, 4, 5}, a relation R is defined by R = {(x, y) : x, y $\in$ A and x < y}. Then R is-

(1) Reflexive (2) Symmetric

(3) Transitive (4) None of these

2. For real numbers x and y, we write $x \, R \, y \Leftrightarrow x - y + \sqrt{2}$ is an irrational number. Then the relation R is-

(1) Reflexive (2) Symmetric

(3) Transitive (4) none of these

3. Let L denote the set of all straight lines in a plane. Let a relation R be defined by $\alpha \, R \, \beta \Leftrightarrow \alpha \perp \beta$, $\alpha, \beta \in L$. Then R is-

(1) Reflexive (2) Symmetric

(3) Transitive (4) none of these

4. Let R be a relation defined in the set of real numbers by $a \, R \, b \Leftrightarrow 1 + ab > 0$. Then R is-

(1) Equivalence relation (2) Transitive

(3) Symmetric (4) Anti-symmetric

5. Two points P and Q in a plane are related if OP = OQ, where O is a fixed point. This relation is-

(1) Reflexive but symmetric

(2) Symmetric but not transitive

(3) An equivalence relation

(4) none of these

6. Let A = {2, 3, 4, 5} and let R = {(2, 2), (3, 3), (4, 4), (5, 5), (2, 3), (3, 2), (3, 5), (5, 3)} be a relation in A. Then R is-

(1) Reflexive and transitive

(2) Reflexive and symmetric

(3) Reflexive and antisymmetric

(4) none of these

7. Let L be the set of all straight lines in the Euclidean plane. Two lines ℓ_1 and ℓ_2 are said to be related by the relation R if ℓ_1 is parallel to ℓ_2. Then the relation R is-

(1) Reflexive (2) Symmetric

(3) Transitive (4) Equivalence

8. Let A = {p, q, r}. Which of the following is an equivalence relation in A ?

(1) R_1 = {(p, q), (q, r), (p, r), (p, p)}

(2) R_2 = {(r, q) (r, p), (r, r), (q, q)}

(3) R_3 = {(p, p), (q, q), (r, r), (p, q)}

(4) none of these

9. The relation R defined in A = {1, 2, 3} by a R b if $|a^2 - b^2| \leq 5$. Which of the following is false-

(1) R ={(1, 1), (2, 2), (3, 3), (2, 1), (1, 2), (2, 3), (3, 2)

(2) $R^{-1} = R$

(3) Domain of R = {1, 2, 3}

(4) Range of R = {5}

10. Let N denote the set of all natural numbers and R be the relation on N $\times$ N defined by (a, b) R (c, d) if ad (b + c) = bc(a + d), then R is-

(1) Symmetric only

(2) Reflexive only

(3) Transitive only

(4) An equivalence relation

11. Let P = {(x, y) : $x^2 + y^2 = 1$, x, y $\in$ R} Then P is-

(1) reflexive (2) symmetric

(3) transitive (4) anti-symmetric

12. If R be a relation '<' from A = {1, 2, 3, 4} to B = {1, 3, 5} i.e. (a, b) $\in$ R iff a < b, then ROR^{-1} is-

(1) {(1, 3), (1, 5), (2, 3), (2, 5), (3, 5), (4, 5)}

(2) {(3, 1), (5, 1), (3, 2), (5, 2), (5, 3), (5, 4)}

(3) {(3, 3), (3, 5), (5, 3), (5, 5)}

(4) {(3, 3), (3, 4), (4, 5)}

13. Let R and S be two equivalence relations in a set A. Then-

(1) $R \cup S$ is an equivalence relation in A

(2) $R \cap S$ is an equivalence relation in A

(3) R – S is an equivalence relation in A

(4) none of these

14. **Statement–1 :** In the set $N \times N$ consider relation R defined as (a, b) R (c, d) $\Leftrightarrow$ ad = bc ; then R is equivalence relation.

Statement–2 : Relation R is reflexine, symmetric & transitive.

(1) Statement–1 is true, Statement–2 is true; Statement–2 is not the correct explanation of Statement–1

(2) Statement–1 is false, Statement–2 is true

(3) Statement–1 is true, Statement–2 is false

(4) Statement–1 is true, Statement–2 is true; Statement–2 is the correct explanation of Statement–1.

15. **Statement–1 :** Let A = {1, 2, 3}, B = {a, b, c, d},

C = {α, β, γ}

R = {(1, a) (1, c) (2, d)} and

S = {(a, α) (a, γ) (c, β)}

then SOR = {(1, α) (1, γ) (1, β)}

Statement–2 : $R \subseteq A \times B$, $S \subseteq B \times C$ and $SOR \subseteq A \times C$.

(1) Statement–1 is true, Statement–2 is true; Statement–2 is not the correct explanation of Statement–1

(2) Statement–1 is false, Statement–2 is true

(3) Statement–1 is true, Statement–2 is false

(4) Statement–1 is true, Statement–2 is true; Statement–2 is the correct explanation of Statement–1.

16. **Statement-1 :** Let $a,b \in I$

$R_1 \to aR_1b \Leftrightarrow a + b$ is an even integer then R_1 is an equivalence relation.

$R_2 \to aR_2b \Leftrightarrow a - b$ is an even integer, then R_2 is an equivalence relation.

$R_3 \to aR_3b \Leftrightarrow a < b$, then R_3 is not an equivalence relation.

Statement-2 : A relation which is reflexive, symmetric and transitive is called an equivalence relation.

(1) Statement–1 is true, Statement–2 is true; Statement–2 is not the correct explanation of Statement–1

(2) Statement–1 is false, Statement–2 is true

(3) Statement–1 is true, Statement–2 is false

(4) Statement–1 is true, Statement–2 is true; Statement–2 is the correct explanation of Statement–1.

17. Let R = {(1, 3), (4, 2), (2, 4), (2, 3), (3, 1)} be a relation on the set A = {1, 2, 3, 4}. The relation R is- **[AIEEE - 2004]**

(1) transitive

(2) not symmetric

(3) reflexive

(4) a function

18. Let R = {(3, 3), (6, 6), (9, 9), (12, 12), (6, 12), (3, 9), (3, 12), (3, 6)} be relation on the set A = {3, 6, 9, 12). The relation is- **[AIEEE - 2005]**

(1) reflexive and transitive only

(2) reflexive only

(3) an equilvalence relation

(4) reflexive and symmetric only

19. Let W denote the words in the English dictionary. Define the relation R by : R = {(x, y) ∈ W × W : the words x and y have at least one letter in common}. Then R is- **[AIEEE - 2006]**

(1) reflexive, symmetric and not transitive

(2) reflexive, symmetric and transitive

(3) reflexive, not symmetric and transtive

(4) not reflexive, symmetric and transitive

20. Consider the following relations :-

R = {(x, y) : x, y are real numbers and x = wy for some rational number w} ;

$S = \left\{\left(\frac{m}{n}, \frac{p}{q}\right) : \text{m, n, p and q are integers such that n, q} \neq 0 \text{ and qm} = \text{pn}\right\}$.

Then : **[AIEEE - 2010]**

(1) R is an equivalence relation but S is not an equivalence relation

(2) Neither R nor S is an equivalence relation

(3) S is an equivalence relation but R is not an equivalence relation

(4) R and S both are equivalence relations

21. Let R = {(3, 3), (5, 5), (9, 9), (12, 12), (5, 12), (3, 9), (3, 12), (3, 5)} be a relation on the set A = {3, 5, 9, 12}. Then, R is :-

[JEE-Main 2013 (Online)]

(1) reflexive, transitive but not symmetric.

(2) symmetric, transitive but not reflexive.

(3) an equivalence relation

(4) reflexive, symmetric but not transitive

22. Let R = {(x, y) : x, y $\in$ N and $x^2 - 4xy + 3y^2 = 0$}, where N is the set of all natural numbers. Then the relation R is : **[JEE-Main 2013 (Online)]**

(1) reflexive and transitive.

(2) symmetric and transitive

(3) reflexive but neither symmetric nor transitive

(4) reflexive and symmetric.

23. For any two real numbers a and b, we define aRb if and only if $\sin^2 a + \cos^2 b = 1$. The relation R is :- **[JEE-Main 2014]**

(1) Reflexive but not symmetric

(2) Symmetric but not transitive

(3) Transitive but not reflexive

(4) An equivalence relation

24. Consider the following two binary relations on the set A={a,b,c}:

R_1 ={(c,a),(b,b),(a,c),(c,c),(b,c),(a,a)} and

R_2 = {(a,b),(b,a),(c,c),(c,a),(a,a),(b,b),(a,c)}.Then

[JEE-Main 2018 (Online)]

(1) R_1 is not symmetric but it is transitive.

(2) both R_1 and R_2 are transitive

(3) R_2 is symmetric but it is not transitive

(4) both R_1 and R_2 are not symmetric

25. Let N denote the set of all natural numbers. Define two binary relations on N as

R_1 = {(x, y) $\in$ N×N : 2x + y = 10}

and R_2 = {(x,y) $\in$ N ×N : x + 2y = 10}. Then :

[JEE-Main 2018 (Online)]

(1) Both R_1 and R_2 are symmetric relations

(2) Range of R_1 is {2, 4, 8}

(3) Both R_1 and R_2 are transitive relations.

(4) Range of R_2 is {1,2,3,4}

ANSWER KEY Exercise

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	3	1	2	3	3	2	4	4	4	4
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	2	3	2	4	4	4	2	1	1	3
Que.	21	22	23	24	25					
Ans.	1	3	4	3	4					