

INDIAN SCHOOL DARSAIT**Class XII****Mathematics Worksheet****Worksheet # 1 Equivalence Relation****(Chapter – 1: Relations & Functions)****CLASS WORK**

1.	Show that the relation $R = \{(1,1), (2,2), (3,3), (1,2), (2,3)\}$ defined on the set $A = \{1,2,3\}$ is reflexive but neither symmetric nor transitive.
2.	Let $A = \{0, 1, 2, 3\}$ and R be a relation on A defined by $R = \{(0,0), (0,1), (0,3), (1,0), (1,1), (2,2), (3,0), (3,3)\}$. Is R reflexive, symmetric and transitive?
3.	Check whether the relation defined on the set $\{1,2,3,4,5,6\}$ by $R = \{(a,b): b = a+1\}$ is reflexive, symmetric and transitive.
4.	Let N be the set of natural numbers and R is a relation defined over N by $R = \{(x, y): x+2y=10\}$. Write the relation R and check if it is reflexive, symmetric and transitive.
5.	Show that the relation $R = \{(a,b): a \leq b, a, b \in R\}$ is reflexive and transitive but not symmetric.
6.	Check whether the relation defined on the set of real numbers by $R = \{(a,b): a \leq b^3\}$ is reflexive, symmetric and transitive.
7.	Let the relation R be defined on the set $A = \{1, 2, 3, 4, 5\}$ by $R = \{(a, b): a^2 - b^2 < 8\}$. Write the relation R . Also verify whether the relation is reflexive, symmetric and transitive.
8.	For the set $A = \{1, 2, 3\}$ define a relation R on A by $R = \{(1,1), (2,3), (3,3), (1,3)\}$. Write the ordered pairs to be added to R to make it the smallest equivalence relation.
9.	Let $A = \{1, 2, 3\}$ then write the following relations on A i) Reflexive and transitive but not symmetric ii) Symmetric but not reflexive and transitive iii) Reflexive, symmetric and transitive
10.	How many equivalence relations are possible on set $A = \{1, 2, 3\}$?
11.	Show that the relation $R = \{(a,b): a-b \text{ is even}\}$ defined on the set $A = \{1,2,3,4,5\}$ is an equivalence relation. Further show that the elements of $\{1,3,5\}$ are related to each other, the elements of $\{2,4\}$ are related to each other and no element of $\{1,3,5\}$ are related to any element of $\{2,4\}$.
12.	Show that the relation $R = \{(a,b): a-b \text{ is a multiple of } 4\}$ defined on the set $A = \{x \in Z, 0 \leq x \leq 12\}$ is an equivalence relation. Further find all the elements related to 1.
13.	Let R be a relation defined on the set $A = \{1,2,3,4,5,6,7\}$ by $R = \{(a,b): \text{both } a \text{ and } b \text{ are either even or odd}\}$. Show that R is an equivalence relation. Further show that i) all elements of $\{1,3,5,7\}$ are related to each other ii) all elements of $\{2,4,6\}$ are related to each other. iii) no element of $\{1,3,5,7\}$ is related to any element of $\{2,4,6\}$
14.	Show that the relation $R = \{(a,b): a-b \text{ is divisible } 3, a, b \in Z\}$ is an equivalence relation.

INDIAN SCHOOL DARSAIT**Class XII****Mathematics Worksheet****Worksheet # 1 Equivalence Relation****(Chapter – 1: Relations & Functions)**

15.	Prove that the relation R on the set $N \times N$ defined by $(a,b)R(c,d) \Rightarrow a+d = b+c$, for all $(a,b), (c,d) \in N \times N$ is an equivalence relation.
16.	Let $A = \{1,2,3,4,5,6,7\}$ and R be relation in $A \times A$ by $(a,b)R(c,d)$ if $a + d = b + c$ for all $(a,b), (c,d) \in A \times A$. Prove that R is an equivalence relation. Obtain the equivalence class of (2,5).
17.	Prove that the relation R on the set $N \times N$ defined by $(a,b)R(c,d) \Rightarrow ad = bc$, for all $(a,b), (c,d) \in N \times N$ is an equivalence relation.
18.	Prove that the relation R on the set $N \times N$ defined by $(a,b)R(c,d) \Rightarrow ad(b+c) = bc(a+d)$, for all $(a,b), (c,d) \in N \times N$ is an equivalence relation.
19.	Let L be the set of lines in the XY plane and R be a relation defined on N defined by $R = \{(L_1, L_2) : L_1 \parallel L_2\}$ is an equivalence relation. Find the set of all elements related to $y = 2x + 4$.
20.	Prove that the relation R on the set A of points in a plane given by $R = \{(P, Q) : P \text{ and } Q \text{ are equidistant from the origin}\}$ is an equivalence relation. Further show that the set of all points related to a point $P \neq (0,0)$ is the circle passing through the point P with origin as centre.
21.	Determine whether the relation R defined on the set of real numbers given by $R = \{(a, b) : a - b + \sqrt{3} \text{ is irrational}\}$ is reflexive, symmetric and transitive.
22.	If R_1 and R_2 are two equivalence relations, prove that $R_1 \cap R_2$ is also an equivalence relation.
23.	In the set of natural numbers N define a relation R as follows: $\forall n, m \in N, nRm$ if on division by 5 each of the numbers n and m leaves the same remainder. Show that R is an equivalence relation. Also obtain the pair-wise disjoint subsets determined by R.
24.	If R is an equivalence relation on a set X, then show that R^{-1} is also an equivalence relation on X.
25.	Prove that the union of two equivalence relations not necessarily an equivalence relation?
26.	If $A = \{1,2,3\}$, then find the number of equivalence relation on A containing (1,2).
27.	If $A = \{1,2,3\}$, then find the number of equivalence relation on A containing (1,2) and (1,3) which are reflexive and symmetric but not transitive.

HOME WORK

28.	Let $R = \{(a, a^3) : \text{where } a \text{ is prime number less than } 5\}$ is a relation. Find the range of R. Also verify whether the relation is reflexive, symmetric and transitive.
29.	Let R be a relation defined on the set N of natural numbers by $R = \{(x, y) : 2x + y = 24, x, y \in N\}$. find the domain and range of the relation. Check whether R is an equivalence relation.
30.	Check whether the relation defined on the set of real numbers by $R = \{(a, b) : a < b^2\}$ is reflexive, symmetric and transitive.
31.	Let N be the set of natural numbers and R be a relation defined in N by

INDIAN SCHOOL DARSAIT

Class XII

Mathematics Worksheet

Worksheet # 1 Equivalence Relation

(Chapter – 1: Relations & Functions)

	$R = \{(a,b) : a > b, a, b \in N\}$. Show that R is transitive but neither reflexive nor symmetric
32.	Show that the relation $R = \{(a,b) : a = b\}$ defined on the set $A = \{x \in Z, 0 \leq x \leq 12\}$ is an equivalence relation. Further find all the elements related to 1.
33.	Show that the relation $R = \{(a,b) : 2 \text{ divides } a - b\}$ defined on the set Z of integers is an equivalence relation.
34.	Let T be the triangles in a plane and R be relation in T given by $R = \{(T_1, T_2) : T_1 \text{ is congruent to } T_2\}$. Show that R is an equivalence relation.
35.	Let L be the set of lines in a plane and R be a relation defined on L by $R = \{(L_1, L_2) : L_1 \text{ is perpendicular to } L_2\}$. Show that R is symmetric but neither reflexive nor transitive.
36.	Prove that the relation R on the set $N \times N$ defined by $(a,b)R(c,d) \Rightarrow a^2 + d^2 = b^2 + c^2$, for all $(a,b), (c,d) \in N \times N$ is an equivalence relation.
37.	Prove that the relation R on the set Z of all integers defined by $(x,y) \in R \Rightarrow x - y$ is divisible by n is an equivalence relation.
38.	Let Z be the set of integers. Show that the relation $R = \{(a,b) : a + b \text{ is even}, a, b \in Z\}$ is an equivalence relation.
39.	Prove that the relation R in the set $A = \{5,6,7,8,9\}$ given by $R = \{(a, b) : a - b \text{ is divisible by } 2\}$ is an equivalence relation. Obtain the equivalence class of 6.
40.	Given a non – empty set X and R be a relation defined on $P(X)$, the power set of X defined by $ARB \Rightarrow A \subset B, \forall A, B \in P(X)$. Check whether R is reflexive, symmetric and transitive.
41.	If Q is the set of rational numbers and R be a relation defined on Q by $xRy \Rightarrow x - y \leq \frac{1}{2}$, then prove that R is not an equivalence relation.
42.	If $A = \{1,2,3\}$, then find the number of equivalence relation on A containing (1,2) and (1,3) which are reflexive and transitive but not symmetric.
43.	A relation R on the set of non – zero complex numbers is defined by $(z_1, z_2) \in R$ iff $\frac{z_1 - z_2}{z_1 + z_2}$ is a real number. Show that R is an equivalence relation.
44.	Consider the division of the set $A = \{1, 2, 3, 4, 5, 6, 7, 8\}$ by subsets $\{1, 6\}, \{2, 7\}, \{3, 8\}, \{4\}$ and $\{5\}$. Show that the relation R in set A given by $R = \{(a, b) : \text{if } a \text{ and } b \text{ belong to the same subset of the division of } A\}$, is an equivalence relation. Also find the set of all elements of A related to 6 and the set of all elements of A related to 5.

SELF STUDY

45.	Show that the relation R on the set A of all triangles in a plane as $R = \{(T_1, T_2) : T_1 \text{ is similar to } T_2\}$ is an equivalence relation. Further consider three right triangles T_1 with sides 3,4,5, T_2 with sides 5,12,13 and T_3 with sides 6,8,10. Which triangles among T_1, T_2 and T_3 are related?
46.	Let S be the set of all students in a School with R as a relation in S given by $R = \{(S_1, S_2) : S_1 \text{ and } S_2 \text{ are like minded students}\}$. Show that R is an equivalence relation i) Write two equivalence classes of S under the relation. (eg: set of honest students represented by [Honest Minded])

INDIAN SCHOOL DARSAIT**Class XII****Mathematics Worksheet****Worksheet # 1 Equivalence Relation****(Chapter – 1: Relations & Functions)**

	For which equivalence class you would like to be a member
47.	Determine whether the relation R defined on the set of real numbers given by $R = \{(a,b) : a,b \in R, a-b+\sqrt{2} \text{ is irrational}\}$ is reflexive, symmetric and transitive.
48.	Let $f: X \rightarrow Y$ defined by $f = \{(a,b) : f(a) = f(b)\}$. Show that f is an equivalence relation
49.	Let P be the set of all points in a plane and R be a relation on P defined by $R = \{(A,B) \in P \times P : \text{if the distance between A and B is less than 3 units}\}$. Check whether R is an equivalence relation or not.
50.	Let Z be the set of all integers and R be a relation defined on Z by $R = \{(a,b) : a-b \text{ is divisible by } 5\}$. Show that R is an equivalence relation.
51.	Prove that the relation R defined on the set $A = \{1, 2, 3, \dots, 12\}$ given by $R = \{(a,b) : a-b \text{ is divisible by } 3\}$ is an equivalence relation. Find the set of all elements related to 1.
52.	Show that the relation R defined on the set Z of integers given by $R = \{(a,b) : 3 \text{ divides } a-b\}$ is an equivalence relation.
53.	Consider the relation R in the set of people in colony defined by aRb if a and b are members of joint family. Is R an equivalence relation?
54.	Let R be a relation defined on the set N of natural numbers defined by nRm if n divides m. Write whether R is reflexive, symmetric and transitive.
55.	Show that the relation R defined on the set A of all polygons defined by $R = \{(P_1, P_2) : P_1 \text{ and } P_2 \text{ have the same number of sides}\}$ is an equivalence relation. What is the set of all in A related to the right triangle T with sides 3,4 and 5?
56.	Show that the relation R defined on the set A of all books in a college library defined by $R = \{(x,y) : x \text{ and } y \text{ have the same number of pages}\}$ is an equivalence relation.
57.	Let Z be the set of integers and Z_0 be the non zero integers = $\{(a,b)(c,d) : ad = bc\}$ be a relation on $Z \times Z_0$, show that R is the equivalence relation on $Z \times Z_0$.
58.	Verify $S = \{(a,b) : a^2 + b^2 = 1\}$ is an equivalence relation on R or not.
59.	Define $R = \{(x,y) : x,y \in Q, x = \frac{1}{y}\}$ check the given relation is equivalence relation or not.