

**CHAPTER 1 - RELATIONS & FUNCTIONS**

- 1) Let  $Z$  be the set of integers and  $R$  be a relation defined in  $Z$  such that  $aRb$  if  $(a - b)$  is divisible by 5. Then  $R$  partitions the set  $Z$  into \_\_\_\_\_ pairwise disjoint subsets.
- 2) Consider set  $A = \{1, 2, 3\}$  and the relation  $R = \{(1, 2)\}$ , then  $R$  is a transitive relation. State true or false.
- 3) Every relation which is symmetric and transitive is reflexive also. State true or false.
- 4) Let  $R$  be a relation in set  $N$ , given by  $R = \{(a, b) : a = b - 2, b > 6\}$  then  $(3, 8) \in R$ . State true or false with reason.
- 5) If a relation defined as  $R = \{(x,x), (y,y), (z,z), (x,z)\}$  in set  $A = \{x,y,z\}$  then  $R$  is \_\_\_\_\_ (reflexive symmetric) relation.
- 6) For the set  $A = \{1, 2, 3\}$ , define a relation  $R$  in the set  $A$  as follows:  $R = \{(1, 1), (2, 2), (3, 3), (1, 3)\}$ . Write the ordered pairs to be added to  $R$  to make it the smallest equivalence relation.
- 7) If  $R = \{(x, y) : x + 2y = 8\}$  is a relation on  $N$ , write the range of  $R$ .
- 8) Let  $R = \{(a, a^2) : a \text{ is a prime number less than } 5\}$  be a relation. Find the range of  $R$ .
- 9) A reflexive relation is identity relation also. State true or false.
- 10) Let set  $A = \{1, 2, 3\}$ , define relation  $R$  on  $A$  as  $R = \{(a, b) \in A \times A : a + b < 6\}$ . Show that  $R$  is a universal relation.

- 11) Let  $A = \{a, b, c\}$ , find the total number of distinct relations in set  $A$ .
- 12) For any relation  $R$  in a set  $A$ , we can define the inverse relation  $R^{-1}$  by  $a R^{-1} b$  if and only if  $bRa$ . Prove that  $R$  is symmetric if and only if  $R = R^{-1}$ .

❖ Long Answer I / Long Answer II Type

- 13) 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. Find all elements related to the element 6. [Foreign 2013]
- 14) Let  $P$  be the set of all the points in a plane and the relation  $R$  in set  $P$  be defined as  $R = \{(A, B) \in P \times P \mid \text{distance between points } A \text{ and } B \text{ is less than } 3 \text{ units}\}$ . Show that the relation  $R$  is not an equivalence relation.
- 15) Let  $f: A \rightarrow A$  be a given function. A relation  $R$  in set  $A$  is given by  $R = \{(a, b) \in A \times A \mid f(a) = f(b)\}$ . Check, whether  $R$  is an equivalence relation. <https://loyaleducation.org>
- 16) Prove that the relation  $R$  in the set  $A = \{1, 2, 3, 4, 5\}$  given by  $R = \{(a, b) : |a - b| \text{ is even}\}$ , is an equivalence relation. Show that all the elements  $\{1, 3, 5\}$  are related to each other and all the elements of  $\{2, 4\}$  are related to each other. But no element of  $\{1, 3, 5\}$  is related to any element of  $\{2, 4\}$ . [NCERT; DoE; Chennai 2015]
17. Check whether the relation  $R$  defined in the set  $A = \{1, 2, 3, 4, 5, 6\}$  as  $R = \{(a, b) : b = a + 1\}$  is reflexive, symmetric or transitive. [NCERT]
18. Show that the relation  $R$  in the set  $A$  of points in a plane given by  $R = \{(P, Q) : \text{distance of the point } P \text{ from the origin is same as the distance}$

of the point Q 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 P with origin as centre.

[NCERT]

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