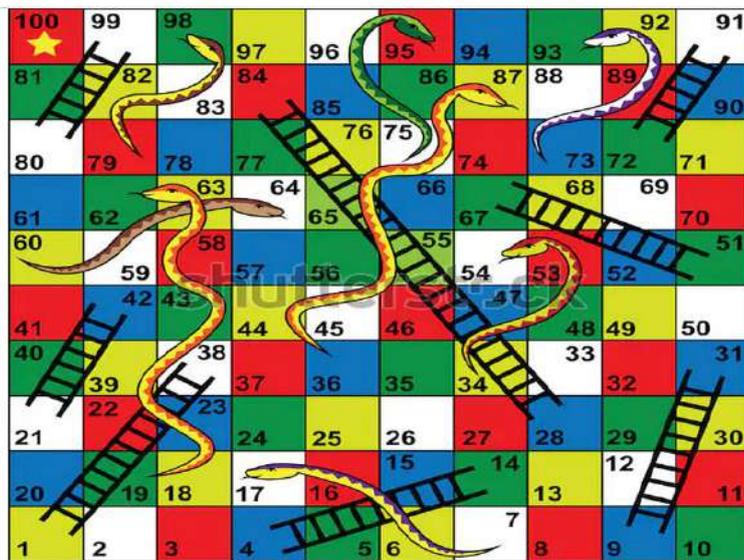


CASE STUDY BASED QUESTIONS

Chapter -1 Relations and Functions

- 1 Vivek and Anuj are playing snake and ladder game at home during vacation. While rolling the dice Vivek's cousin Anand observed and noted that possible outcomes of the throw every time belongs to set $\{1,2,3,4,5,6\}$. Let X be the set of players and Y be the set of all possible outcomes.

$$X = \{V, A\} \quad Y = \{1,2,3,4,5,6\}$$



- (i) Let $R: Y$ to Y be defined by $R = \{(a,b) / b \text{ is divisible by } a\}$. Then R is

A. Reflexive B. symmetric C. reflexive & transitive
D. Equivalence

- (ii) How many functions are possible from X to Y
(iii) How many relations are possible from X to Y

- 2 In a school library around 8000 books are there. It is divided and kept in different places in the big library room based on the language-

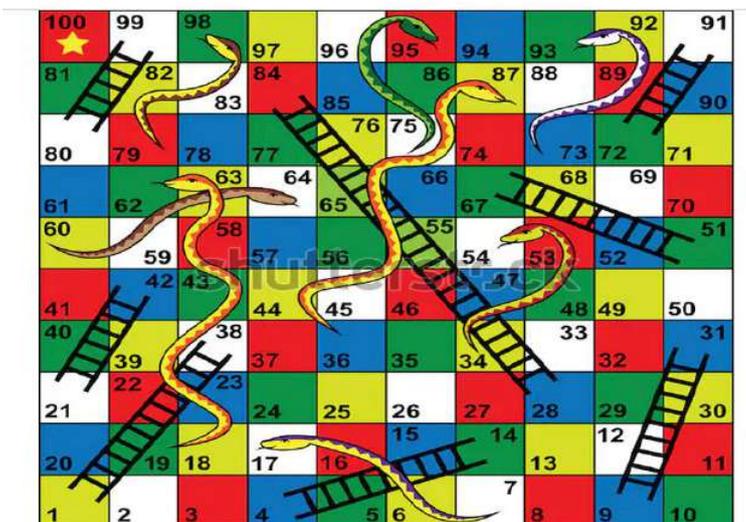
English, Malayalam, Hindi, Sanskrit. It is again divide based on poems, Novels, Literature, short story, Dictionary etc.



Let B = set of all books in the library. A relation R is defined on B , given by $R = \{ (x,y); x \text{ and } y \text{ have same number of pages} \}$

- (i) Is R a reflexive relation?
- (ii) Is R a symmetric relation?
- (iii) Is R a transitive relation?
- (iv) Is it an equivalence relation?

- 3 Arya and Medha are playing snake and ladder game at home during vacation. While rolling the dice Arya 's cousin Anand observed and noted that possible out comes of the throw every time belongs to set $\{ 1,2,3,4,5,6\}$. Let X be the set of players and Y be the set of all possible out comes. $X = \{ V, A \}$ $Y = \{ 1,2,3,4,5,6\}$



Let $R: Y$ to Y be defined by $R = \{ (a,b) : |a - b| \text{ is even} \}$.

- (i) Is R a reflexive relation?
- (ii) Is R a symmetric relation?
- (iii) Is R a transitive relation?
- (iv) is it an equivalence relation?

4

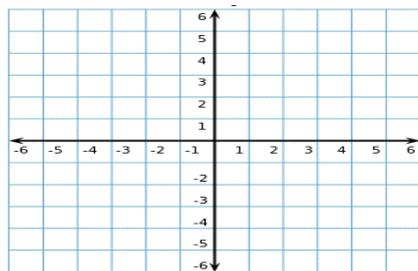
A scout master wants to make different groups of students so that they can be given different tasks. Students started making groups with their friends, then the scout master interfered and told them to make groups as per a rule “a student will make group with roll number in such a way that the difference of roll number is divisible by 3.



- (i) Write a relation **R** in set-builder form for the rule told by the scout master.
- (ii) Which roll number of students will be in the group of students with roll number 2, if there are 30 students in the class?
- (iii) Which roll number of students will be in the group of students with roll number 3, if there are 30 students in the class?

5

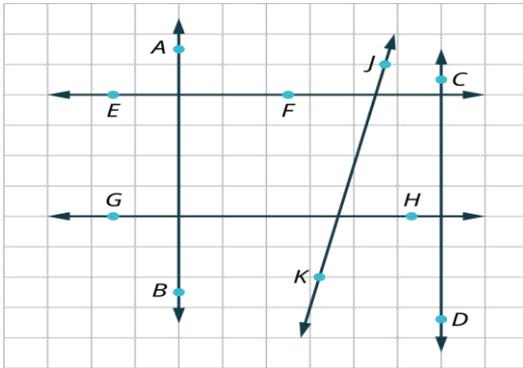
Mohan and Ritu were playing a game. The rule for the game is that when Mohan plots a point say P on a Cartesian plane, then Ritu has to find points on the plane in such a way the distance of the points from the origin O is same as that of the distance between the origin and the point P (ie; OP). Mohan's sister Avantika put the rule of the game in set form as $R = \{ (P, Q) : OP = OQ \}$



- (i) Is R a reflexive relation?
- (ii) Is R a symmetric relation?
- (iii) Is R a transitive relation?
- (iv) Is it an equivalence relation?
- (v) What figure Ritu gets if she joins all such points?

6

Abhimanu is having a collection of all lines in XY plane and his friend Arjun made a relation on this collection as $R_1 = \{ (L_1, L_2) / L_1 \text{ is parallel to } L_2 \}$. Arjun also made another relation on the same collection as $R_2 = \{ (L_1, L_2) / L_1 \text{ is perpendicular to } L_2 \}$.



They ask their class mate to check the following:

- (i) Is the relation R_1 form an equivalence relation
- (ii) Find the set of lines related to $y = 2x + 4$ with respect to R_1
- (iii) Is the relation R_2 form an equivalence relation?

7

In class 6, the teacher conducted a survey on the fruits and vegetables the students like most. The class leader is asked to record the data. From the data it was found that the topmost 3 fruits liked by most of them are Apple, Orange, Mango whereas the 3 vegetables most of them like are Tomatoes, Carrot, Cucumber. The teacher put it in 2 sets $F = \{ \text{Apple, Orange, Mango} \}$ and $V = \{ \text{Tomatoes, Carrot, Cucumber} \}$



- (i) How many relations are possible from F to V ?

	<p>(ii) How many functions are possible from F to V? (iii) How many one to one functions are possible from F to V? (iv) How many bijections are possible from F to V?</p>
8	<p>48 children joined a vacation camp organized by Sports authority of a locality and they were allotted registration number .They want to make 4 teams with 12 members each out of the 48 students for football match . The coach asked the children to form teams in such way that “ two students are in the same team if the difference of their registration number is divisible by 4”.</p>  <p>Now answer the question based on the above information: (i) Is it possible to form the teams by the rule given by the Coach? (ii) Which registration numbers are the members of the team with number 1? (iii) Which registration numbers are the members of the team with number 4?</p>
9	<p>During a SwachBharth Abhiyan organizing committee wanted to collect and segregate Metal, paper, glass, batteries , organic and plastic waste , In the set of all participants a relation R defined as $R= \{ (x,y)/$ both the participants collect the same type of waste }</p> 

	<p>Based on the given information answer the following:</p> <p>(i) Check whether R is an Equivalence relation in the set of all participants</p> <p>(ii) In how many groups the participants are divided on the basis of their waste collection, assume that there are participants to collect all type of the waste.</p>
10	<p>In a master chef competition final round 3 chef were selected and Judges assigned three dishes $D = \{ D1, D2, D3 \}$ to the participants $P = \{ P1, P2, P3 \}$ and asked them to prepare dishes as per the following rules:</p> <p>Rule A :everybody has to prepare exactly one dish</p> <p>Rule B:no 2 participants is allowed to prepare same dish</p> <p>Rule C : all the dish must be prepared in the competition</p>  <p>Answer the following in the context of functions</p> <p>(i) In how many ways all participants can choose a Dish as per rule A?</p> <p>(ii) In how many ways everybody can choose a dish to prepare as per the rule B?</p> <p>(iii) How many ways all participants can prepare exactly one dish as per rule C?</p>

ANSWER KEY

1	SOLUTIONS: (i) C (ii) 6^2 (iii) 2^{12}
2	SOLUTIONS/ANS: (i) Yes (ii) yes (iii) yes (iv) yes
3	SOLUTIONS/ANS: (i) Yes (ii) yes (iii) yes (iv) yes
4	SOLUTIONS/ANS: (i) $R = \{ (a, b) / a - b \text{ is divisible by } 3 \}$ (ii) $\{ 2, 5, 8, 11, 14, \dots \}$ (iii) $\{ 3, 6, 9, 12, 15, \dots \}$
5	SOLUTIONS/ANS: (i) Yes (ii) yes (iii) yes (iv) yes (v) circle
6	SOLUTIONS/ANS: (i) R_1 is reflexive, symmetric, transitive so, equivalence (ii) $y = 2x + c$; c is any arbitrary constant (iii) No(R is not reflexive, transitive but symmetric)
7	SOLUTIONS/ANS: (i) 2^9 (ii) 3^3 (iii) $3! / (3-3)! = 3! = 6$ (iv) $3!$
8	SOLUTIONS/ANS: (i) Yes (ii) $\{ 1, 5, 9, 13, 17, 21, \dots \}$ (iii) $\{ 4, 8, 12, 16, \dots \}$
9	SOLUTIONS/ANS: (i) Yes, it is an equivalence relation (ii) 6 groups
10	SOLUTIONS/ANS: (i) No of function $3 \times 3 \times 3 = 27$ (ii) No of one to one functions from D to $P = 3!$ (iii) No of onto functions from D to $P = 3!$