

Activity – 1

Subject	MATHEMATICS
Class	XII
Chapter/Unit	RELATION AND FUNCTIONS
Topic	EQUIVALENCE RELATION
Time	40 minutes
Nature of Activity	Individual

What will I learn? (Learning outcome)

To check that the relation R in the set L of all lines in a plane, defined by $R = \{(l, m): l \perp m\}$ is an equivalence relation(symmetric ,reflexive or transitive).

Skills: Logical ability, Analytical thinking, Deductive reasoning, Creativity, Accuracy.

What do I require?

Hardboard, some pieces of threads, pins, white thick sheets of paper, pencils, colours, a pair of scissors coloured paper, sketch pens, geometry box, glue stick,

What do we need to know?

Parallel lines, perpendicular lines,

➤ **Teacher 's Activity**

Teacher will discuss Reflexive, symmetric and Transitive relations with students

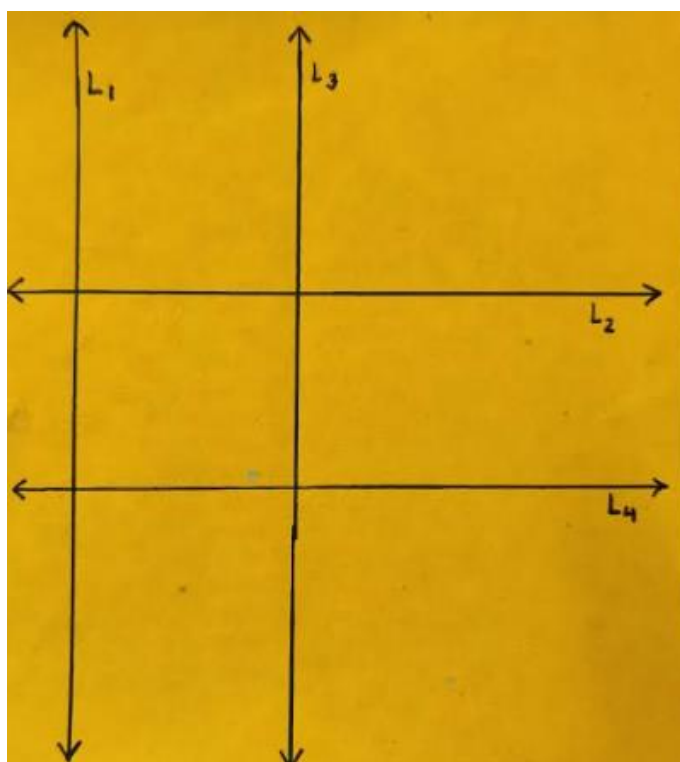
How will I proceed?

➤ **Student's Activity**

Student will

- 1.Take a piece of hardboard and paste a white paper on it. Fix the threads randomly on the hardboard with the help of pins such that some of them are parallel, some are perpendicular to each other as shown in Fig.1.
- 2.Let the threads represent the lines l_1, l_2, l_3, l_4
3. l_1 is perpendicular to each of the lines l_2 , and l_4 . [see Fig. 1]
4. l_3 is perpendicular to each of the lines l_2 , and l_4 . [see Fig. 1]
5. l_1 is parallel to l_3 and l_2 is parallel to l_4
- 6 $(l_3, l_4), (l_1, l_4), ((l_3, l_2) (l_1, l_2), \in R$

FIG 1



What have i observed?

S.No.		
1	In Fig. 1, is a line is perpendicular to itself, so the relation $R = \{(l, m): l \perp m\}$ reflexive -----	(is/is not).
2(a)	In Fig. 1, l_1 perpendicular l_2 . Is $l_2 \perp$ perpendicular l_1 ? _- -----	(Yes/No)
	$(l_2, l_3) \in R \Rightarrow (l_3, l_2)$ _____ R	$(\notin/\in)$
2	Similarly, If $l_3 \perp l_2$. Is l_2 perpendicular l_3 ? ----- --	(Yes/No)
	$(l_4, l_3) \in R \Rightarrow (l_3, l_4)$ _____ R	$(\notin/\in)$
	The relation R symmetric -----	(is/is not)
3	In Fig. 1, l_1 perpendicular l_2 and l_2 perpendicular l_3 . Is $l_1 \perp l_3$? -----	(Yes/No)
	i.e., $(l_1, l_2) \in R$ and $(l_2, l_3) \in R \Rightarrow (l_1, l_3)$ -----R	$(\notin/\in)$
	$\therefore$ The relation R ----- transitive	(is/is not).

What have I learnt?

This activity can be used to check whether a given relation is an equivalence relation or not. In this case, the relation is not an equivalence relation.

The activity can be repeated by taking some more wire in different positions
($R = \{(l, m) : l \parallel m\}$ is an equivalence relation or not

Let me evaluate myself

Q1 Let T be the set of all triangles in a plane with R a 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.

Q2. Let L be the set of all lines in XY plane and R be the relation in L defined as

$R = \{(L_1, L_2) : L_1 \text{ is parallel to } L_2\}$. Show that R is an equivalence relation. Find the set of all lines related to the line $y = 2x + 4$

Q 3 Consider the non-empty set consisting of children in a family and a relation R defined as $a R b$ if a is brother of b . Then R is

- | | |
|--------------------------------------|-----------------------------------|
| (a) symmetric but not transitive | (b) transitive but not symmetric |
| (c) neither symmetric nor transitive | (d) both symmetric and transitive |

Q4. Let $A = \{0, 1, 2, 3\}$ and define a relation R on A as follows: $R = \{(0, 0), (0, 1), (0, 3), (1, 0), (1, 1), (2, 2), (3, 0), (3, 3)\}$. Is R reflexive? symmetric? transitive?

Q 5. 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.
