ACTIVITY - 01

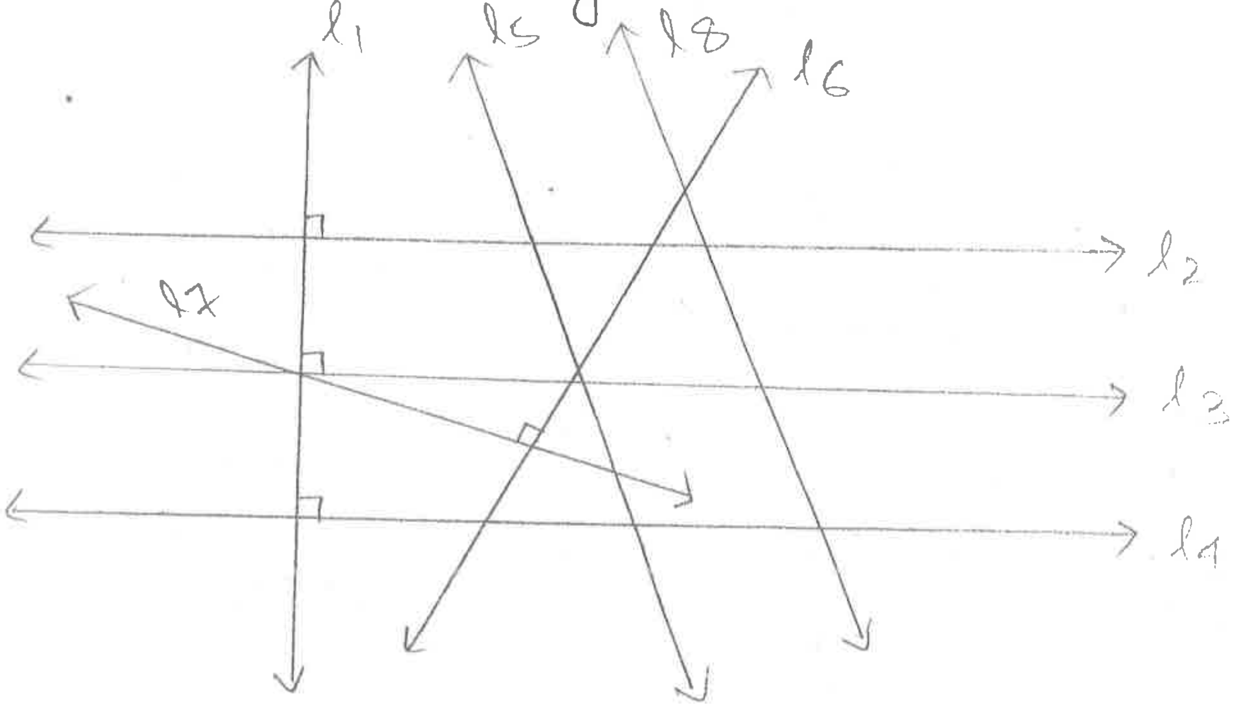
Math

OBJECTIVE :- To verify that the relation 'R' in the set of all lines in a plane, defined by $R = \{(l, m) : l \parallel m\}$ is an equivalence relation.

MATERIAL REQUIRED :- A piece of plywood, some pieces of wire (8), nails, white paper, glue.

METHOD OF CONSTRUCTION :-

Take a piece of plywood & paste a white paper on it. Fix the wires randomly on the plywood with the help of nails such that some of them are parallel, some are perpendicular to each other and some are inclined as shown in fig.



DEMONSTRATION :-

1. Let the wires represent the lines $l_1, l_2, \ldots l_8$
2. l_1 is $\perp$er to to each of the lines l_2, l_3, l_4
3. l_6 is perpendicular to l_7.
4. $l_2 \parallel l_3$, $l_3 \parallel l_4$ & $l_4 \parallel l_5$.
5. (l_2, l_3), (l_3, l_4), $(l_5, l_8) \in R$.

OBSERVATION :-

1. in fig every line is Parallel to itself
   so the relation $R = \{(l, m) : l \parallel m\}$ is reflexive.

2. $\because l_2 \parallel l_3 \Rightarrow l_3 \parallel l_2$

   so; $(l_2, l_3) \in R \Rightarrow (l_3, l_2) \in R$

   Similarly $(l_3, l_4) \in R \Rightarrow (l_4, l_3) \in R$

   & $(l_5, l_8) \in R \Rightarrow (l_8, l_5) \in R$

   $\therefore$ The Relation R is symmetric.

3. $\because l_2 \parallel l_3$ & $l_3 \parallel l_4 \Rightarrow l_2 \parallel l_4$

   $\Rightarrow (l_2, l_3) \in R$ & $(l_3, l_4) \in R$

   $\Rightarrow (l_2, l_4) \in R$

   Similarly $l_3 \parallel l_4$ & $l_4 \parallel l_2 \Rightarrow l_3 \parallel l_2$

   $\Rightarrow (l_3, l_4) \in R$ & $(l_4, l_2) \in R$

   $\Rightarrow (l_3, l_2) \in R$

   $\therefore$ The relation R is transitive.

Hence; the Relation R is reflexive, symmetric & transitive. so, R is an equivalence relation.

APPLICATION :-

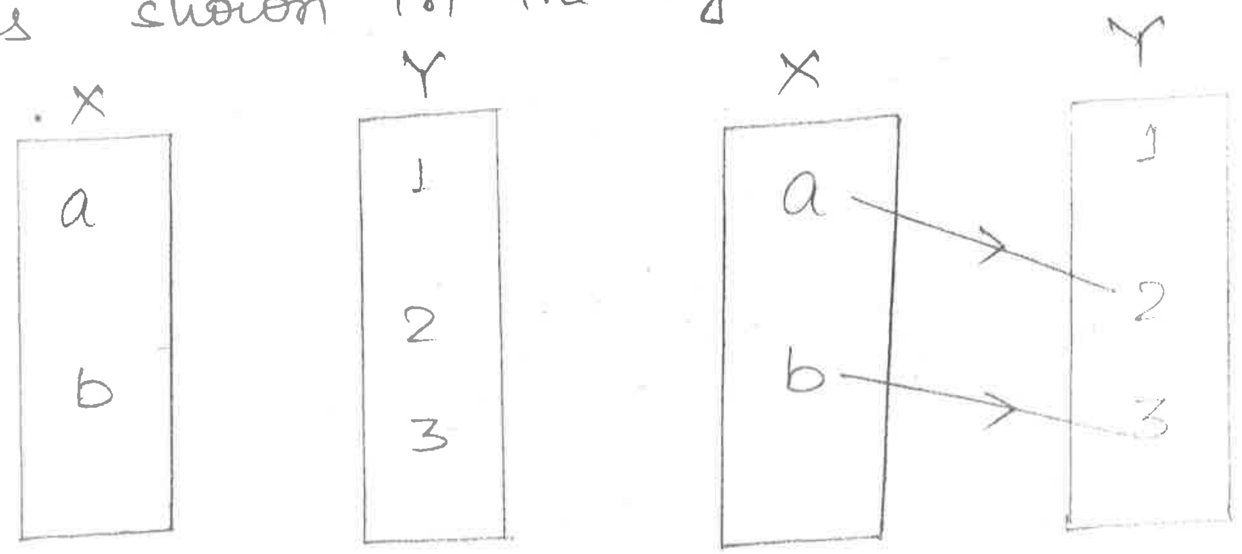
This activity is useful in understanding the concept of an equivalene relation

OBJECTIVE :- To demonstrate a function which is one-one but not onto.

MATERIAL REQUIRED :- cardboard, nails, strings, adhesive and plastic strips.

METHOD OF CONSTRUCTION :-

1. Paste a plastic strip on the left hand side of the card board and fix two nails in it. Name the nails as a and b.
2. Paste another strip on the right hand side of the cardboard & fix three nails in it. Name the nails as 1, 2, 3.
3. Join nails on the left strip on the right as shown in the fig.



DEMONSTRATION :-

1. Take the set $X = \{a, b\}$
2. Take the set $Y = \{1, 2, 3\}$
3. Join elements of X to the elements of Y as shown in fig.

ACTIVITY - 03

OBJECTIVE:- To verify that amongst all the rectangles of same Perimeter the square has maximum area.

MATERIAL REQUIRED:- Chart Paper, sharpener, Pencil, glue etc.

METHOD OF CONSTRUCTION:-

1. Take cardboard of convenient size and Paste on white paper.
2. Make rectangle each of Perimeter say 48 cm on a chart Paper.
3. Rectangles of different dimensions are
   R_1 : 15cm × 9cm R_2 : 13cm × 11cm,
   R_3 : 12 cm × 12 cm R_4 : 10cm × 14 cm.
4. Cut these rectangles and Paste.

Demonstration:-

1. Area of R_1 = 15 cm × 9 cm = 135 cm^2
   Area of R_2 = 13 cm × 11 cm = 143 cm^2
   Area of R_3 = 12 cm × 12 cm = 144 cm^2
   Area of R_4 = 10 cm × 14 cm = 140 cm^2
2. Perimeter of each rectangle is same but their area is different. Area of rectangle R_3 is maximum. It is a square of side 12 cm.

Application:-

This activity is useful in explaining the idea of maxima & minima of a function

OBSERVATION :-

1. The image of the element a of x in Y is 2.
2. The image of the element b of x in Y is 3
   so the function is one one.
3. Every element in X has a image in Y
   so the function is one one.
4. The Pre image of the element 1 of Y in x doesn't exist so the function is not onto.

Thus the fig. represents a function which is one one but not onto.

APPLICATION :-

This activity can be used to demonstrate the concept of one one but not onto function.

ACTIVITY - 04

OBJECTIVE:- To find analytically the limit of function $f(x)$ at $x=c$ and also to check the continuity of the function at that Point.

MATERIAL REQUIRED:- Paper, Pencil, calculator

METHOD OF CONSTRUCTION:-

1. Consider the function given by;

$$f(x) = \infty \; ; x=4 \quad f(x) = \frac{x^2-16}{x-4} \; ; x \neq 4$$

(undefined) $\infty ; x=4$

2. Take some Points on the left & some Points on the right side of c (=4) which are very near to c.
3. find the corresponding values of $f(x)$ for each of the Points considered in step
4. Record the values of Points on the left and right side of c as x and the corresponding values of f(x) in a form of a table

DEMONSTRATION:-

The values of x and f(x) are recorded as follows.

Table-1 (for Points on the left

x	3.9	3.99	3.999	3.9999	3.99999
$f(x)$	7.9	7.99	7.999	7.9999	7.99999

Table-2
(for Points on the right of c=4)

x	4.1	4.01	4.001	4.0001	4.00001
$f(x)$	8.1	8.01	8.001	8.0001	8.00001

OBSERVATION :-

1. The value of $f(x)$ is approaching to $\underline{8}$ as $x \to 4$ from the left.
2. The value of $f(x)$ is approaching to 8 as $x \to 4$ from the right.
3. So $\lim_{x \to 4^+} f(x) = 8$ and $\lim_{x \to 4^-} = 8$
4. Therefore $\lim_{x \to 4} f(x) = 8$; $f(4) = \cancel{8}100$
5. Since $f(c) \neq \lim_{x \to c} f(x)$ so the function is not continuous at $x = 4$.

APPLICATION :-

This activity is useful in understanding the concept of limit and continuity of a function at a Point.