DARE TO DREAM
FREEDOM INTERNATIONAL SCHOOL

FREEDOM INTERNATIONAL SCHOOL

CERTIFICATE

This is to certify that

ABHIRATH ADAMANE

has satisfactorily completed the activities and projects in

MATHEMATICS

prescribed by the Central Board of Secondary Education

at Freedom International School in the

Year 2022 - 2023

Signature of the teacher in charge of the batch : S. Murugan

Date : 05.12.2022.

Principal's Signature and Seal :

PRINCIPAL
FREEDOM INTERNATIONAL SCHOOL
BANGALORE

FREEDOM INTERNATIONAL SCHOOL ★ BANGALORE

Name of the Candidate : ABHIRATH ADAMANE

Roll Number :

Signature of the Internal Examiner : S. Murugan

Signature of the External Examiner :

External Examiner Code :

Date of Practical Examination : 13.01.2023

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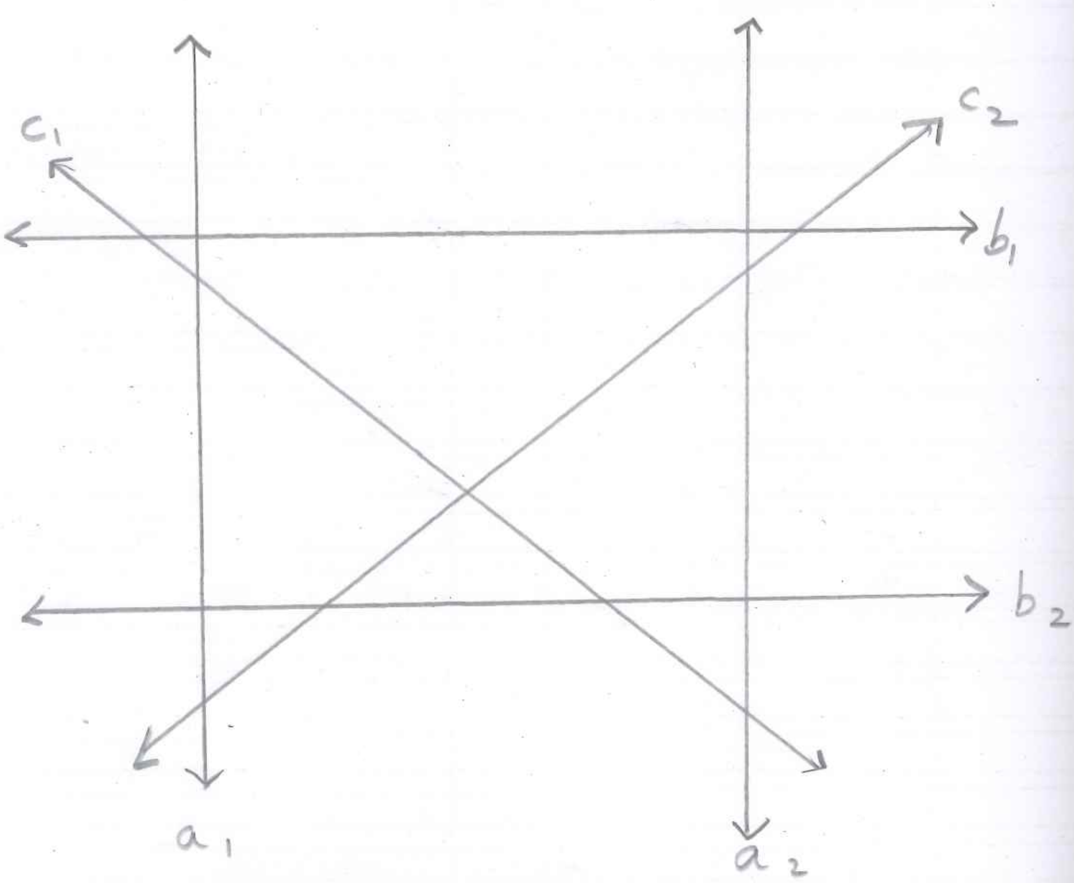

c_1
c_2
b_1
b_2
a_1
a_2

TYPES OF RELATIONS

OBJECTIVE:

To verify that the relation R in the set L of all lines in a plane, defined as $[(a,b): a \perp b, a,b \in L]$ is symmetric but neither reflexive or transitive.

MATERIALS REQUIRED:

A drawing board, white paper sheet, pencil, scale, pins.

METHOD OF CONSTRUCTION:

1. Take a drawing board and place it on the table. Now fix a white paper sheet with pins.
2. Draw straight lines on paper so that some are parallel and perpendicular to the given drawn lines
3. Name these lines a_1, a_2, b_1, b_2 as shown.

OBSERVATION:

1. Relation R is symmetric

a) $a_1 \perp b_1$ and $b_1 \perp a_1$
$(a_1, b_1) \in R$ and $(b_1, a_1) \in R$
R is symmetric

b) $a_2 \perp b_1$ and $b_1 \perp a_2$
$(a_2, b_1) \in R$ and $(b_1, a_2) \in R$
R is symmetric

2. Relation R is not reflexive
No line is perpendicular to itself.
$(a_1, a_1), (a_2, a_2), (b_1, b_1), (b_2, b_2) \notin R$

3. Relation R is not transitive
1. $b_1 \perp a_1$ and $a_1 \perp b_2$, (b_1, a_1) $(a_1, b_2) \in R$
But b_1 is not perpendicular to b_2
$\therefore (b_1, b_2) \notin R$

2. $a_1 \perp b_1$ and $b_1 \perp a_2$, $(a_1, b_1), (b_1, a_2) \in R$
But a_1 is not perpendicular to a_2
$\therefore (a_1, a_2) \notin R$

RESULT :

This activity verifies that a relation R in a set L of plane lines, $R = [(a,b) : a \perp b, a, b \in A]$ is symmetric but neither reflexive or transitive.

B. Murugan

EQUIVALENCE RELATION

OBJECTIVE:

To verify that a relation R in set L of all lines in a plane,

$$R = \{(a, b) : a \parallel b,\ a, b \in L\},$$

is an equivalence relation

MATERIALS REQUIRED:

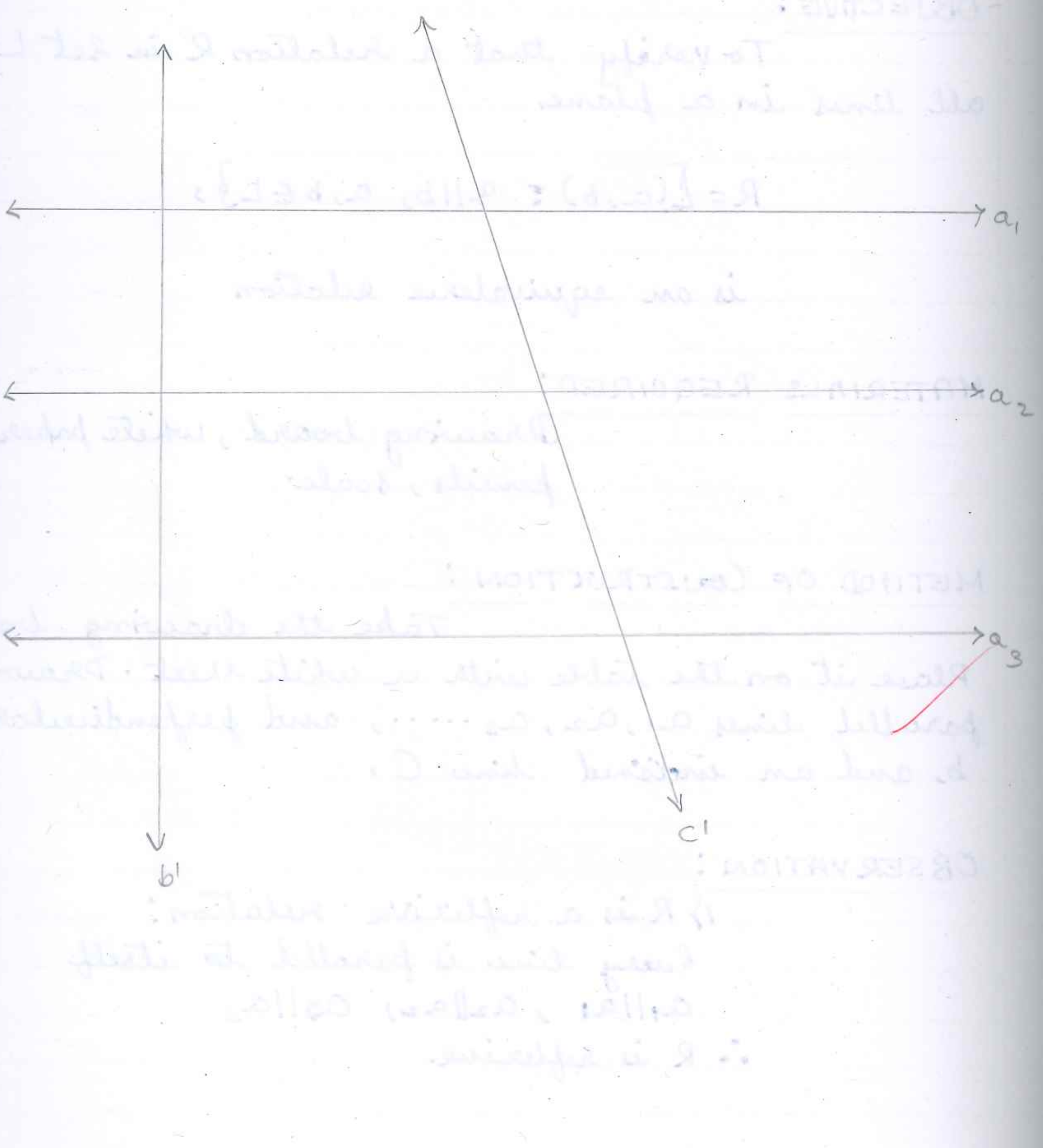
Drawing board, white paper, pins, pencils, scale.

METHOD OF CONSTRUCTION:

Take the drawing board. Place it on the table with a white sheet. Draw some parallel lines $a_1, a_2, a_3, \ldots$, and perpendicular line b, and an inclined line C.

OBSERVATION:

1) R is a reflexive relation:
Every line is parallel to itself
$a_1 \parallel a_1$, $a_2 \parallel a_2$, $a_3 \parallel a_3$
$\therefore$ R is reflexive.



a1
a2
a3
b'
c'

2) R is a symmetric relation:

a) By construction, $a_1 \parallel a_2$ and $a_2 \parallel a_1$.
$\Rightarrow (a_1, a_2), (a_2, a_1) \in R$.
$\therefore$ R is symmetric.

b) By construction, $a_1 \parallel a_3$ and $a_3 \parallel a_1$.
$\Rightarrow (a_1, a_3), (a_3, a_1) \in R$
$\therefore$ R is symmetric.

3) R is a transitive relation:
$a_1 \parallel a_2$ and $a_2 \parallel a_3$. so $(a_1, a_2), (a_2, a_3) \in R$
$a_1 \parallel a_3$, so $(a_1, a_3) \in R$
$\therefore$ R is transitive

RESULT:

We have verified that $R = \{(a,b) : a \parallel b,\ a, b \in L\}$ is reflexive, symmetric, and transitive, Hence, R is an equivalence relation.

NAME OF EXPERIMENT Continuity of a Function DATE 29/11/22

EXPERIMENT No. 3 EXPERIMENT RESULT

CONTINUITY OF A FUNCTION

OBJECTIVE:

To analytically find the limit of a function $f(x)$ at $x=c$ and check the continuity of the function

MATERIALS REQUIRED:

Drawing board, paper, pencil pins, scale.

METHOD OF CONSTRUCTION:

1) Take a function $f(x) = \begin{cases} \dfrac{x^2-16}{x-4} & , x \neq 4 \\ 8 & , x = 4 \end{cases}$

2) Take values very close to 4 on the left and find fuction values. Record them in the table given.

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

3) Take values close to 4 on the right and find function values. Record them in the table given

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

NAME OF EXPERIMENT .... DATE .... PAGE No. 6

EXPERIMENT No. .... EXPERIMENT RESULT ....

OBSERVATION:

The two tables demonstrate that when x is near 4, either from left or right, the function value approaches 8. The value of $f(x)$ approaches 8 as $x \to 4^-$ and $x \to 4^+$

CONCLUSION:

1. $\lim_{x \to 4^-} f(x) = 8$ exists
2. $\lim_{x \to 4^+} f(x) = 8$
3. $f(4) = 8$

$\therefore$ $f(x$ is continuous at $x = 4$

NAME OF EXPERIMENT: Applications of Derivatives DATE: 29/11/22
EXPERIMENT No.: 4 EXPERIMENT RESULT: PAGE No. 7

APPLICATION OF DERIVATIVES

OBJECTIVE:

To construct an open box of maximum volume from a given sheet by cutting equal squares on all corners.

MATERIALS REQUIRED:

Paper of size 44 × 24 cm, tape, pencil, scissors.

METHOD OF CONSTRUCTION:

1. Take the rectangular paper and name it.

2. Cut four equal squares of side 1cm from the corners and fold up the flaps to make a box. Measure the sides and find its volume.

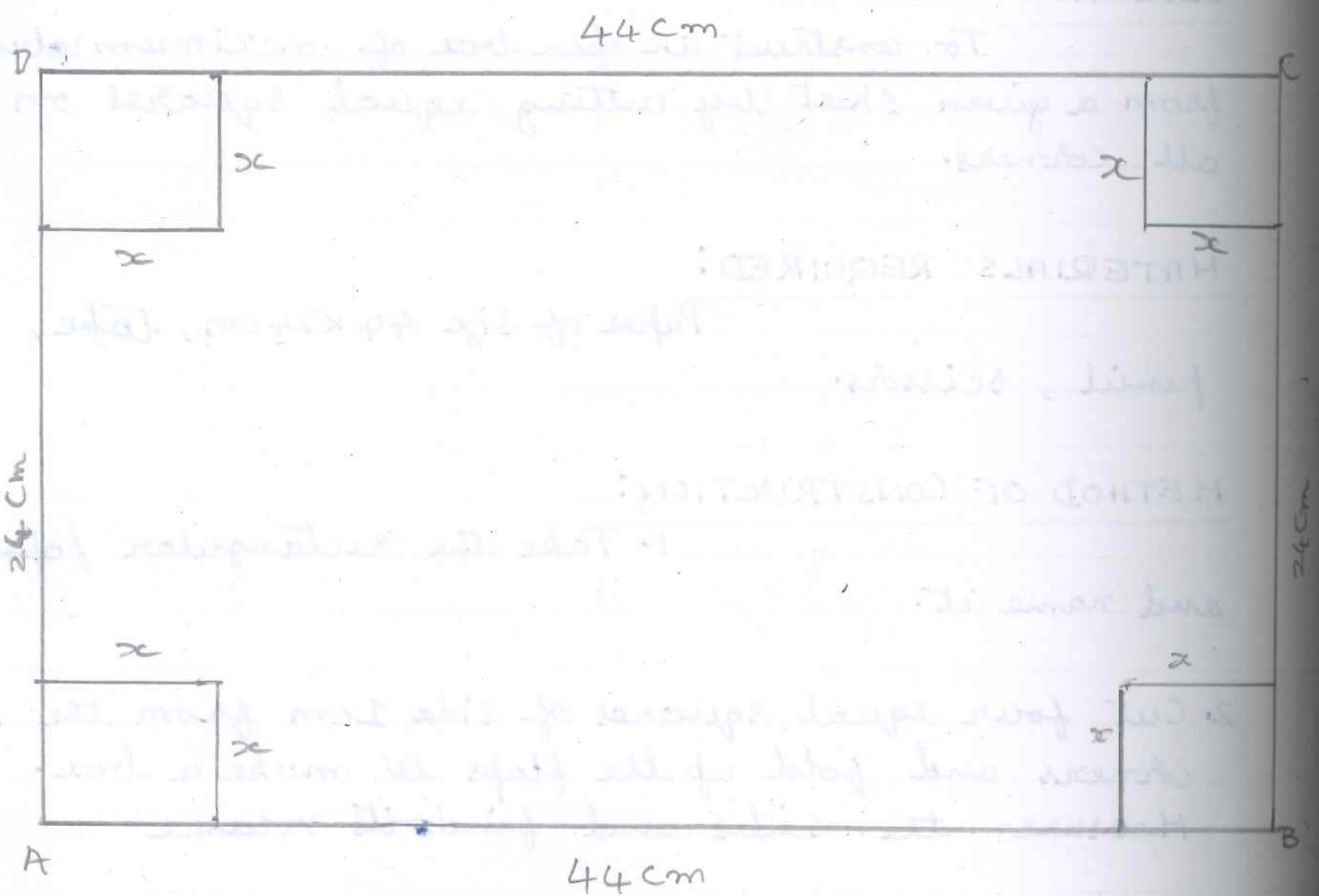
3. Repeat the process by cutting squares of side 2cm, 3cm, ... upto 7cm each.

4. In each case, make a box by folding up the flaps. Measure the sides and find the volume.

DEMONSTRATION:

1) $x = 1$: $l = 44 - 2 = 42cm$, $b = 24 - 2 = 22cm$, $h = 1cm$

Volume 1 $= 1 \times 42 \times 22 = 924 \, cm^3$



44 cm
D
C
x
x
x
x
24 Cm
24 Cm
x
x
x
x
A
B
44 cm

2) $x = 2$: $l = 44-4 = 40cm$, $b = 24-4$ $20cm$, $h = 2cm$
Volume 2 $= 2\times40\times20 = 1600\ cm^3$

3) $x=3$: $l = 44-6 = 38cm$, $b = 24-6 = 18cm$, $h = 3cm$
Volume 3 $= 3\times38\times18 = 2052\ cm^3$

4) $x=4$: $l = 44-8 = 36cm$, $b = 24-8 = 16\ cm$, $h = 4cm$
Volume 4 $= 4\times36\times16 = 2304\ cm^3$

5) $x=5$: $l = 44-10 = 34cm$, $b = 24-10 = 14\ cm$, $h = 5cm$
Volume 5 $= 5\times34\times14 = 2380\ cm^3$

6) $x=6$: $l = 44-12 = 32cm$, $b = 24-12 = 12cm$, $h = 6cm$
Volume 6 $= 6\times32\times12 = 2304\ cm^3$

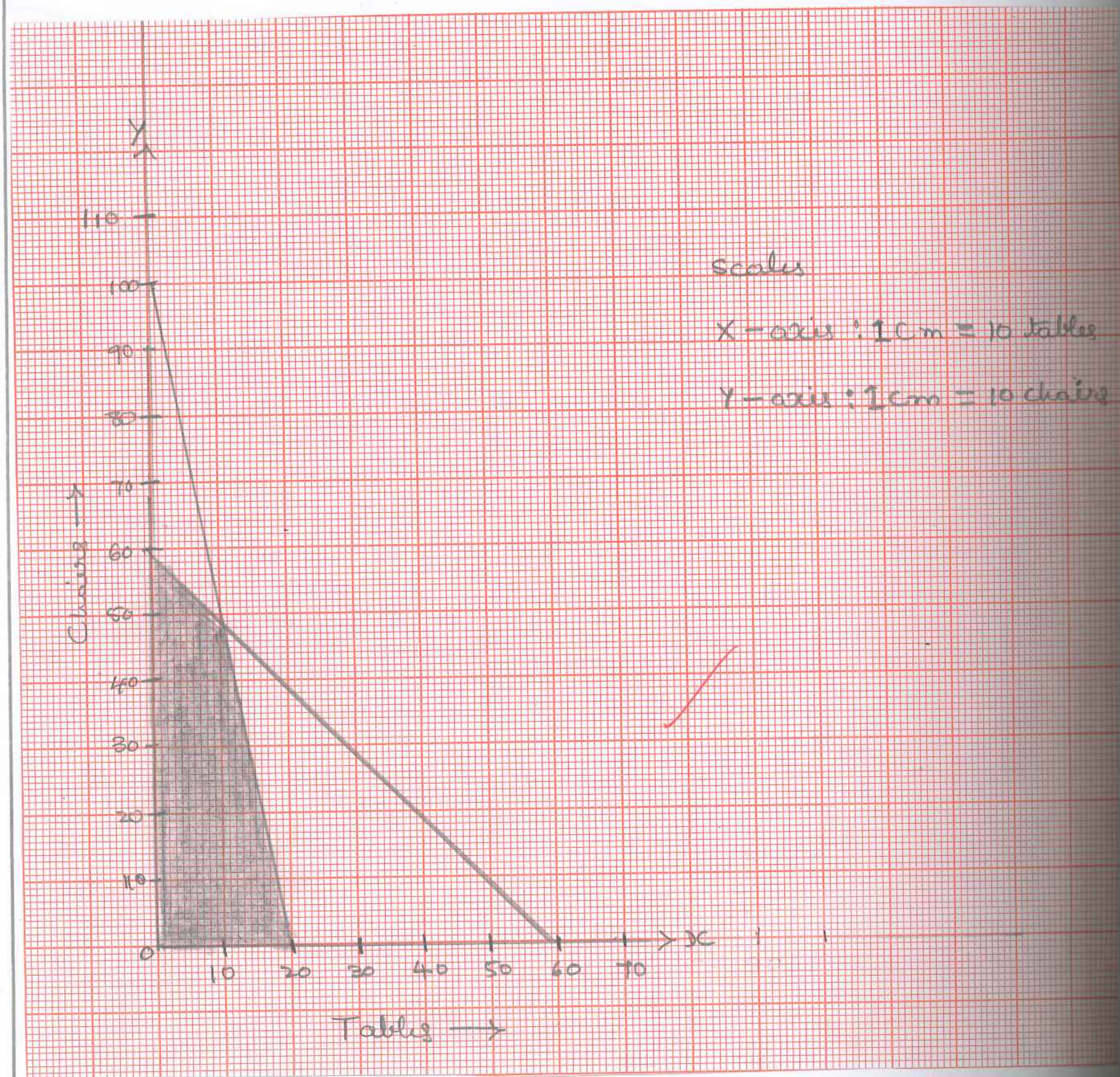
7) $x=7$: $l = 44-14 = 30cm$, $b = 24-14 = 10cm$, $h = 7cm$
Volume 7 $= 7\times30\times10 = 2100\ cm^3$

OBSERVATION :

1. $x = 1cm$, $V_1 = 924\ cm^3$
2. $x = 2cm$, $V_2 = 1600\ cm^3$
3. $x = 3cm$, $V_3 = 2052\ cm^3$
4. $x = 4cm$, $V_4 = 2304\ cm^3$
5. $x = 5cm$, $V_5 = 2380\ cm^3$
6. $x = 6cm$, $V_6 = 2304\ cm^3$
7. $x = 7cm$, $V_7 = 2100\ cm^3$

RESULT :

The Volume is maximum when a square of side 5cm is removed from the corners.


Y
110
100
90
80
70
60
50
40
30
20
10
0
Chairs →
10
20
30
40
50
60
70
x
Tables →
Scales
X – axis : 1 cm = 10 tables
Y – axis : 1 cm = 10 chairs

LINEAR PROGRAMMING PROBLEM

OBJECTIVE:

A dealer deals in tables and chairs. He has Rs 5000 to invest and storage for 60 pieces. A table costs Rs250 and a chair is Rs50. He can sell a table and a chair at a profit of Rs50 and Rs15, respectively. If he sells all bought items, how much should he invest for maximum profit?

MATERIAL REQUIRED:

Drawing sheet, scale, compass-box, calculator.

PROCEDURE:

$x \to$ No. of tables, $y \to$ No of chairs

$x, y \geq 0$ and $x + y \leq 60$

Tables: Rs 250, Chair = Rs 50

$\therefore 250x + 50y \leq 5000 \Rightarrow 5x + y \leq 100$

profit $= 50x + 15y$

Draw the graph for both the equations:

$5x+y=100$	x y	20 0	0 100	10 50

$x+y=60$	x y	0 60	60 0	10 50

The solution is the required feasible region OABC, whose boundary points are O(0,0), A(20,0), B(10,50), C(0,60)

Calculate the value of profit for the feasible region

Sl.No.	Points of Boundary	$P = 50x + 15y$
1	O(0,0)	$P = 0$
2	A(20,0)	$P = 1000$
3	B(10,50)	$P = 1250$
4	C(0,60)	$P = 900$

Boundary B gives maximum profit = Rs 1250 and so the dealer should purchase 10 tables and 50 chairs.

RESULT:

The shaded region represents the solution set for the given equation, and concluded that for a profit of Rs 1250, 10 tables and 50 chairs should be produced.

S. Murugan

NAME OF EXPERIMENT One-One and onto function DATE 30/11/22

EXPERIMENT No. 6 EXPERIMENT RESULT

ONE-ONE AND ONTO FUNTION

OBJECTIVE:

To demonstrate a function which is one-one and onto

MATERIALS REQUIRED:

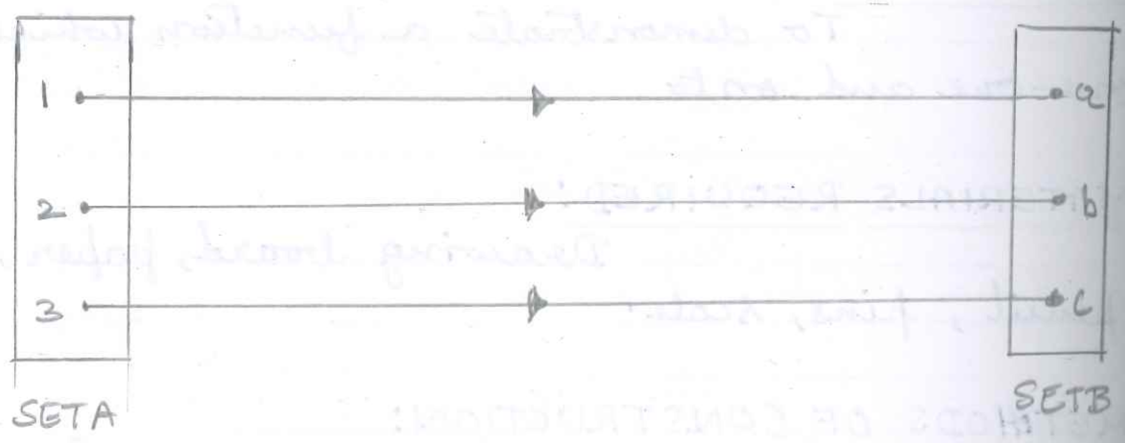
Drawing board, paper, pencil, pins, scale.

METHODS OF CONSTRUCTION:

1. Take two function $A = \{1, 2, 3\}$ and $B = \{a, b, c\}$
2. Take three points on left hand of sheet as set $A = \{1, 2, 3\}$
3. Take three points on right hand of sheet as set $B = \{a, b, c\}$
4. Join point 1 of set A to point a of set B, 2 of set A to b of set B ~~and~~ 3 of set A to c of set B.

OBSERVATION:

1. Element '1' of set A has 'a' from set B. Element '2' of set A has 'b' from set B. Element '3' of set A has 'c' from set B. Each element of set A has image in set B. So function is one-one.
2. Element 'a' of set B has pre-image 1 in set A. Element 'b' of set B has pre image 2 in set A. Element 'c' of set B has pre image 3 in set A. Every element in B has a pre-image in A. So it is an onto function.


1
2
3
a
b
c
SETA
SETB

RESULT:

The function from set A to set B defined as {(1,a), (2,b), (3,c) is one-one and onto.

S. Muniswamy

CONDITIONL PROBABILITY

OBJECTIVE:

To explain conditional probability of event A when B has occurred through the rolling of a dice

QUESTION:

Find Conditional probability of event A, a number appears on both dice, if event B has alrea occurred, where event B is, if 4 has appeared atlea once.

Material Required:

White paper, drawing board, pins, scale, pencil.

METHOD OF CONSTRUCTION:

1) Fix white paper on drawing boa with pins.

2) Draw a big square 6cm X 6cm divide into 36 squares.

3. Write every outcome of rolling t pair of dice on each square.

DEMONSTRATION:

1) The figure represents the sample spac throwing a pair of dice

2) Event A is if number is appears o dice and B is if 4 appeared atleast once.

1,1	1,2	1,3	1,4	1,5	1,6
2,1	2,2	2,3	2,4	2,5	2,6
3,1	3,2	3,3	3,4	3,5	3,6
4,1	4,2	4,3	4,4	4,5	4,6
5,1	5,2	5,3	5,4	5,5	5,6
6,1	6,2	6,3	6,4	6,5	6,6

NAME OF EXPERIMENT .... DATE ....

EXPERIMENT No. .... EXPERIMENT RESULT .... PAGE No

3) Outcomes favourable to $A = 1\ [(4,4)]$

Outcomes favourable to $B = 6\ [(4,1)(4,2)($
$(4,4)(4,5)(4,6)], [(1,4)(2,4)(3,4)(5,4)(6,4)]$

4) Outcomes favourable to both $= 1\ [(4,4)]$

5) Total outcomes $= 36$

6) $n(A) = 1 \quad n(B) = 11 \quad n(S) = 36$

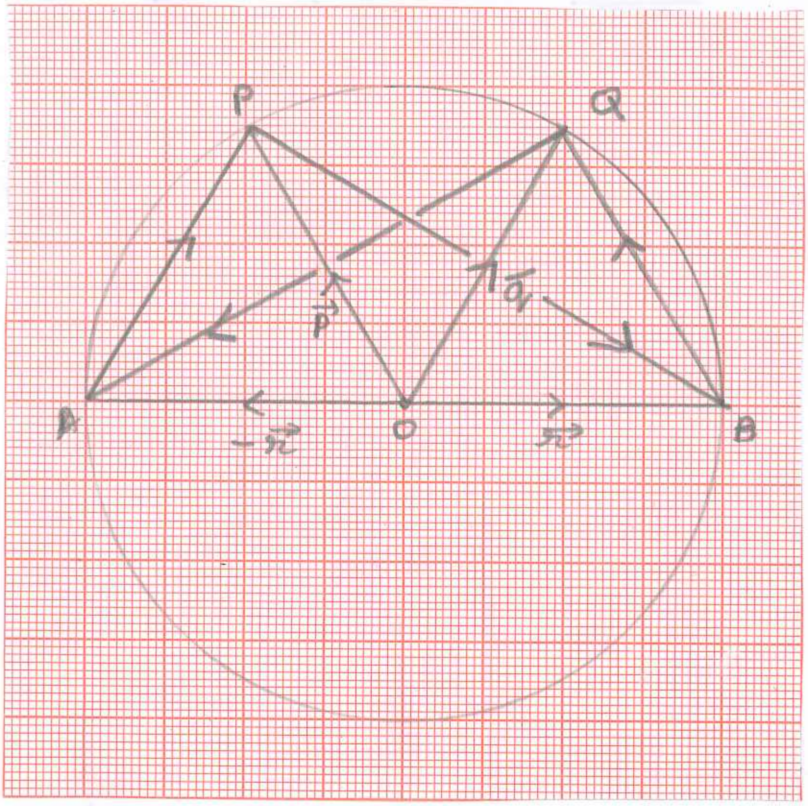
$$P(B) = \frac{n(B)}{n(S)} = \frac{11}{36} \qquad P(A) = \frac{n(A)}{n(S)} = \frac{1}{36}$$

$$P(A/B) = \frac{P(A \cap B)}{P(B)} = \frac{1}{11}$$

OBSERVATION:

1. Favourable outcome to A, $n(A) =$
to B, $n(B) = 11$
2. Total outcome $= 36$
3. Favourable outcome to A and B $=$
4. $P(A \cap B) = \frac{1}{36}$
5. $P(A/B) = \frac{1}{11}$

S. Hunger


A
P
Q
O
B

NAME OF EXPERIMENT Vector Algebra DATE 30/11/22

EXPERIMENT No. 8 EXPERIMENT RESULT

VECTOR ALGEBRA

OBJECTIVE :

To verify that angle in semicircle is a 9
angle using vector method.

MATERIAL REQUIRED :

A white paper, a drawing boar
pencil, scale.

METHOD OF CONSTRUCTION :

1. Fix white paper on drawing boar
2. Draw circle with centre O, radius - 5cm
3. Join $\overrightarrow{OA} = -\vec{r}$, $\overrightarrow{OB} = \vec{r}$, $\overrightarrow{OP} = \vec{P}$, $\overrightarrow{OQ} = \vec{q}$

DEMONSTRATION :

In ΔOAP

$\overrightarrow{OA} + \overrightarrow{AP} = \overrightarrow{OP}$

$\overrightarrow{AP} = \vec{P} + \vec{r}$

In ΔOBP,

$\overrightarrow{OB} + \overrightarrow{BP} = \overrightarrow{OP}$

$\overrightarrow{BP} = \vec{P} - \vec{r}$

In ΔOBQ

$\overrightarrow{OB} + \overrightarrow{BQ} = \overrightarrow{QQ}$

$\overrightarrow{BQ} = \vec{q} - \vec{r}$

In ΔOAQ,

$\overrightarrow{OA} + \overrightarrow{AQ} = \overrightarrow{OQ}$

$\overrightarrow{AQ} = \vec{q} + \vec{r}$

OBSERVATION :

In ΔAOP, $\overrightarrow{AP}\cdot\overrightarrow{BP} = (\vec{p}+\vec{r})(\vec{p}-\vec{r})$

$= |\vec{p}|^2 - |\vec{r}|^2 = 0$

$\therefore \angle APO = 90^\circ$

In ΔBOQ, $\overrightarrow{AQ}\cdot\overrightarrow{BQ} = (\vec{q}-\vec{r})(\vec{q}+\vec{r})$

$= |\vec{q}|^2 = |\vec{r}|^2 = 0$

$\therefore \angle BQO = 90^\circ$

we can prove pythogoras theorem by actual measurements. $|8.6|^2 + |5|^2 = |10|^2$

RESULT :

Angle in a semicircle is 90°.

S. Kumar