* تمام طلبہ دی گئی Practical Book خریدیں۔

* PDF کی مدد سے Book مکمل کریں۔

* تجربے جس Page پر لکھے گئے ہیں۔ اُسی Page پر لکھیں۔

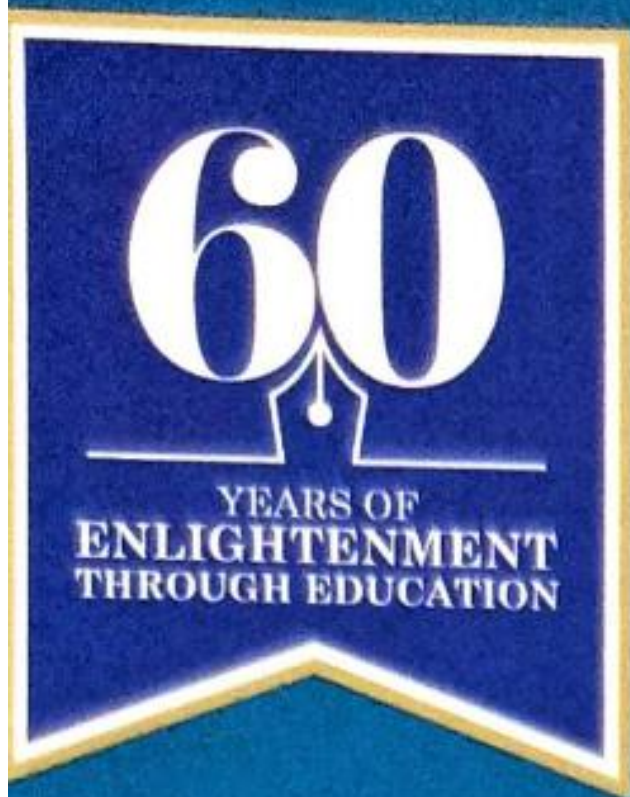* اشکال اور ترسیم جہاں ضرورت ہو خود بنائیں۔ Ink - pen کا استعمال نہ کریں صرف پینسل سے ہی بنائیں۔

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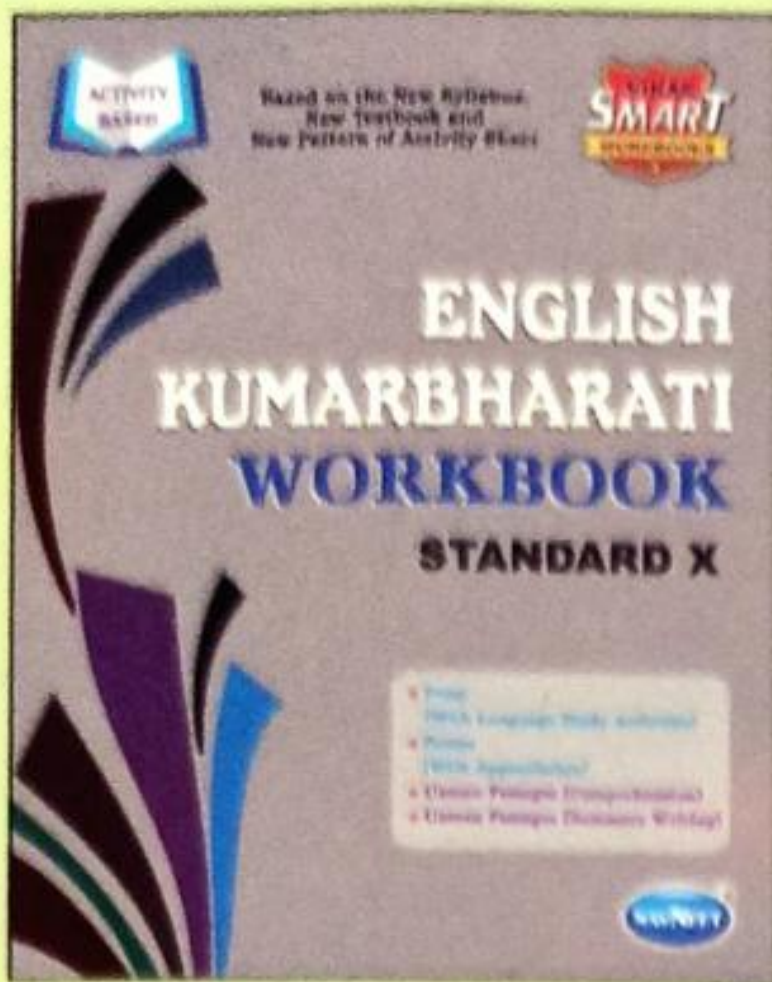
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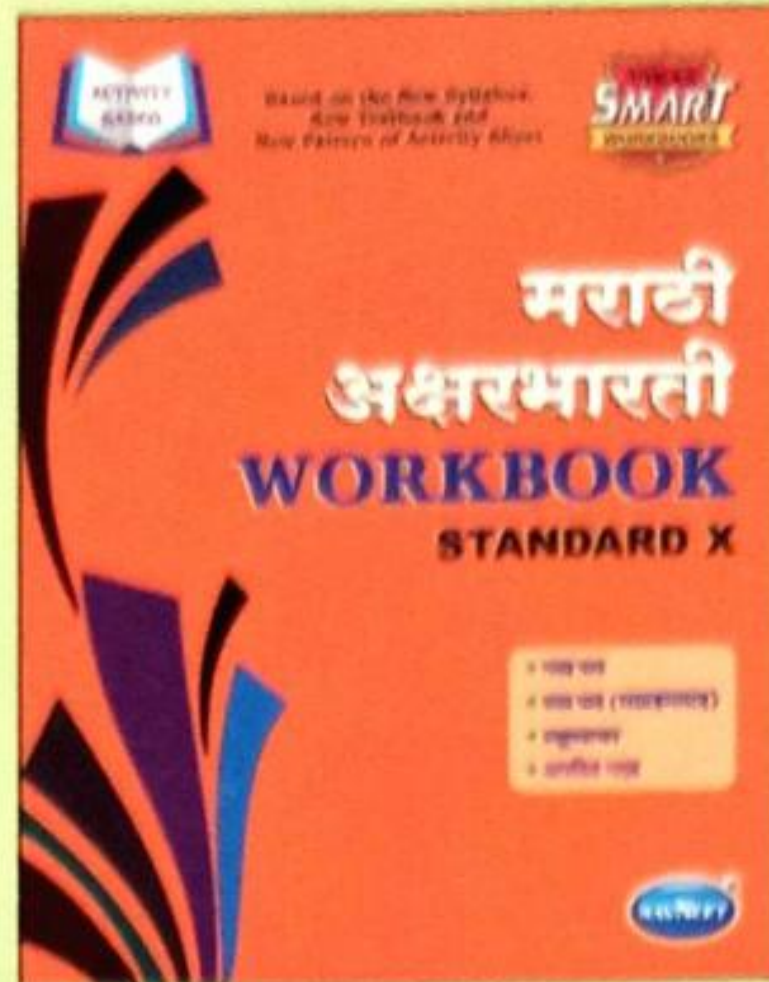
Based on the Board's
Revised Evaluation Pattern

VIKAS
MATHEMATICS
PRACTICAL BOOK
(PARTS I & II)
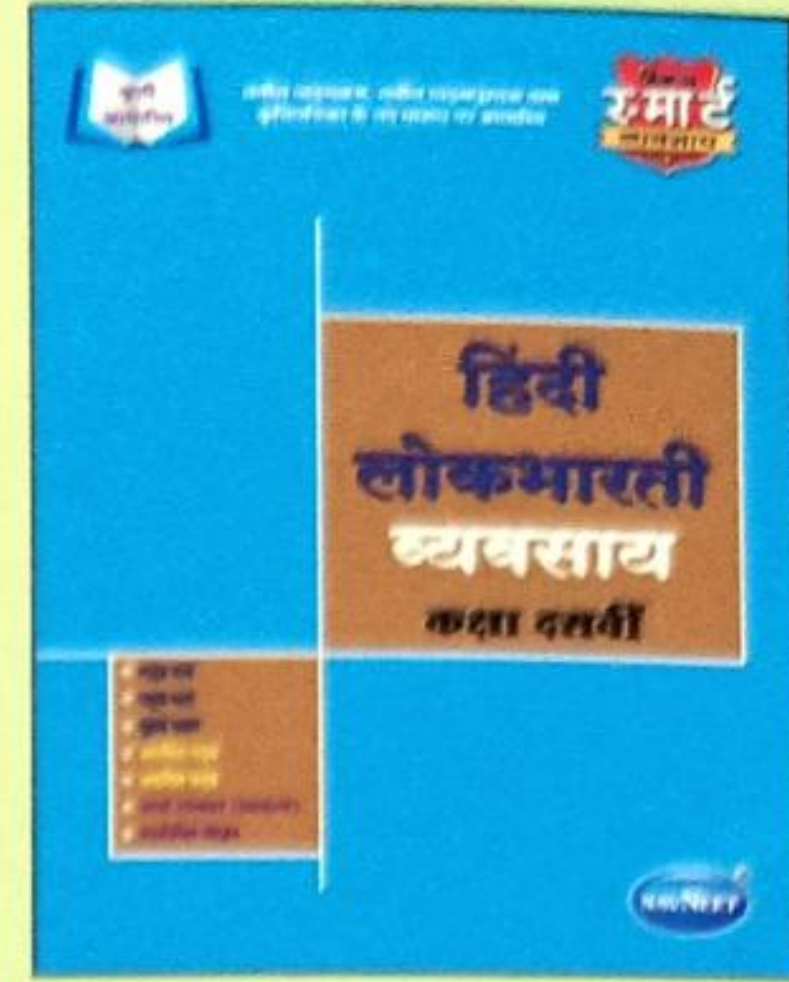### (INTERNAL EVALUATION HANDBOOK)
STANDARD X
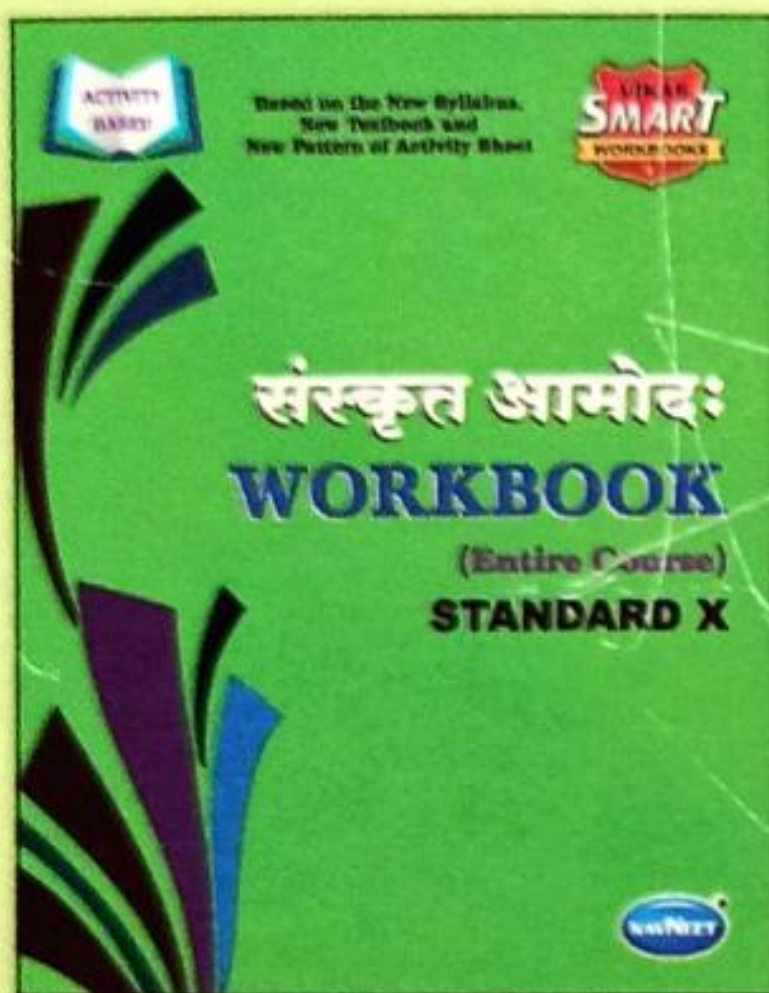
NAV

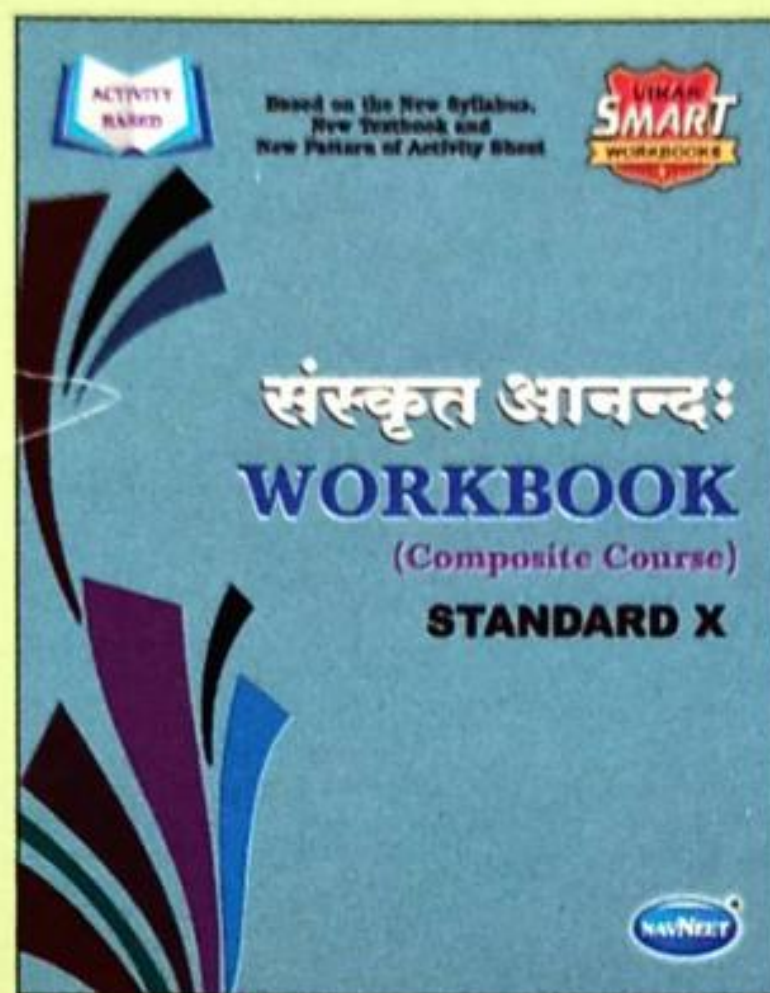# MOST USEFUL WORKBOOKS FOR STANDARD

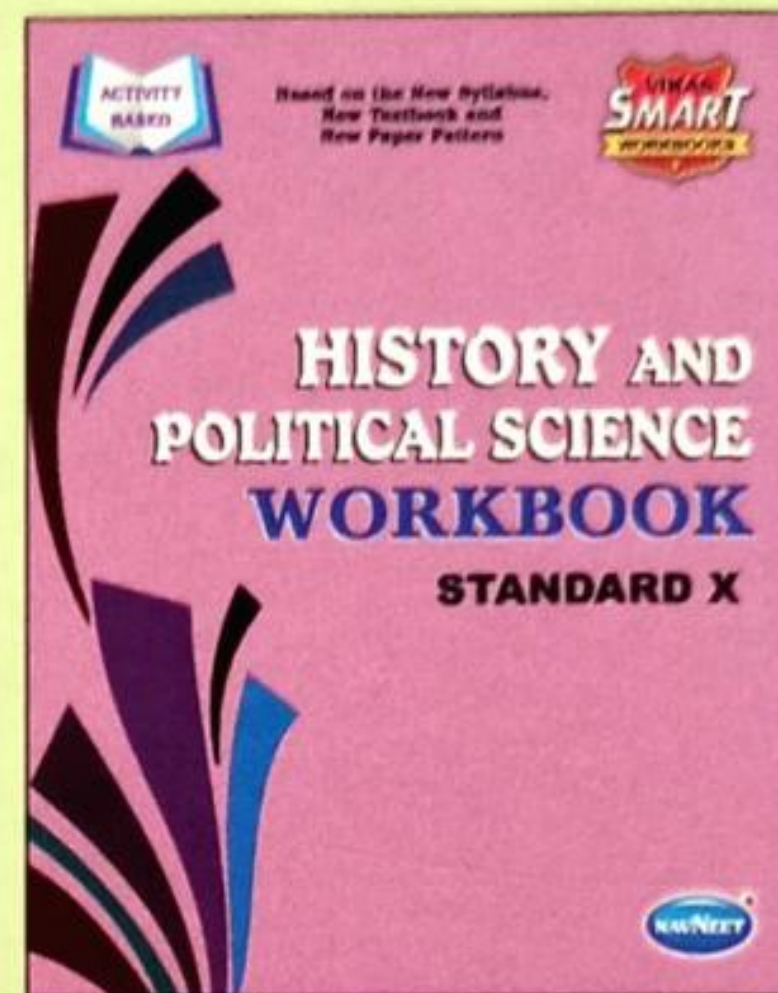**ENGLISH KUMARBHARATI**

मराठी अक्षरभारती
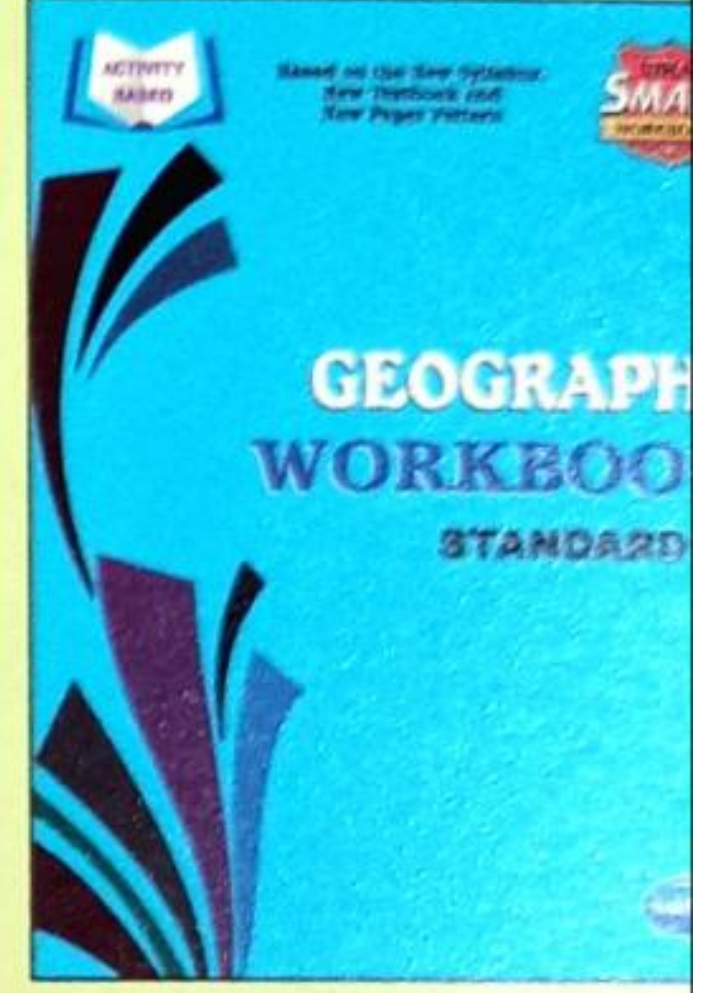
हिंदी लोकभारती

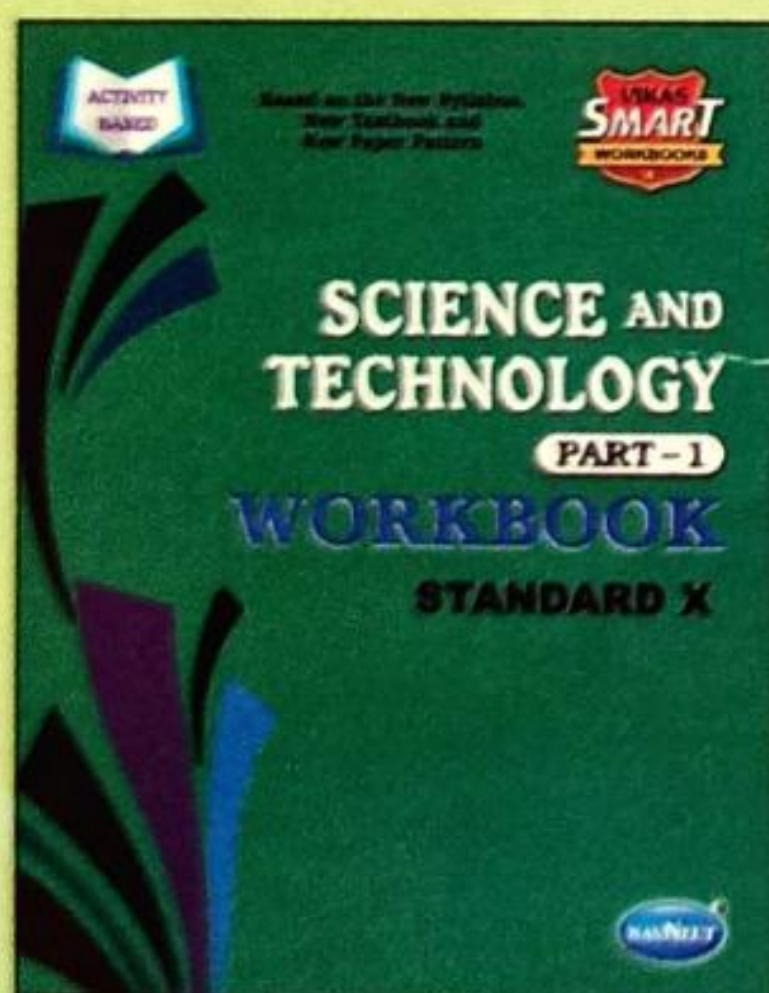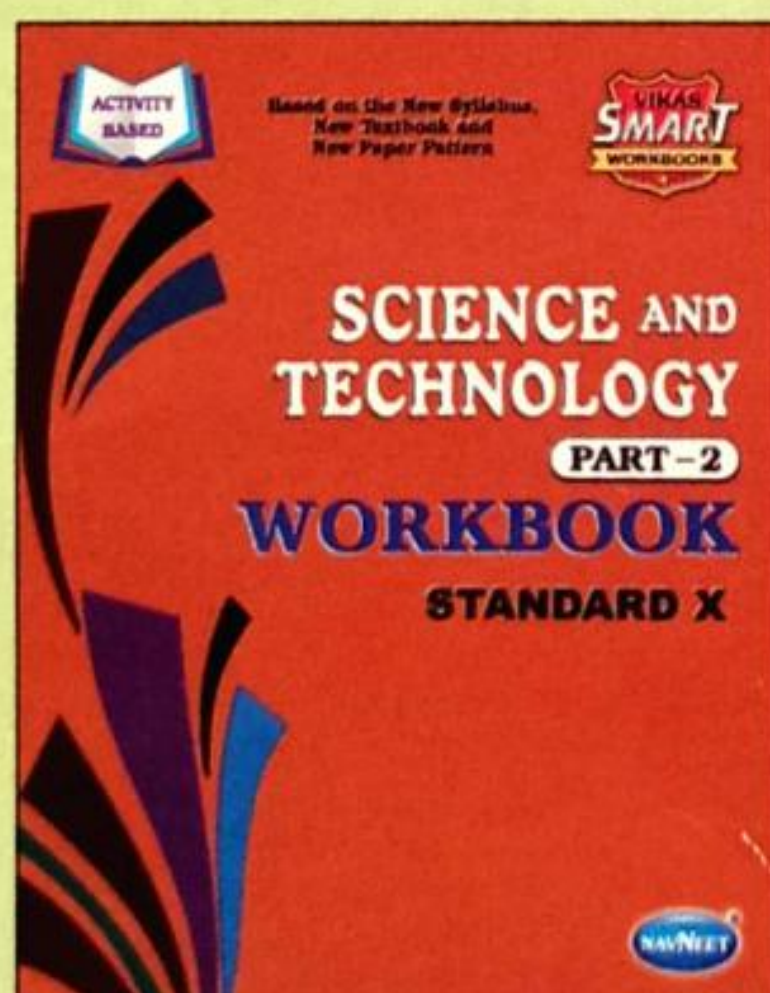**संस्कृत आमोदः (Entire Course)**

संस्कृत आनन्दः (Composite Course)

HISTORY AND POLITICAL SCIENCE

GEOGRAPHY

SCIENCE AND TECHNOLOGY (Part 1)

SCIENCE AND TECHNOLOGY (Part 2)
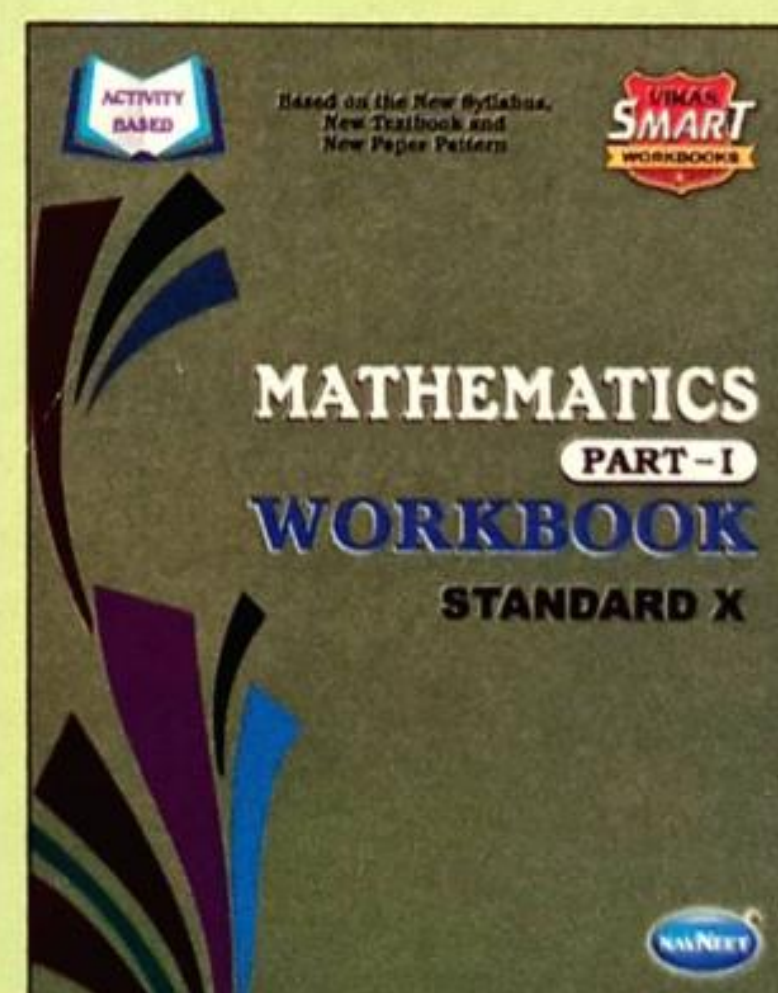
MATHEMATICS (PART I)
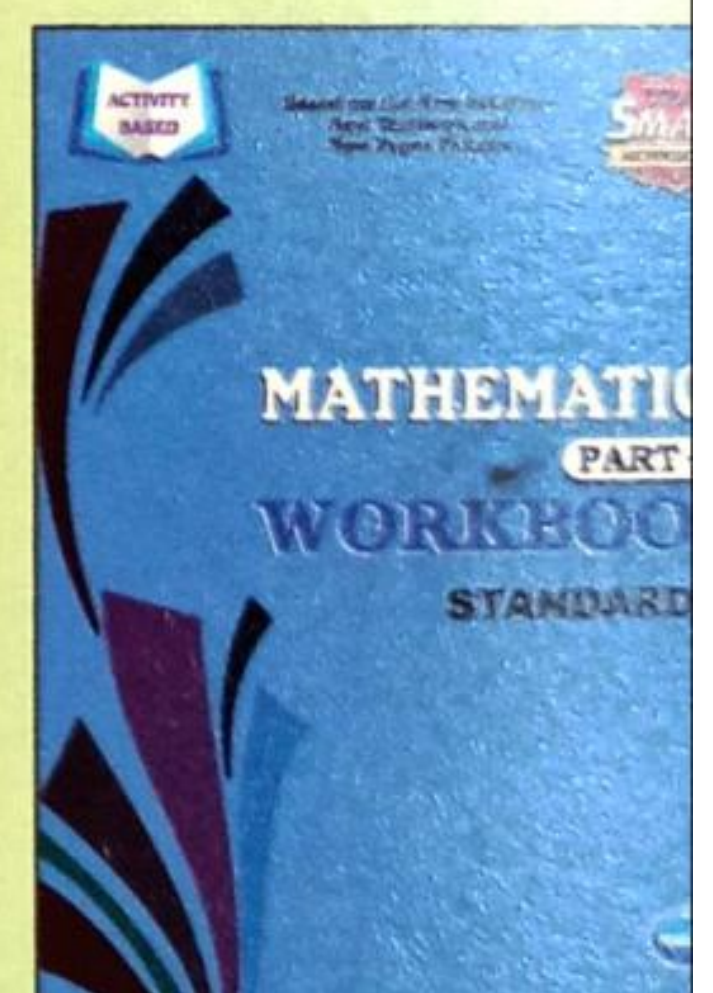
MATHEMATICS (PART II)

MATHEMATICS PART-I

[Activities : 2 marks each]

Chapter 1 : Linear Equations in Two Variables

Activity 1   Date : ....

Complete the following table to draw the graph of the equation $x + y = 3$.

x	3	-2	0
y	0	5	3
(x, y)	(3, 0)	(-2, 5)	(0, 3)

Activity 2   Date : ....

Complete the following table to draw the g the equation $2x + 3y = 12$.

x	-3	3
y	6	2
(x, y)	(-3, 6)	(3, 2)

Activity 3   Date : ....

Complete the following activity, to solve the simultaneous equations $3x + 2y = 6$ and $2x + 4y = 12$ by Cramer's rule :

$$D = \begin{vmatrix} 3 & 2 \\ 2 & 4 \end{vmatrix} = 8, \quad D_x = \begin{vmatrix} 6 & 2 \\ 12 & 4 \end{vmatrix} = \boxed{0},$$

$$D_y = \begin{vmatrix} 3 & 6 \\ 2 & 12 \end{vmatrix} = \boxed{24}$$

$$\therefore x = \boxed{0} \text{ and } y = \boxed{3}.$$

Activity 4   Date : ....

Complete the following activity, to find th of k, if $\begin{vmatrix} 5 & 2 \\ k & 4 \end{vmatrix} = 6$.

$$5 \times \boxed{4} - \boxed{2k} = 6$$

$$\therefore \boxed{20} - 2k = 6$$

$$\therefore -2k = -14$$

$$\therefore k = \boxed{7}$$

<u>Rough work</u>

Chapter 2 : Quadratic Equations

Activity 5

Date : ....

Complete the following activity, to write the quadratic equation $y^2 = 2y - 7$ in the standard form to get the values of a, b, c.

Standard form	a	b	c
$y^2 - 2y + 7 = 0$	1	-2	7

Activity 6

Date : ....

Complete the following activity, to determir whether $m + \dfrac{1}{m} = 0$ is a quadratic equation or not.

$m + \dfrac{1}{m} = 0$

$\therefore m \times m + \dfrac{1}{m} \times m = 0$ ... (Multiplying by m

$\therefore \boxed{m^2} + \boxed{1} = 0$

Here, m is the only variable with highest inde $\boxed{2}$.

$\therefore$ the given equation $\boxed{\text{is}}$ a quadratic equatior

Activity 7

Date : ....

One root of the quadratic equation $kx^2 - 10x + 3 = 0$ is $\dfrac{1}{3}$. Complete the following activity, to find the value of k.

$\dfrac{1}{3}$ is a root of the given quadratic equation.

Substitute $x = \dfrac{1}{3}$ in the given quadratic equation.

$\therefore k\left(\dfrac{1}{3}\right)^2 - 10\left(\dfrac{1}{3}\right) + 3 = 0.$

$\therefore \boxed{\dfrac{1}{9}} k - \boxed{\dfrac{10}{3}} + 3 = 0$

$\therefore k - \boxed{3} = 0$

$\therefore k = \boxed{3}$

Activity 8

Date : ....

Complete the following activity, to determir the nature of the roots of the quadratic equatic $2x^2 - 5x - 3 = 0.$

Here, $a = 2$, $b = -5$, $c = -3$.

$b^2 - 4ac = \boxed{-5}^2 - 4\,(2)\,(-3)$

$\qquad = \boxed{25} + 24$

$\qquad = \boxed{49}$

$\therefore b^2 - 4ac > 0$

The roots are $\boxed{\text{real and not equal.}}$

Rough work

Activity 9   Date : ....

Complete the following activity, to find the 15th term of the A.P. 3, 8, 13, 18, ...

Here, $a = 3$, $d = \boxed{5}$, $t_{15} = ?$

$t_n = a + (n-1)\,d$

$\therefore t_{15} = 3 + \boxed{(15-1)} \times \boxed{5}$

$\qquad = 3 + \boxed{70}$

$\qquad = 73$

Activity 10   Date : ....

Complete the following activity, to find the num of terms in A.P. 1, 3, 5, ..., 149.

Here, $a = 1$, $d = \boxed{2}$, $t_n = 149$.

$t_n = a + (n-1)d$

$\therefore 149 = \boxed{1 + (n-1) \times 2}$

$\therefore 149 = 2n - \boxed{1}$

$\therefore n = \boxed{75}$

Activity 11   Date : ....

Complete the following activity to find the two-digit numbers which are divisible by 4.

The two-digit numbers divisible by 4 are 12, 16, 20, ..., 96.

Here, $t_n = 96$.

$t_n = a + (n-1)d$

$\therefore 96 = \boxed{12} + (n-1) \times \boxed{4}$

$\therefore 96 = 8 + \boxed{4n}$

$\therefore n = \boxed{22}$

Activity 12   Date : ....

The first term and the common difference of A.P. are 6 and 3 respectively.

Complete the following activity to find S_{27}.

Here, $a = 6$, $d = 3$, $S_{27} = ?$

$S_n = \dfrac{n}{2}\left[\boxed{2a} + (n-1)d\right]$

$\therefore S_{27} = \dfrac{27}{2}\left[12 + (27-1)\boxed{3}\right]$

$\qquad = \dfrac{27}{2} \times \boxed{90}$

$\qquad = 27 \times 45$

$\qquad = \boxed{1215}$

Rough work

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Chapter 4 : Financial Planning

Activity 13   Date : ....

On some medicines, the rate of GST is 12%. Complete the following activity, to find the amount of SGST to be charged on the medicine of taxable value of ₹ 800.

The taxable value of the medicine is ₹ ☐

The rate of GST = 12%

$$\therefore GST = \dfrac{\boxed{}}{\boxed{}} \times 800 = ₹ \boxed{}$$

$$SGST = \dfrac{1}{2} \times GST = ₹ \boxed{}$$

Activity 14   Date : ....

Complete the following activity by writ the proper numbers or words using the gi information.

Sr. No.	FV	Share is at	M
(i)	₹ 10	Premium of ₹ 7	☐
(ii)	₹ 25	☐	₹
(iii)	☐	At par	₹
(iv)	☐	Discount ₹ 25	₹

Activity 15   Date : ....

Suresh invested ₹ 1200 to purchase shares of FV ₹ 10 at a premium of ₹ 5. Complete the following activity to find the number of shares he purchased.

$$MV = FV + \boxed{} = ₹ \boxed{}$$

$$\text{The number of shares} = \dfrac{\text{Total investment}}{MV}$$

$$= \dfrac{\boxed{}}{15}$$

$$= \boxed{}$$

Activity 16   Date : ....

A share of FV ₹ 10 is purchased for MV ₹ Dividend declared is 18%. Complete the follow activity to find the rate of return.

Dividend on share of FV ₹ 10

$$\text{at } 18\% = \dfrac{18}{100} \times \boxed{} = ₹ 1.80$$

MV of the share = ☐

Dividend on ₹ 12 = ₹ 1.80

$$\text{Rate of return} = \dfrac{1.80}{12} \times \boxed{} = \boxed{}$$

Rough work

Activity 17

Date : ....

In a class of 42 students in Model High School, 3 students use spectacles. Complete the following activity, to find the probability of a student selected at random wearing spectacles.

The total number of students in the class is 42.

$\therefore n(S) = \boxed{42}$

Let A be the event that a student uses spectacles.

Then $n(A) = \boxed{3}$

$P(A) = \dfrac{\boxed{n(A)}}{\boxed{n(S)}}$ ... (Formula)

$\therefore P(A) = \boxed{\dfrac{1}{14}}$

Activity 18

Date : ....

The six faces of a die are marked as $\boxed{A}$ $\boxed{B}$ $\boxed{D}$ $\boxed{E}$ $\boxed{O}$. The event M is getting a vowel on upper face of the die when it is rolled. Comp the following activity to find the probability of event.

$S = \left\{ \boxed{A, B, C, D, E, O} \right\}, n(S) = 6$

$M = \left\{ \boxed{A, E, O} \right\}, n(M) = \boxed{3},$

$P(M) = \dfrac{n(M)}{n(S)} = \boxed{\dfrac{1}{2}}$

Activity 19

Date : ....

Thirty cards bearing numbers 1 to 30 are placed in a box. One card is drawn at random. Complete the following activity to find the probability of the event A that the number on the card is divisible by 8.

$S = \{1, 2, 3, ..., 30\}, n(S) = \boxed{30}$

A is the event that the number on the card is divisible by 8.

$\therefore A = \left\{ \boxed{8, 16, 24} \right\}; n(A) = \boxed{3}$

$P(A) = \dfrac{n(A)}{n(S)} = \boxed{\dfrac{1}{10}}$.

Activity 20

Date : ....

Two coins are tossed simultaneously. Comp the following activity to write the sample space and expected outcomes of the events :

(i) Event A : to get at least one head.

(ii) Event B : to get no head.

If two coins are tossed simultaneously,

$S = \left\{ \boxed{HH}, HT, TH, \boxed{TT} \right\}$

(i) Event A : to get at least one head

$\therefore A = \{HH, \boxed{HH}, TH\}$

(ii) Event B : to get no head

$\therefore B = \left\{ \boxed{TT} \right\}$

<u>Rough work</u>

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Reduced.

Activity 21   Date : ....

[following] table shows the daily supply of [elect]ricity to different places in a town. To show the [info]rmation by a pie diagram, measures of central [angl]es of sectors are to be decided. Complete the [follo]wing activity to find the measures.

[pl]aces	Supply of electricity (Thousand units)	Measures of the central angle
[ro]ds	4	$\dfrac{4}{30} \times 360° = 48°$
[fac]tories	12	$\boxed{} \times 360° = 144°$
[sho]ps	6	$\dfrac{6}{30} \times 360° = \boxed{}$
[ho]uses	8	$\boxed{} \times 360° = \boxed{}$
[T]otal	30	360°

Activity 22   Date : ....

The marks obtained by a student in different subjects are shown. To show the information by a pie diagram, measures of central angles of sectors are to be decided. Complete the following activity to find the measures.

Subject	Marks	Measures of the central angle
Marathi	22	$\boxed{}$
English	28	$\boxed{}$
Science	30	$\boxed{}$
Mathematics	40	$\boxed{}$
Total	120	360°

Activity 23   Date : ....

[The] maximum temperatures in °C of 30 towns [are s]hown in the following table. Complete the [follo]wing activity to find the mean of the maximum [tem]peratures. (Take 30 as assumed mean)

Class (Temperature °C)	Class mark x_i	Deviations $d_i = x_i - A$ $d_i = x_i - 30$	Frequency (Number of towns) f_i	$f_i d_i$
20–24	22	$\boxed{}$	8	– 64
24–28	26	– 4	7	– 28
28–32	30 → A	0	5	0
32–36	34	$\boxed{}$	6	$\boxed{}$
36–40	38	8	4	32
			$\Sigma f_i = 30$	$\Sigma f_i d_i = \boxed{}$

Activity 24   Date : ....

Complete the activity by filling in the boxes.

Class	Continuous classes	cf (less than type)	Frequency
10–19	9.5 – 19.5	8	8
20–29	19.5 – 29.5	20	20 – 8 = 12
30–39	$\boxed{}$	27	$\boxed{}$
40–49	$\boxed{}$	30	$\boxed{}$

Chapter 1 : Similarity

Activity 1

Date : ....

In $\triangle$ABC, ray BD bisects $\angle$ABC and A–D–C, seg DE $\parallel$ side BC and A–E–B. Complete the following activity to prove $\dfrac{AB}{BC} = \dfrac{AE}{EB}$.

Proof : In $\triangle$ABC,

ray BD bisects $\angle$ABC.

$\therefore \dfrac{AB}{BC} = \dfrac{AD}{\boxed{DC}}$

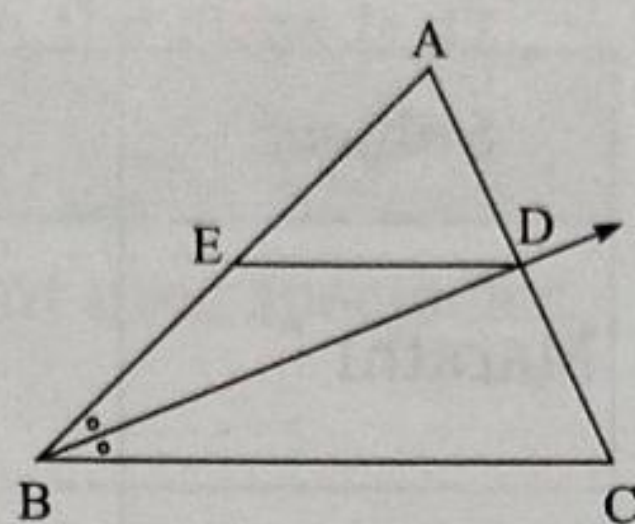... [Theorem of an angle bisector of a triangle] ... (1)

In $\triangle$ABC,

DE$\parallel$BC

$\therefore \dfrac{AE}{EB} = \dfrac{AD}{DC}$

... $\left(\boxed{\text{Basic Proportionality Theorem}}\right)$ ... (2)

$\therefore \dfrac{AB}{\boxed{BC}} = \dfrac{\boxed{AE}}{EB}$ ... [From (1) and (2)]

Activity 2

Date : ....

In the adjoining figure, BP$\perp$AC, CQ$\perp$AB, A–P–C, A–Q–B. Prove that, $\triangle$APB and $\triangle$AQC are similar.

Complete the activity by filling the boxes.
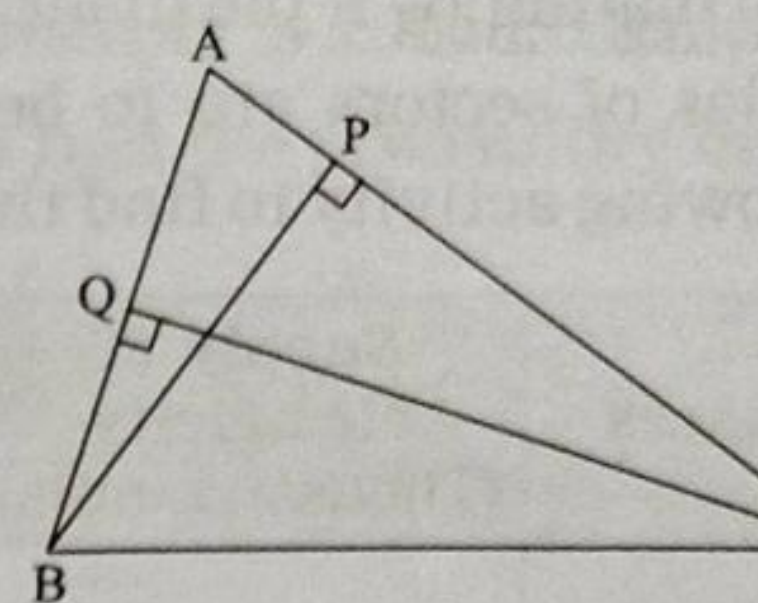
In $\triangle$APB and $\triangle$AQC,

$\angle$APB = $\boxed{90}°$. ...

$\angle$AQC = $\boxed{90}°$. ...

$\therefore \angle$APB $\cong \angle$AQC ... [From (1) and

$\angle$PAB $\cong \angle$QAC ... $\boxed{\text{Common angle}}$

$\therefore \triangle$APB $\sim \triangle$AQC

... $\left[\text{By } \boxed{AA} \text{ test of similarit}\right.$

Activity 3

Date : ....

Observe the given figure and complete the following activity.
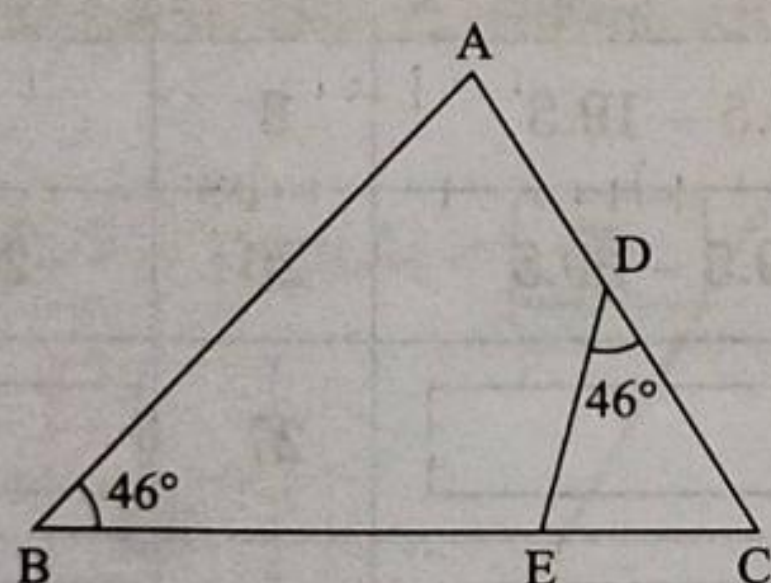
$\angle$B $\cong \boxed{\angle EDC}$ ... (Each is of measure 46°)

$\angle$C $\cong \angle$C ... $\boxed{\text{Common angle}}$

$\therefore \triangle$ABC $\sim \triangle\boxed{EDC}$

... (By $\boxed{AA}$ test of similarity)

Activity 4

Date : ....

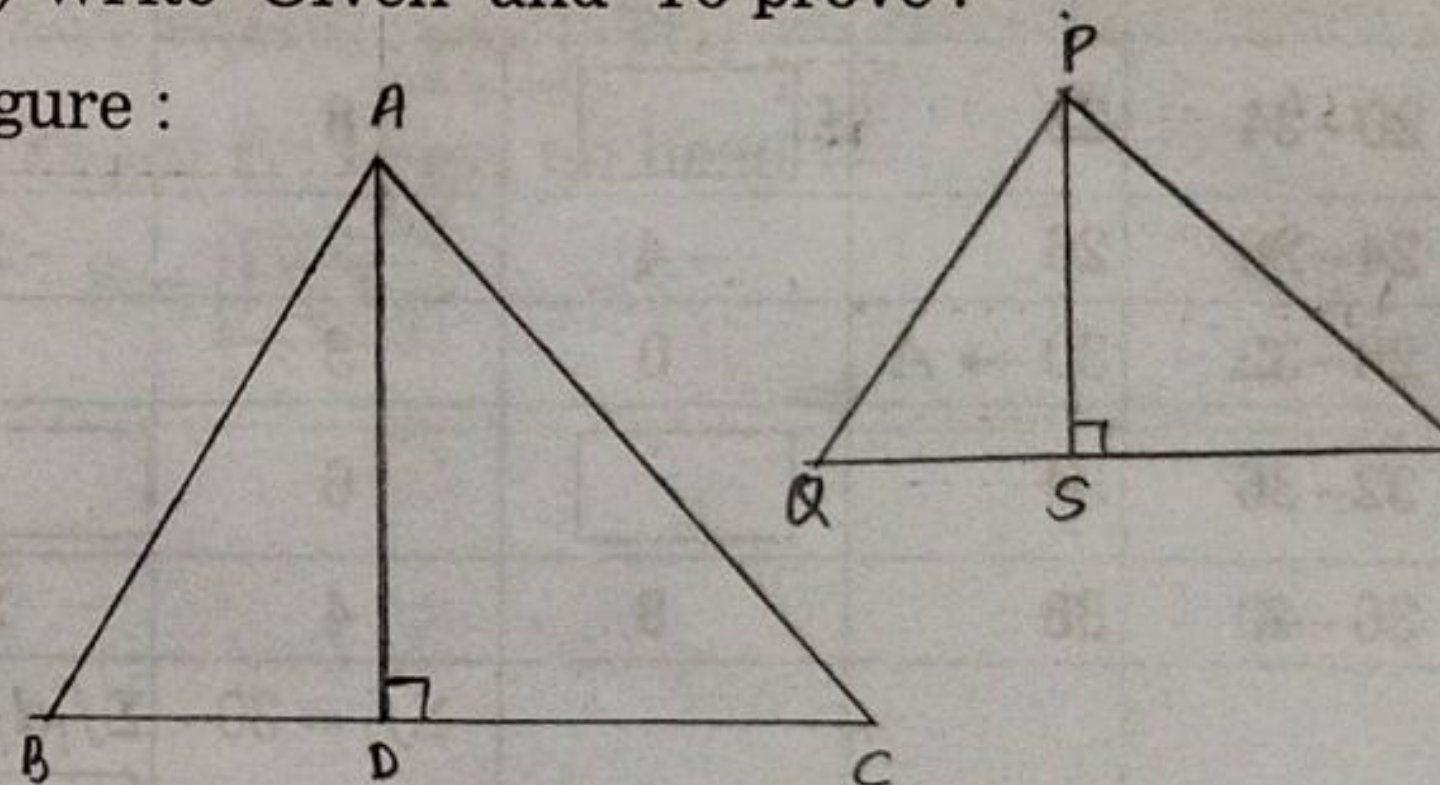In order to prove, 'Ratio of areas of two triang is equal to the ratio of the products of their ba and corresponding heights.'

(i) Draw a neat labelled figure.

(ii) Write 'Given' and 'To prove'.

Figure :

Given : In $\triangle$ABC, base = BC, heigth = AD

In $\triangle$PQR, base = QR, height = PS

To prove : $\dfrac{A(\triangle ABC)}{A(\triangle PQR)} = \dfrac{BC \times AD}{QR \times PS}$

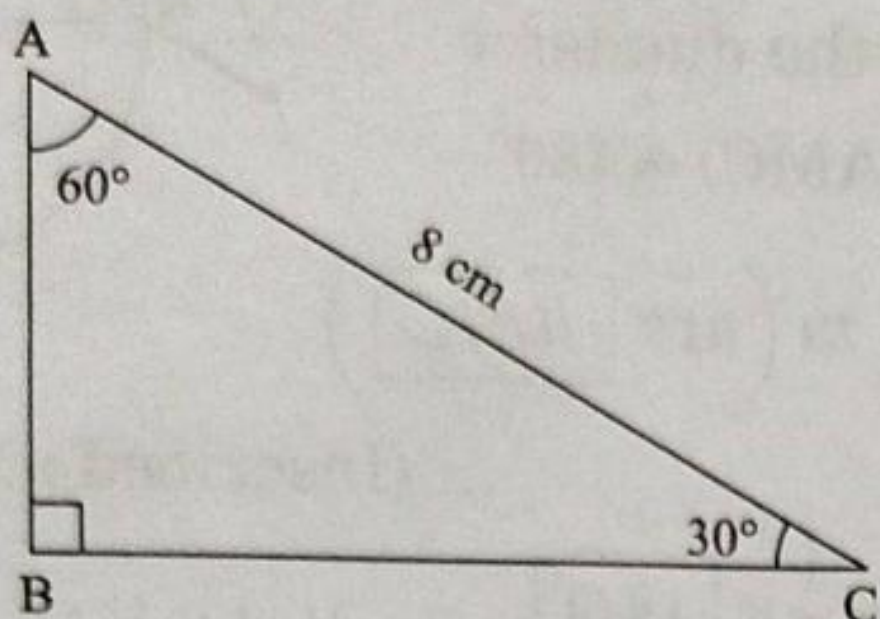Scanned by TapScanner

Reduced.

Activity 5   Date : ....

he figure, $AC = 8$ cm, $\angle ABC = 90°$, $\angle BAC = 60°$,
$CB = 30°$. Complete the following activity to
AB and BC.

A

60°

8 cm

30°

B   C

ABC,

30°–60°–90° triangle theorem,

$AB = \dfrac{1}{2} \times AC$ and $BC = \boxed{\dfrac{\sqrt{3}}{2}} AC$

$AB = \dfrac{1}{2} \times 8$ and $BC = \boxed{\dfrac{\sqrt{3}}{2}} \times 8$

$AB = \boxed{4}$ cm and $BC = \boxed{4\sqrt{3}}$ cm

Activity 6   Date : ....

Complete the following
activity to find the length
of median AQ on side BC,
if $AB^2 + AC^2 = 122$ and
$BQ = 5$.

A

B   Q   C

In $\triangle ABC$, seg AQ is the median.

$\therefore AB^2 + \boxed{} = 2AQ^2 + 2BQ^2$

... (Apollonius theorem)

$\therefore 122 = 2AQ^2 + 2(5)^2$

$\therefore 2AQ^2 = 122 - \boxed{}$

On simplifying,

$\therefore AQ^2 = \boxed{}$

$\therefore AQ = \boxed{}$

... (Taking square roots of both the sides)

Activity 7   Date : ....

th the help of the information
en in the figure, complete
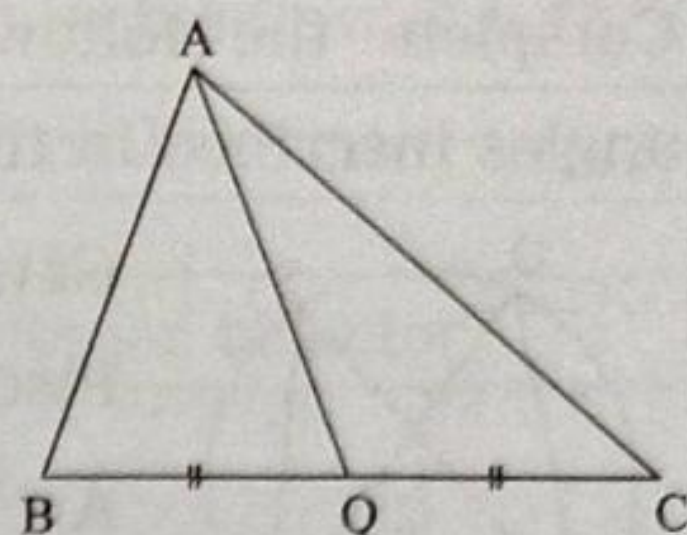following activity to find AB
BC.

$= BC$ ... (Given)

$\angle BAC = \angle BCA = \boxed{45°}$

A

$\sqrt{8}$

B   C

$AB = BC = \boxed{\dfrac{1}{\sqrt{2}}} \times AC$

$= \boxed{\dfrac{1}{\sqrt{2}}} \times \sqrt{8}$

$= \boxed{\dfrac{1}{\sqrt{2}}} \times 2\sqrt{2}$

$AB = BC = 2$

Activity 8   Date : ....

A ladder rests on a pole such that the base of the
ladder is 27 dm away from the base of the pole. The
top of the ladder touches the top of the pole at a
height of 120 dm. Complete the following activity
to find the length of the ladder.

In $\triangle ABC$,

$\angle ABC = 90°$

$\therefore$ by Pythagoras theorem,

$\boxed{AC^2} = AB^2 + \boxed{BC^2}$
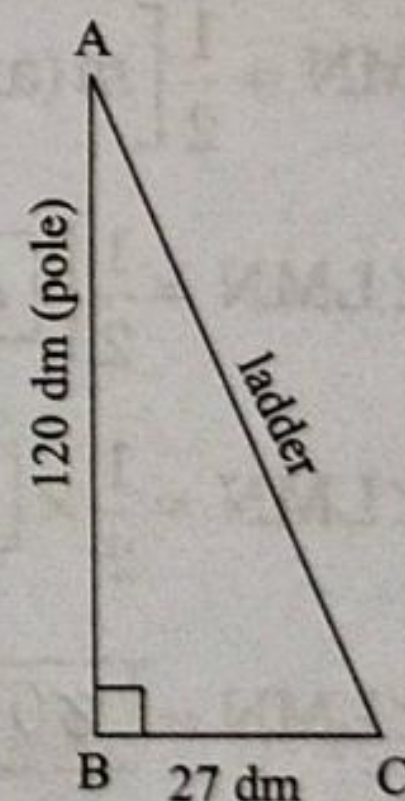
$\therefore AC^2 = 120^2 + 27^2$

$= \boxed{14400} + 729$

$= 15129$

$\therefore AC = \sqrt{\boxed{15129}}$

$\therefore AC = 123$

Length of the ladder is 123 dm

A

120 dm (pole)

ladder

B   27 dm   C

Activity 9

Date : ....

Complete the following activity to prove that angles inscribed in the same arc are congruent.

Given : $\angle PQR$ and $\angle PSR$ are inscribed in the same arc.

Arc PXR is intercepted by the angles.

To prove : $\angle PQR \cong \angle PSR$.

Proof :

$m\angle PQR = \dfrac{1}{2} m (\text{arc PXR})$

... $\boxed{\text{Inscribed angle theorem}}$ ... (1)

$m\angle \boxed{PSR} = \dfrac{1}{2} m (\text{arc PXR})$

... $\boxed{\text{Inscribed angle theorem}}$ ... (2)

$\therefore m\angle \boxed{PQR} = m \angle PSR$ ... [From (1) and (2)]
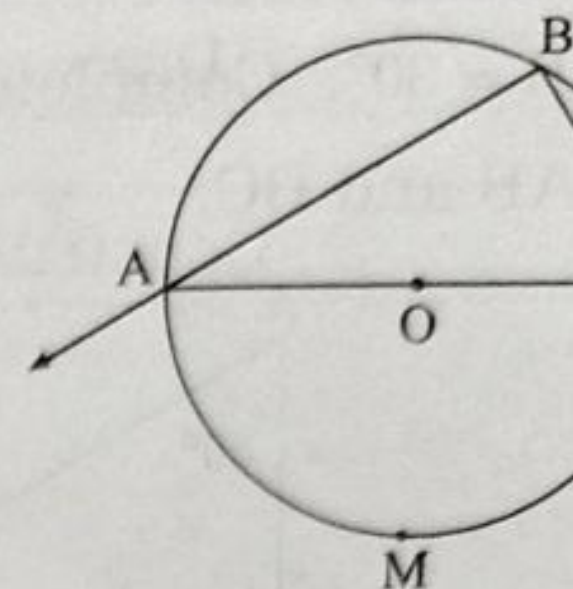
$\therefore \angle PQR \cong \angle PSR$

... (Angles equal in measure are congruent)

Activity 10

Date : ....

Observe the given figure and complete following activity :

Seg AC is the diameter

$\therefore m (\text{arc AMC}) = 180°$

$\angle ABC = \dfrac{1}{2} m \left(\text{arc } \boxed{AMC}\right)$

... (Inscribed angle theo

$\therefore \angle ABC = \dfrac{1}{2} \times \boxed{180'}$

$\therefore \angle ABC = \boxed{90'}$

$\therefore$ angle inscribed in a semicircle is a

$\boxed{\text{Right angle}}$

Activity 11

Date : ....

In the figure,

$m(\text{arc LN}) = 110°$,

$m(\text{arc PQ}) = 50°$.

Complete the following activity to find $\angle LMN$.
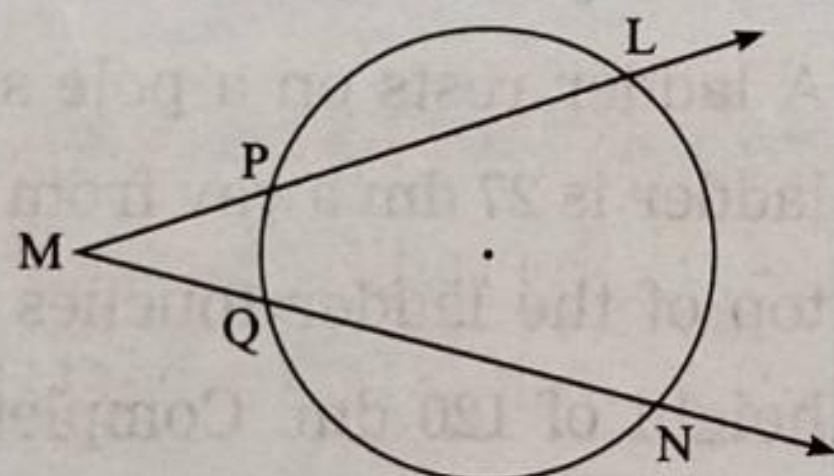
$\angle LMN = \dfrac{1}{2}\left[m(\text{arc LN}) - \boxed{m(\text{arc PQ})}\right]$

$\therefore \angle LMN = \dfrac{1}{2}\left[\boxed{110°} - 50°\right]$

$\therefore \angle LMN = \dfrac{1}{2} \times \boxed{60°}$

$\therefore \angle LMN = \boxed{30°}$

Activity 12

Date : ....

In the figure, chord $EF \parallel$ chord GH. Prove that, chord $EG \cong$ chord FH.

Complete the following activity to write the proof.

Construction : Draw seg GF.
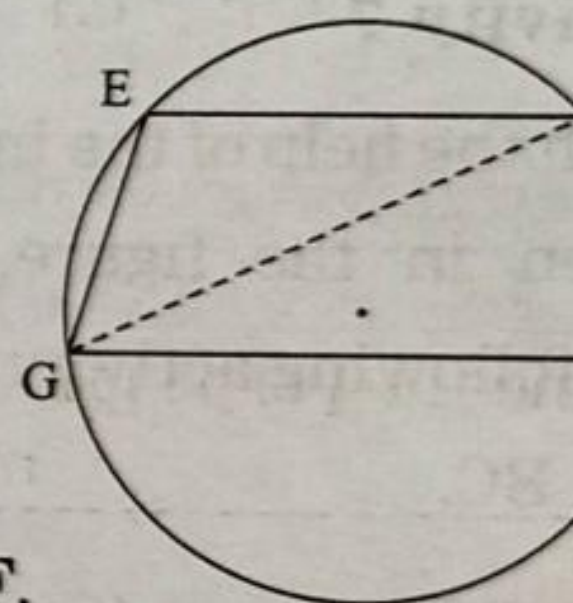
Proof : $\angle EFG = \angle FGH$

... $\left(\boxed{\text{Alternate angle}}\right)$ ..

$\angle EFG = \boxed{\dfrac{1}{2} \times m(\text{arc EG})}$

... (Inscribed angle theorem) ..

$\angle FGH = \boxed{\dfrac{1}{2} \times m(\text{arc FH})}$

... (Inscribed angle theorem) ..

$\therefore m(\text{arc EG}) = \boxed{m(\text{arc FH})}$

... [From (1), (2) and

$\therefore$ chord $EG \cong$ chord FH

... (Corresponding chords of congruent a

vity 13   Date : ....

w the instructions given in the flow chart :

Draw ∠XYZ = 120°

↓

Construct its bisector

120°
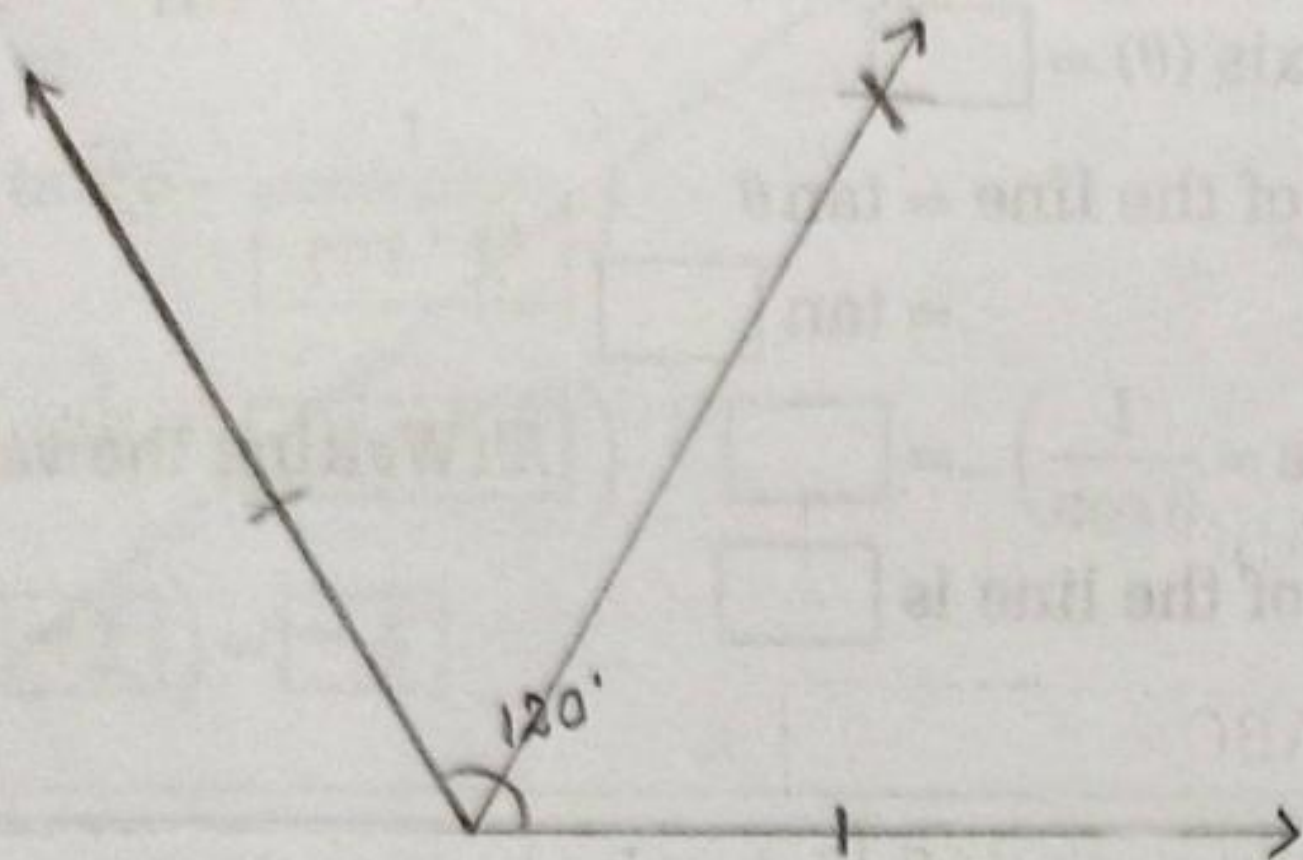
Activity 14   Date : ....

Follow the instructions given in the flow chart :

Draw a segment of length 4.8 cm

↓

Construct its perpendicular bisector

A   4.8 cm   B
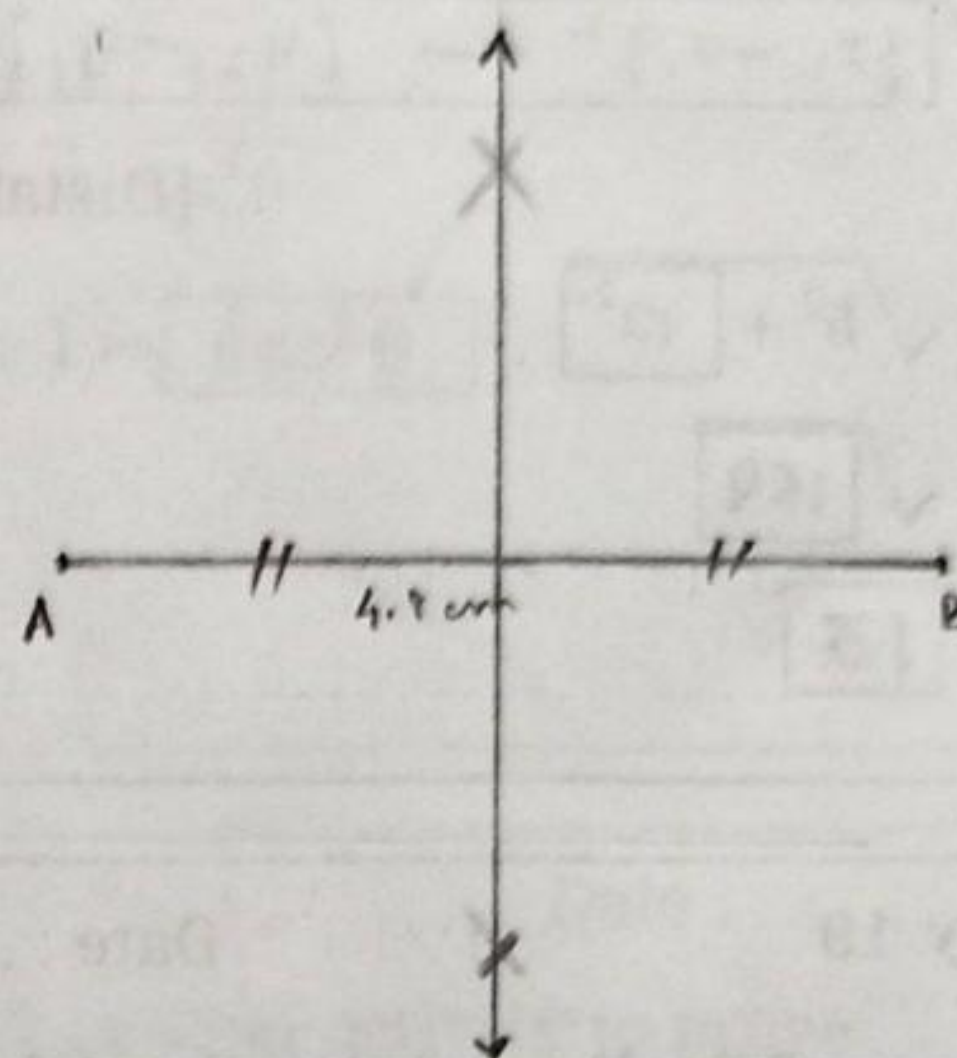
vity 15   Date : ....

plete the following activity to draw a tangent
circle at a point on the circle.

aw a circle of radius 3.3 cm with O as centre

↓

ake a point P on the circle and draw ray OP

↓

raw a perpendicular line to ray OP at point P

↓

me the perpendicular line as *l*. *l* is the tangent at point P

O   r = 3.3 cm   P
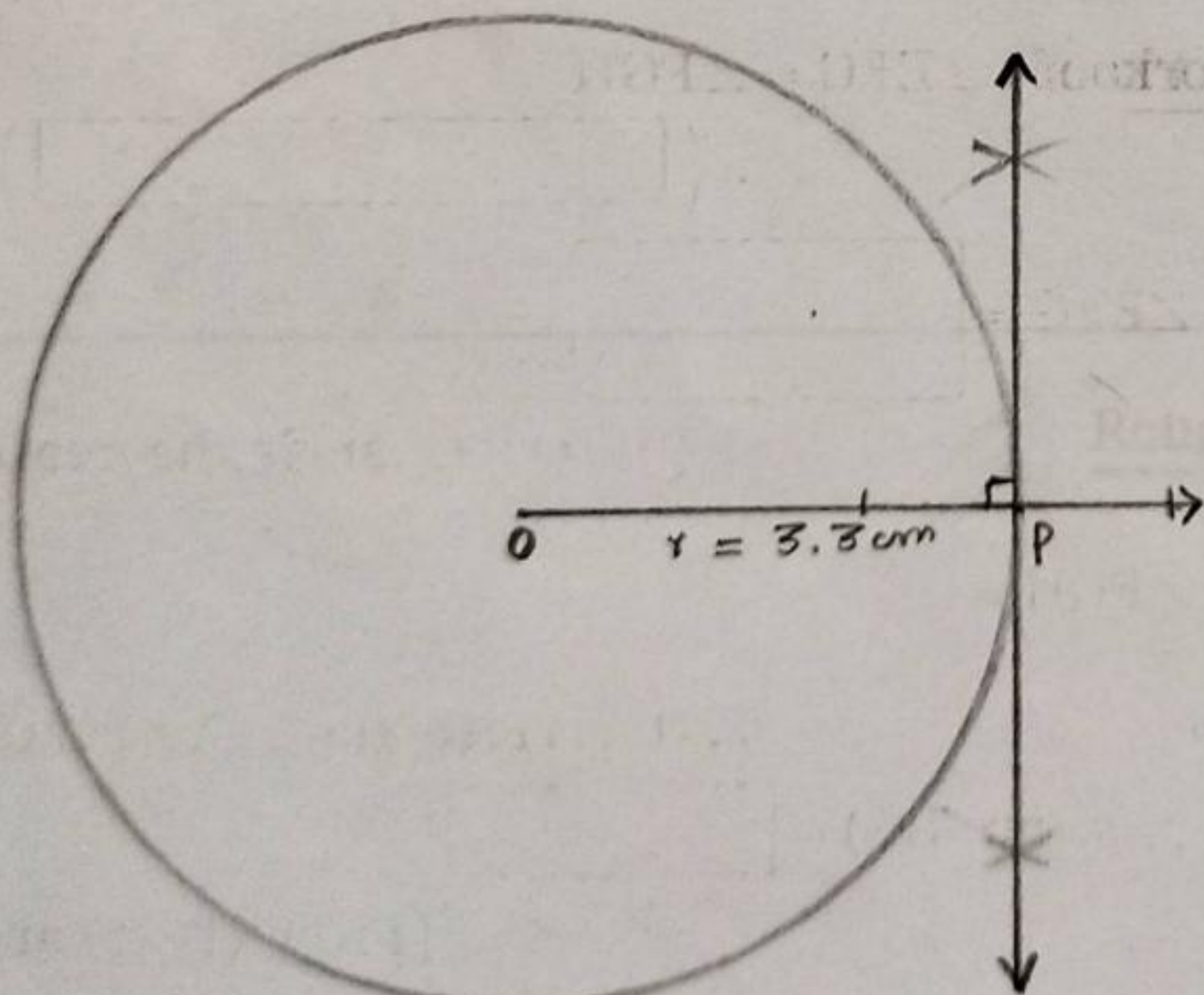
Activity 16   Date : ....

Follow the instructions given in the flow chart :

Draw a circle with centre P and radius 2.4 cm

↓

Mark points A and B on the circle such that ∠APB = 100°

↓

Construct perpendiculars at points A and B to the radii PA and PB. Mark the point of intersection of perpendicular as M.

↓

Measure and record ∠AMB

A   100°   P   B

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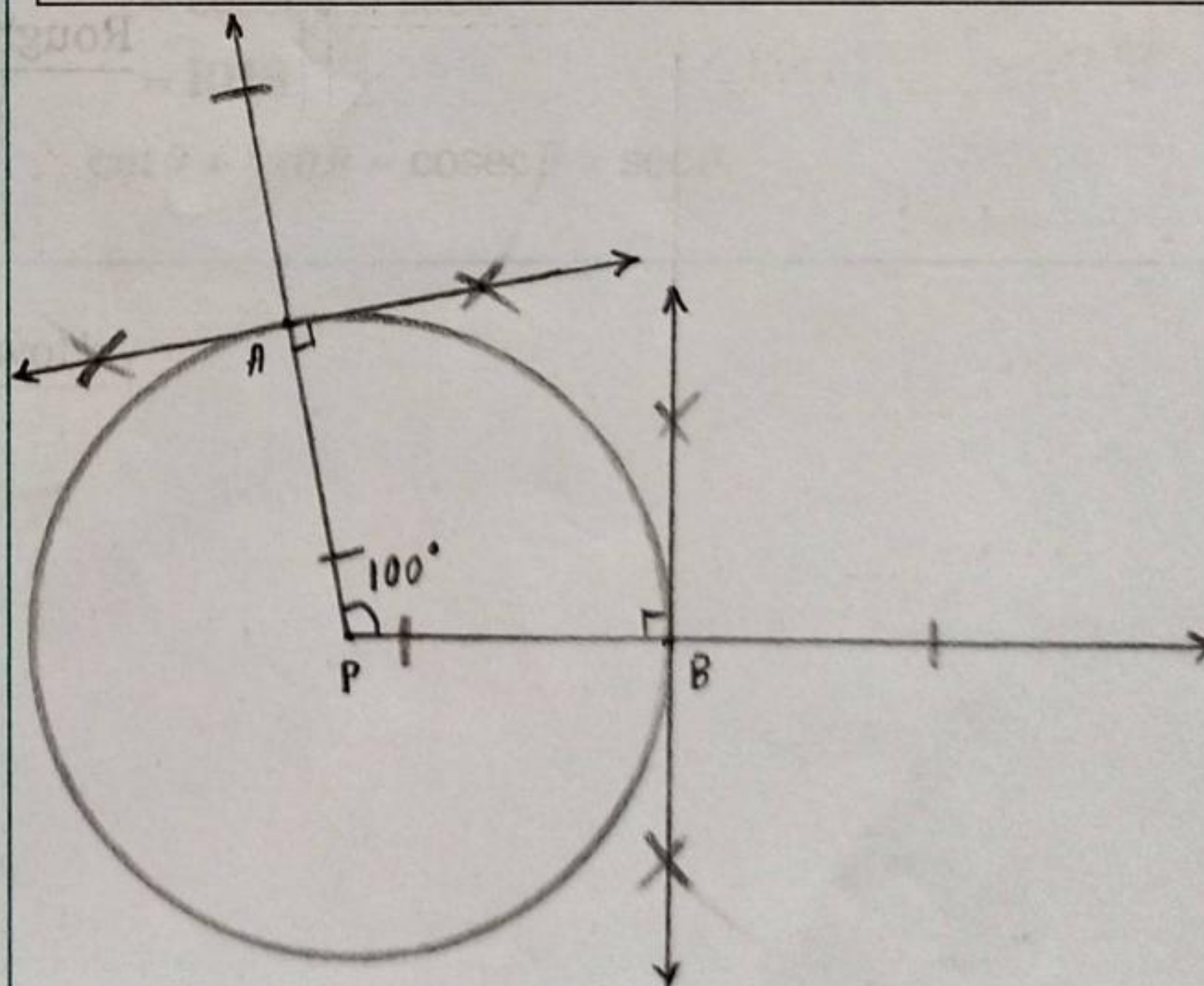
Activity 17

Date : ....

If P $(-6, -3)$ and Q $(-1, 9)$, then complete the following activity to find PQ.

Let P(x_1, y_1) and Q(x_2, y_2)

$x_1 = -6, y_1 = -3, x_2 = -1$ and $y_2 = 9$

$PQ = \sqrt{[x_2 - x_1]^2 \boxed{-} [y_2 - y_1]^2}$

... [Distance formula]

$\therefore PQ = \sqrt{5^2 + \boxed{12^2}}$

$\therefore PQ = \sqrt{\boxed{169}}$

$\therefore PQ = \boxed{13}$

Activity 18

Date : ....

The angle made by a line with the positive direc[tion] of X-axis is 45°. Complete the following activit[y] find the slope of the line.

Angle made by the line with the positive direc[tion] of X-axis (θ) = $\boxed{}$

Slope of the line = $\tan \theta$

$\qquad\qquad = \tan \boxed{}$

$\qquad\qquad = \boxed{}$ ... (Writing the val[ue]

Slope of the line is $\boxed{}$

Activity 19

Date : ....

If the slope of the line joining the points B $(k, -5)$ and P $(1, 2)$ is 7, then complete the following activity to find the value of k.

Slope of line BC $= \dfrac{y_2 - \boxed{}}{x_2 - x_1} = \dfrac{2 - \boxed{}}{1 - k}$

$\qquad\qquad = \dfrac{7}{1 - k}$ ... (1)

Slope of line BC = 7 ... (Given) ... (2)

$\therefore \dfrac{7}{1 - k} = \boxed{}$ ... [From (1) and (2)]

$\therefore k = \boxed{}$

Activity 20

Date : ....

Complete the following activity to find the slop[e] the line passing through the points A $(3, 1)$ [and] B $(5, 3)$.

A $(x_1, y_1) = (3, 1)$ and B $(x_2, y_2) = (5, 3)$

$\therefore x_1 = \boxed{}, y_1 = 1, x_2 = 5$ and $y_2 = \boxed{}$

slope of line AB $= \dfrac{y_2 - y_1}{x_2 - x_1}$

$\qquad\qquad = \dfrac{\boxed{}}{\boxed{}}$

$\qquad\qquad = \boxed{}$

Rough work

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Activity 21

Date : ....

Find the value of $6\tan^2\theta - \dfrac{6}{\cos^2\theta}$ by completing the following activity.

$6\tan^2\theta - \dfrac{6}{\cos^2\theta}$

$= 6\left(\tan^2\theta - \dfrac{1}{\boxed{\cos^2\theta}}\right)$

$= 6\left(\tan^2\theta - \boxed{\sec^2\theta}\right) \qquad ...\left(\dfrac{1}{\cos\theta} = \sec\theta\right)$

$= 6\left(\boxed{-1}\right) = \boxed{-6}$

Activity 22

Date : ....

Complete the following activity by filling the blanks with appropriate answer.

$\sin^2\theta + \cos^2\theta = \boxed{1} \qquad$ ... (Trigonometric Identit

Dividing each term by $\cos^2\theta$

$\dfrac{\sin^2\theta}{\cos^2\theta} + \dfrac{\cos^2\theta}{\cos^2\theta} = \dfrac{\boxed{1}}{\cos^2\theta}$

$\therefore \boxed{\tan^2\theta} + 1 = \boxed{\sec^2\theta}$

Activity 23

Date : ....

Complete the following activity by filling the blanks.

$\sin^2\theta + \cos^2\theta = \boxed{1} \qquad$ ... (Trigonometric Identity)

Dividing each term by $\sin^2\theta$

$\dfrac{\sin^2\theta}{\sin^2\theta} + \dfrac{\cos^2\theta}{\sin^2\theta} = \dfrac{\boxed{1}}{\sin^2\theta}$

$\therefore 1 + \boxed{\cot^2\theta} = \boxed{\csc^2\theta}$

Activity 24

Date : ....

Complete the following activity to prove

$\cot\theta + \tan\theta = \csc\theta \times \sec\theta.$

$\text{LHS} = \cot\theta + \tan\theta$

$= \dfrac{\cos\theta}{\sin\theta} + \dfrac{\boxed{\sin\theta}}{\cos\theta}$

$= \dfrac{\boxed{\cos^2\theta} + \sin^2\theta}{\sin\theta \times \cos\theta}$

$= \dfrac{\boxed{1}}{\sin\theta \times \cos\theta}$

$= \dfrac{1}{\boxed{\sin\theta}} \times \dfrac{1}{\cos\theta}$

$= \csc\theta \times \sec\theta$

$= \text{RHS}$

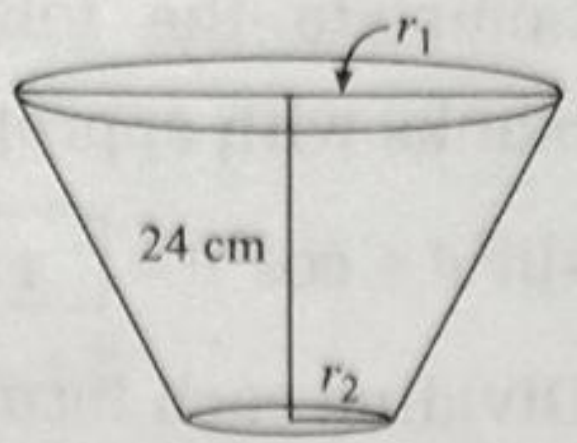$\therefore \cot\theta + \tan\theta = \csc\theta \times \sec\theta.$

Rough work

Reduced.

Activity 25   Date : ....

The circumferences of circular faces of a frustum are 132 cm and 88 cm and its height is 24 cm. Complete the following activity to find the slant height of the frustum.

$\left(\pi = \dfrac{22}{7} \right)$

$\text{circumference}_1 = 2\pi r_1 = 132$

$r_1 = \dfrac{132}{2\pi} = \boxed{}$ cm

$\text{circumference}_2 = 2\pi r_2 = 88$

$r_2 = \dfrac{88}{2\pi} = \boxed{}$ cm

Slant height of frustum, $l = \sqrt{h^2 + (r_1 - r_2)^2}$

$\quad = \sqrt{24^2 + \boxed{}^2}$

$\quad = \boxed{}$ cm

Activity 26   Date : ....

Complete the following activity to find how m solid cylinders of radius 6 cm and height 12 cm be made by melting a solid sphere of radius 18

Radius of the sphere, $r = 18$ cm

For cylinder, radius R = 6 cm, Height H = 12 c

∴ Number of cylinders can be made

$= \dfrac{\text{Volume of sphere}}{\boxed{}}$

$= \dfrac{\dfrac{4}{3}\pi r^3}{\boxed{}}$

$= \dfrac{\dfrac{4}{3} \times 18 \times 18 \times 18}{\boxed{}}$

$= \boxed{}$

Activity 27   Date : ....

The radius and height of a cylindrical water tank are 2.8 m and 3.5 m respectively. Complete the following activity to find the capacity of the water tank in litres.

Capacity of the cylindrical water tank

$= \pi r^2 h$

$= \dfrac{22}{7} \times 2.8 \times 2.8 \times \boxed{}$

$= \boxed{}$ m³

$= \boxed{} \times 1000$ litres   ... [1 m³ = 1000 litre]

$= \boxed{}$ litres

Activity 28   Date : ....

The measure of an arc of the circle is 80° and ra is 18 cm. Find the length of the arc by comple the following activity. ($\pi = 3.14$)

Here, $r = 18$ cm and $\theta = 80°$

Length of the arc

$= \dfrac{\theta}{360} \times \boxed{}$

$= \dfrac{\boxed{}}{360} \times 2 \times 3.14 \times \boxed{}$

$= \boxed{}$ cm

Rough work

This section contains 20 practicals as given in the textbook. Each practical carries 10 marks. As per latest Internal Evaluation Pattern, the teacher should give one practical each for Mathematics Part I ɛ Part II. Assess these two practicals and enter the marks in the marksheet given at the end of this secti Convert these 20 marks into 10 marks.

MATHEMATICS PART–I

Practical 1

Aim : To draw a line parallel to the X-axis or Y-axis on a graph paper. Choose any four points on the li write the equation of the line.

Prerequisite knowledge : Drawing coordinate system, plotting the points of ordered pair, writing coordinates of any point on the graph paper.

Materials : Graph paper, a ruler, pencil, eraser.

Figure :

Scale : 1 cm = 1 unit on both the axes
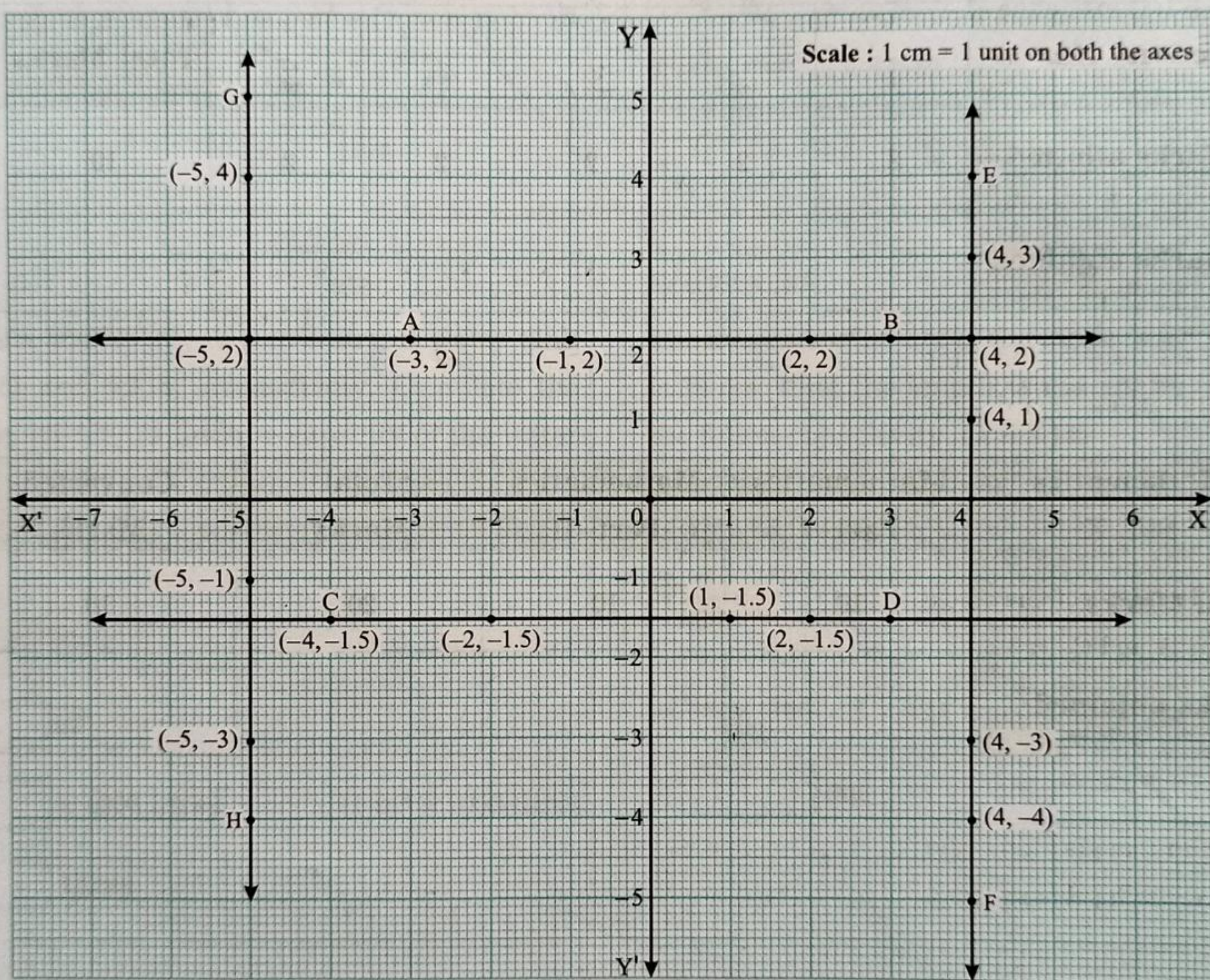
Procedure :

(1) Draw X-axis and Y-axis on the graph paper given to you.

(2) Draw a line parallel to the X-axis at some distance above it. (A line parallel to X-axis at a distar 2 units is drawn above it.)

(3) Take any four points on it and write their coordinates in the observation table.

(4) Which of the two coordinates x or y, is constant? Write it in the table.

(5) Write the equation based on the constant value in the table.

(6) Similarly, draw a line parallel to the X-axis on its lower side, two lines parallel to the Y-axis on eithe
side of it at some distances. Take 4 points on each of the lines. Observe the coordinates of the point:

(7) Write the equations of the lines.

(8) Write the conclusion from the observation table.

Question Slip

raw lines parallel to the X-axis at a distance of 3.5 units above it and 3 units below it. Draw lines parallel to

ne Y-axis at a distance of 4.5 units on its right side and at a distance of 6 units on its left side.

omplete the practical as per the given instructions. Write observations in the observation table and

rite the equations of the lines.

raw your conclusion.

For student's activity
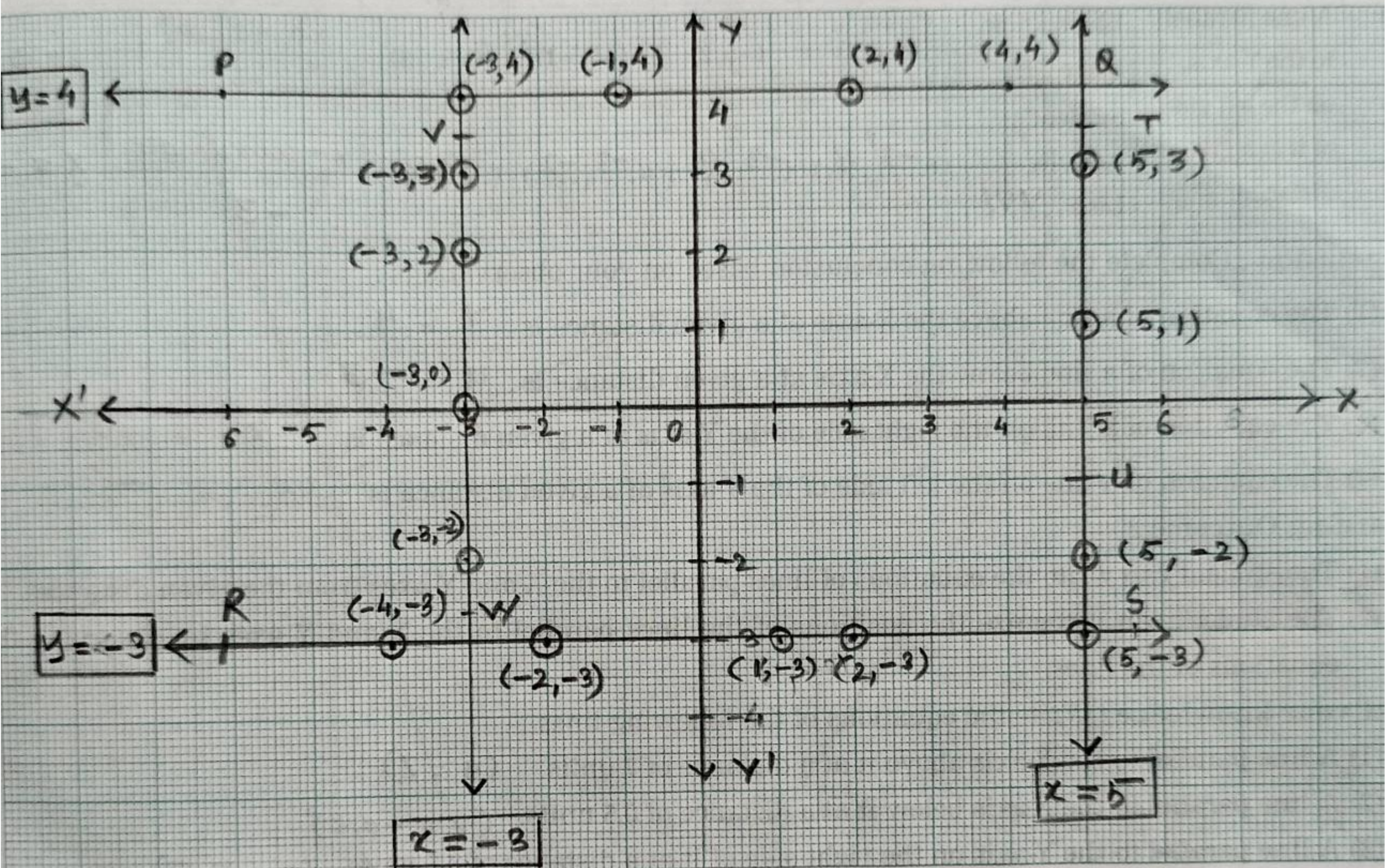
bservation Table :

Sr. No.	Position of the line	Line	Coordinates of the points				Constant coordinate x/y. Its value	Equatio of the lir
1.	A line parallel to the X-axis, above it at a given distance	Illustration (Line AB)	$(-3, 2)$	$(-1, 2)$	$(2, 2)$	$(4, 2)$	y-coordinate, 2	$y = 2$
		Student's Activity Line PQ	$(-3, 4)$	$(-1, 4)$	$(2, 4)$	$(4, 4)$	y-coordinate, 4	$y = 4$

Sr. No.	Position of the line	Line	Coordinates of the points				Constant coordinate x/y. Its value	Equation of the line
2.	A line parallel to the X-axis, below it at a given distance	Illustration (Line CD)	(−4, −1.5)	(−2, −1.5)	(1, −1.5)	(2, −1.5)	y-coordinate, −1.5	$y = -1.5$
		Student's Activity Line RS	(−4, −3)	(−2, −3)	(1, −3)	(2, −3)	y-coordinate −3	$y = -3$
3.	A line parallel to the Y-axis, on the right side of it at a given distance	Illustration (Line EF)	(4, 3)	(4, 1)	(4, −3)	(4, −4)	x-coordinate, 4	$x = 4$
		Student's Activity Line TU	(5, 3)	(5, 1)	(5, −3)	(5, −2)	x-coordinate, 5	$x = 5$
4.	A line parallel to the Y-axis, on the left side of it at a given distance.	Illustration (Line GH)	(−5, 4)	(−5, 2)	(−5, −1)	(−5, −3)	x-coordinate, −5	$x = -5$
		Student's Activity Line VW	(−3, 3)	(−3, 0)	(−3, −2)	(−3, 2)	x-coordinate, −3	$x = -3$

Conclusion : Complete the following conclusion based on your observations :

(1) The equation of a line above the X-axis at a given distance is $y = 4$.

(2) The equation of a line below the X-axis at a given distance is $y = -3$.

(3) The equation of a line on the right side of the Y-axis at a given distance is $x = 5$.

(4) The equation of a line on the left side of the Y-axis at a given distance is $x = -3$.

Learning Outcome :

(1) The student can write the equations of lines parallel to the X and Y axes from the given distances.

(2) The student can recognize the positions of the lines parallel to the X and Y axes by observing the equations of the lines.

Test your knowledge : Write the equations of the following lines :

(1) A line parallel to the X-axis above it at a distance of 7 units. $(y = 7)$

(2) A line parallel to the X-axis below it at a distance of 0.5 units. $(y = -0.5)$

(3) A line parallel to the Y-axis on the right side of it at a distance of 3.5 units. $(x = 3.5)$

(4) A line parallel to the Y-axis on the left side of it at a distance of 5.8 units. $(x = -5.8)$

Date : ....   Teacher's Signature : ....

For Teachers :

(1) Before giving this Practical for examination, make the students to understand it and then let them perform the practical.

(2) In the examination, give either of the two practicals. (Lines parallel to the X-axis or lines parallel to the Y-axis)

(3) In this practical, there are four activities. The first parts are illustrative examples. Let the students use them for the practical examination.

(4) Give the lines at different distances parallel to the axes for the activities to be carried out by the students or prepare new questions for the student for the examination.

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'o write the equation of a line passing through the origin considering any four points on it.

uisite knowledge :

rawing coordinate system on a graph paper.

'lotting the points of ordered pair on a graph paper.

Vriting the coordinates of any point on the graph paper.

als : Graph paper, ruler, pencil, eraser.

s :

Illustration	Student's activity

Scale : 1 cm = 1 unit on both the axes
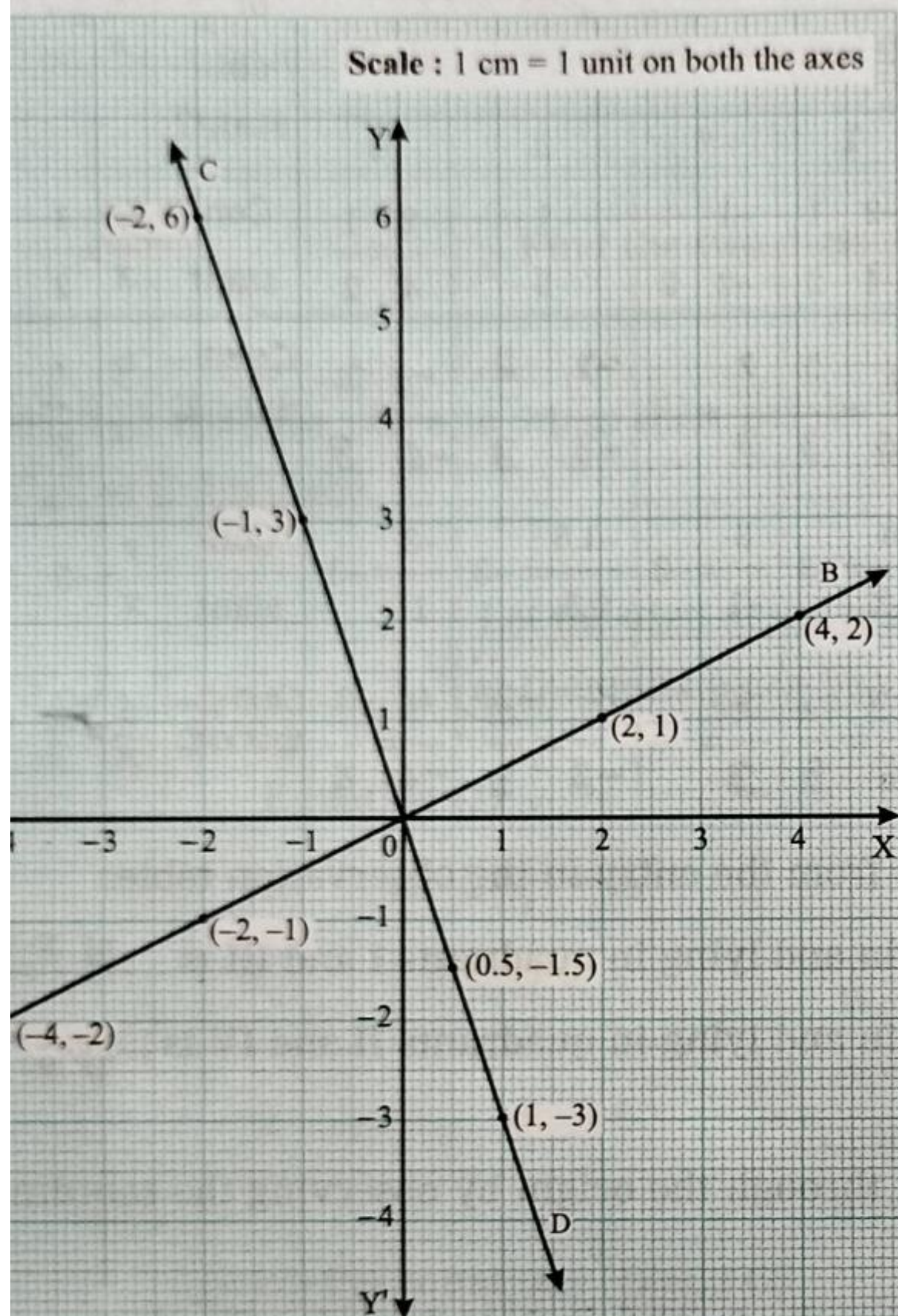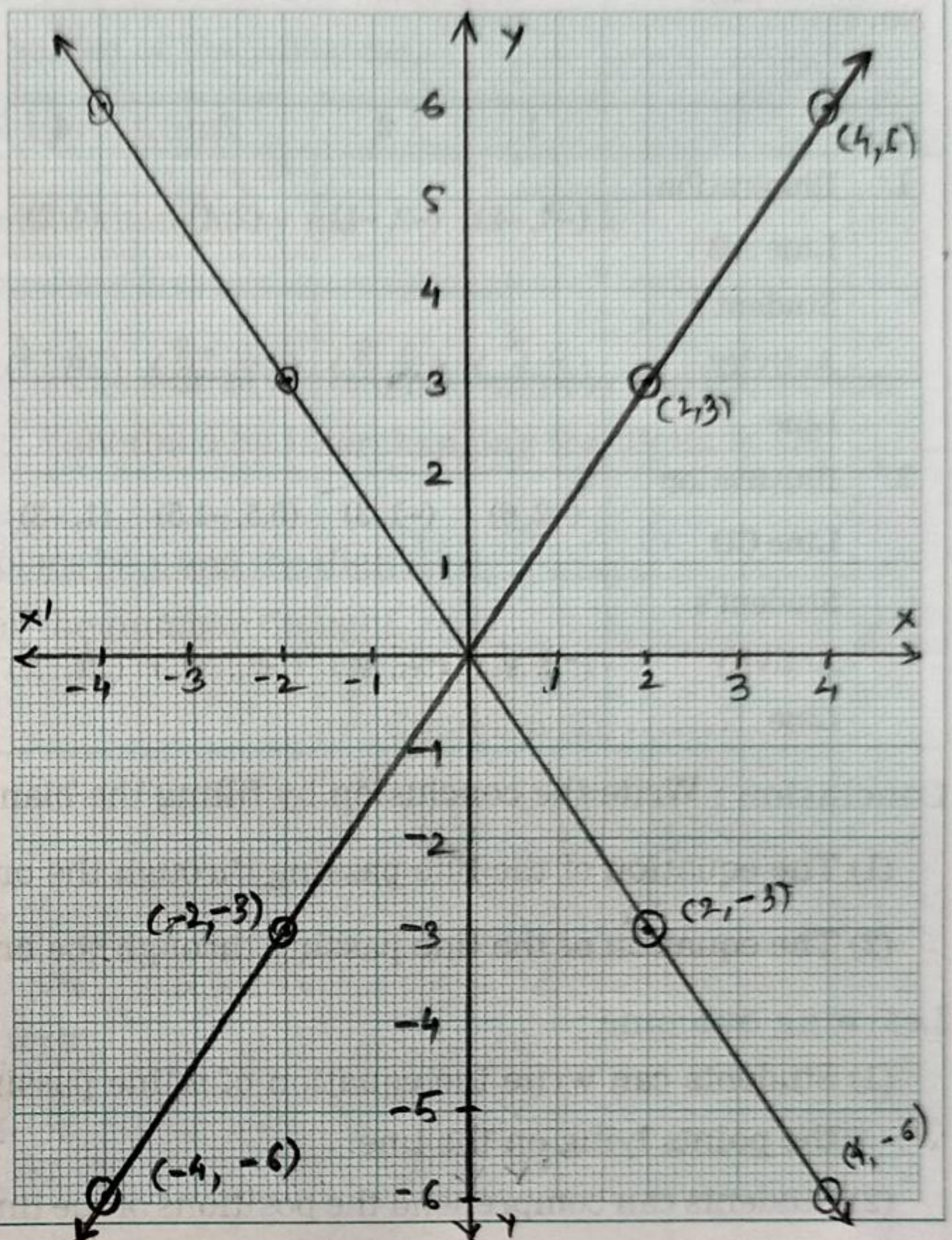
dure :

Draw X and Y axes on the graph paper given to you.

Draw a line passing through the origin and lying in quadrants I and III. (Line AB is drawn in the illustration.)

Take any four points on this line. Write the coordinates of the points in the observation table.

Find the ratio $\dfrac{y}{x}$ for every point. Write in the table, whether the ratio is constant or not.

If you find that the ratio $\dfrac{y}{x}$ for all the four points is constant, write the value of $\dfrac{y}{x}$ in the table.

If $\dfrac{y}{x} = m$ (m is a constant), then write the linear equation in the form $y = mx$.

Similarly, draw another line passing through the quadrants II and IV. Repeat the activity and write the equation of this line.

Derive the conclusion from the entry in the observation table.

Question slip

a line passing through the origin and lying in (i) quadrants I and III taking one point (−4, −4)
aadrants II and IV taking one point (− 4, 6).

vation table :

Line	Coordinates of point				The value of $\frac{y}{x}$ for point				Is the value of $\frac{y}{x}$ constant?	$\frac{y}{x}=?$	Write the equation of the line
	1	2	3	4	1	2	3	4			
Illustration Line AB	(−4, −2)	(−2, −1)	(2, 1)	(4, 2)	$\frac{-2}{-4}=\frac{1}{2}$	$\frac{-1}{-2}=\frac{1}{2}$	$\frac{1}{2}$	$\frac{2}{4}=\frac{1}{2}$	Constant	$\frac{y}{x}=\frac{1}{2}$	$y=\frac{1}{2}x$
Student's Activity Line	(4, 6)	(2, 3)	(−2, −3)	(−4, −6)	$\frac{4}{6}=\frac{2}{3}$	$\frac{2}{3}=...$	$\frac{-2}{-3}=\frac{2}{3}$	$\frac{-4}{-6}=\frac{2}{3}$	Constant	$\frac{y}{x}=\frac{2}{3}$	$y=\frac{2}{3}x$
Illustration Line CD	(−2, 6)	(−1, 3)	(0.5, −1.5)	(1, −3)	$\frac{6}{-2}=-3$	$\frac{3}{-1}=-3$	$\frac{-1.5}{0.5}=-3$	$\frac{-3}{1}=-3$	Constant	$\frac{y}{x}=-3$	$y=-3x$
Student's Activity Line	(−1, 6)	(−2, 3)	(2, −3)	(4, −6)	$\frac{-4}{6}=\frac{-2}{3}$	$\frac{-2}{3}=...$	$\frac{2}{-3}=\frac{-2}{3}$	$\frac{4}{-6}=\frac{-2}{3}$	Constant	$\frac{y}{x}=\frac{-2}{3}$	$y=\frac{-2}{3}x$

lusion : Write the conclusion by filling the blanks from the entry in the observation table.

) The equation of the line passing through the origin and lying in quadrants I and III is $y=\frac{2}{3}x$.

) The equation of the line passing through the origin and lying in quadrants II and IV is $y=\frac{-2}{3}x$

ning outcome :

) Students can write the equation of a line passing through the origin by observing the coordinates of the points lying on the line.

) Students can comprehend the positions of the lines on the graph paper by observing the given equations of the lines.

your knowledge : The coordinates of four points on the line passing through the origin are given elow. Write the equations of the lines

) (2, 10), (1.5, 7.5), (−0.5, −2.5), (−1, −5).

) (−9, 3), (−3, 1), (1.5, −0.5), (6, −2).

e : --------------------   Teacher's Signature : -------------------

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To solve a puzzle of a two-digit number using simultaneous equations.

uisite knowledge :

Knowledge of solving simultaneous equations.

Can write, the original two-digit number and the number formed by interchanging the digits.

ial : Flow chart with verbal information.

lure :

Read carefully the flow chart given to you. Understand the given information.

From the given information form proper equations.

Solve the equations in the space given for it. Find the values of the variables.

Find the solution of the given question from the values of the variables.

Question slip : Flow Chart

Find the two-digit number thought by me

| digit at the tens place is 5 less than twice digit at units place. | The sum of the original number and the number obtained by interchanging the digits is 176. |

Let the digit at the tens place be x and the digit at the units place be y for the number thought.

Equation (1)

$$x = 2y - 5$$

$$x - 2y = -5$$

Write the equations in the form $ax + by = c.$

Equation (2)

$$10x + y + x + 10y = 176$$

$$11x + 11y = 176$$
$$\therefore x + y = 16$$

Solve the equations (1) and (2).
On subtracting eqn (1) & (2),
$$x - 2y = -5 \dots (1)$$
$$x + y = 16 \dots (2)$$
$$\overline{}$$
$$-3y = -21$$
$$y = \frac{21}{3}$$
$$\boxed{y = 7}$$

Put $y = 7$ in eqn (2)
$$\therefore x + y = 16 \dots (2)$$
$$\therefore x + 7 = 16$$
$$\therefore x = 16 - 7$$
$$\boxed{\therefore x = 9}$$

$x = \underline{9}$ and $y = \underline{7}$

The number thought
$$= 10x + y = 10 \times \underline{9} + \underline{7}$$
$$= \underline{90} + \underline{7} = \underline{97}$$

Ans. The number thought is $\underline{97}$

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Similarly, write the values of α and β written on the backside of cards in the observation table.

Thus, you will get two sets of the values of α and β.

Find the values of $\alpha + \beta$ and $\alpha\beta$ from the values of α and β.

Using the formula, form a quadratic equation from the values of $\alpha + \beta$ and $\alpha\beta$.

Get another card from the teacher and form a new quadratic equation.

·vation :

No.	Value on the card	α	β	$\alpha + \beta$	$\alpha\beta$	$x^2 - (\alpha+\beta)x + \alpha\beta = 0$
·· ration	Value on the frontside of the card	6	−3	3	−18	$x^2 - 3x - 18 = 0$
	Value on the backside of the card	−6	7	1	−42	$x^2 - x - 42 = 0$
2. ent's vity	Value on the frontside of the card	3	5	8	15	$x^2 - 8x + 15 = 0$
	Value on the backside of the card	−1	4	3	−4	$x^2 - 3x - 4 = 0$
3. lent's ivity	Value on the frontside of the card	5	−2	3	−10	$x^2 - 3x - 10 = 0$
	Value on the backside of the card	6	4	10	24	$x^2 - 10x + 24 = 0$

·lusion : A quadratic equation can be formed, if the roots of the quadratic equation α and β are known.

·ning outcome : Understands the method of forming a quadratic equation from the values of the roots.

your knowledge : Form quadratic equations if (1) $\alpha = \dfrac{\sqrt{3}}{2}$ and $\beta = -5$ (2) $\alpha = -8$ and $\beta = 7$.

Teacher's Signature : ---------------------

: ---------------------

┌──┐
Teachers :

·Prepare two sets of colour cards.

·One set for the values of α and the other set for the values of β.

·On both the sides of the card write the values of α and β respectively. Keep one value positive and the other one negative.

·Keep some cards prepared.
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Practical 5

: To perform the activity to calculate the sum of first n natural numbers given by your teacher.

·erify the formula $S_n = \dfrac{n(n+1)}{2}$ for the sum of first n natural numbers.

·requisite knowledge :

1) Knowledge of serial order of natural numbers.

2) Knowledge of using the formula $S_n = \dfrac{n(n+1)}{2}$ for the sum of first n natural numbers.

find the sum of first 30 natural numbers as per the activity steps
5) and (6). Note down your answers in the observation table.

The square grid for this is shown alongside.

Derive conclusion from the entries in the observation table.

1							
2	3						
4	5	6					
7	8	9	10				
11	12	13	14	15			
16	17	18	19	20	21		
22	23	24	25	26	27	28	
29	30	(31)	(32)	(33)	(34)	(35)	(36)

Observation Table :

The value of n	$S_n = \dfrac{n(n+1)}{2}$ (x)	The sum found from the square-grid (y)	Is x = y ?
4	$S_4 = \dfrac{4(4+1)}{2} = \dfrac{4 \times 5}{2}$ $= \dfrac{20}{2} = 10$	$7 + 3 = 10$	Yes
19	$S_{19} = \dfrac{19(19+1)}{2} = \dfrac{19 \times 20}{2}$ $\dfrac{380}{2} = 190$	$41 + 45 + 46 + 43 + 15$ $= 190$	Yes
30	$S_{30} = \dfrac{30(30+1)}{2} = \dfrac{30 \times 31}{2}$ $\dfrac{930}{2} = 465$	$92 + 98 + 70 + 68 +$ $61 + 48 + 28 = 465$	Yes

Conclusion : The sum of first n natural numbers, using the formula and by square grid is the same. Thus, we can check the given formula.

Learning outcome : The student can remember the formula by getting the direct proof.

Test your knowledge : Find the sum of first (i) 13 (ii) 25 natural numbers using square grid and using the formula. Check the proof of the formula.

Teacher's Signature : ------------------

Date : ---------------------

❖ ❖ ❖

Aim : To prepare a tax invoice from the contents given by the teacher.

Prerequisite knowledge :

(1) Knowledge about the tax invoice of goods and the relations between GST, CGST and SGST.

(2) To calculate the GST from the given rates.

Materials : A sample tax invoice of goods.

Tax Invoice GST
(Subject to Mumbai Jurisdiction)
XYZ Enterprises
Ground Floor, M.G. Road, Parel, Mumbai–400 000 Tel. (022) 0000 0000

Vendor : ABC Corporation	
Address : Station Road, Borivali (West), Mumbai 400 000	
GSTIN No. : 27XXXXX6789XXZX	
Tax is payable on reverse charge : NO	

GSTIN NO.	: 27XXXXX1234X5ZX
Invoice No.	: L000123
Invoice Date	: 01/07/2018
Order No.	: TC0018
Order Date	: 30/06/2018
DP Name	:

Code	Description of Goods	Qty.	Rate ₹	Amount ₹	CGST %	CGST Amount ₹	SGST %	SGST Amo ₹
K0001	Toner Cartridge 12 A	2	820.00	1640.00	9.00	147.60	9.00	147.
	Total	2		1640.00		147.60		147.

Net Amount in Words		Total Amount	₹	16
Rupees One Thousand Nine Hundred Thirty-Five Only.		Discount	₹	
Total GST Amount : 18% of ₹ 1640.00 = ₹ 295.20		Total CGST	₹	1
Bank Details :		Total SGST	₹	1
Bank Name & Branch : India Bank (Fort Branch)		Total GST Amount	₹	2
Account No. XXXXXXXXXXXXXX				
IFSC Code : IBXXXXXX		Round off	₹	
		Net Amount	₹	19

Terms & Conditions :

1. Payment to be made within 7 days of the receipt of this invoice
2. Interest @ 12% p.a. will be charged for delayed payment
3. Cheque return charges will be ₹ 500.00

For XYZ Enterpr

(Common Seal)   Authorised Signa

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ve the tax invoice given to you by your teacher. Prepare a new tax invoice by changing the following :

ity : 8; Rate : ₹ 818.00.

lure :

Observe minutely the tax invoice given to you by your teacher.

Note down the following in the tax invoice :

  (i) Quantity   (ii) Rate   (iii) Taxable amount

  (iv) The rate of SGST   (v) The rate of CGST   (vi) State tax amount

  (vii) Central tax amount (viii) Total tax amount : GST (ix) Invoice total

Take into account the given changes in the question slip and calculate the tax accordingly.

Fill in the blanks and prepare a new tax invoice.

<div align="center">

Tax Invoice GST
(Subject to Mumbai Jurisdiction)

XYZ Enterprises

Ground Floor, M.G. Road, Parel, Mumbai–400 000 Tel. (022) 0000 0000

</div>

r : ABC Corporation	GSTIN NO.	: 27XXXXX6789XXZX
ess : Station Road, Borivali (West),	Invoice No.	: L000123
Mumbai 400 000	Invoice Date	: 01/07/2018
N No. : 27XXXXX6789XXZX	Order No.	: TC0018
s payable on reverse charge : NO	Order Date	: 30/06/2018
	DP Name	:

le	Description of Goods	Qty.	Rate ₹	Amount ₹	CGST %	CGST Amount ₹	SGST %	SGST Amount ₹
01	Toner Cartridge 12 A	8	818	6·544	9.00	588·96	9.00	588·96
	Total	8		6·544		588·96		588·96

Amount in Words	Total Amount ₹	6544.00
	Discount ₹	0.00
l GST Amount : 18% of _____ = _____	Total CGST ₹	588·96
Details :	Total SGST ₹	588·96
Name & Branch : India Bank (Fort Branch)	Total GST Amount ₹	1177·92
unt No. XXXXXXXXXXXXXX	Round off ₹	0·92
Code : IBXXXXXX	Net Amount ₹	7721·00

ns & Conditions :   **For XYZ Enterprises**

yment to be made within 7 days of the receipt of this invoice

terest @ 12% p.a. will be charged for delayed payment

heque return charges will be ₹ 500.00   (Common Seal)   Authorised Signatory

Conclusion : Can prepare a tax invoice by considering the taxable amount in the trading B2B, calculating the amount of GST, CGST and SGST.

Learning outcome :

(1) Students understand the tax invoice showing the computation of GST.

(2) The interpretation of the entry in the tax invoice.

(3) Students can prepare a new tax invoice from the given information.

Test your knowledge : Prepare a tax invoice from the given information.

Quantity : 11; Rate : ₹ 775.00; GST : 18%

Date : ....

Teacher's Signature : ....

For Teachers :

(1) Collect the various tax invoices of different products as well as different types of services provided.

(2) Decide the changes to be made by the students to prepare a tax invoice.

❖ ❖ ❖

Practical 7

**Aim :** To roll a die ten times and record the outcomes in the form of a table.

Prerequisite knowledge : Knowledge about the outcomes (i) in a random experiment and (ii) when a die is rolled.

Materials : A die, pen/pencil, eraser.

Procedure :

(1) Roll the given die ten times.

(2) Note down the number you get on the upper surface of the die each time in the given table.

(3) You will get a set of 10 numbers. Each number is an outcome.

(4) Prepare an ungrouped frequency distribution of the outcomes.

Figure :

Illustration		Student's Activity	

obtained when a dice is rolled 10 times
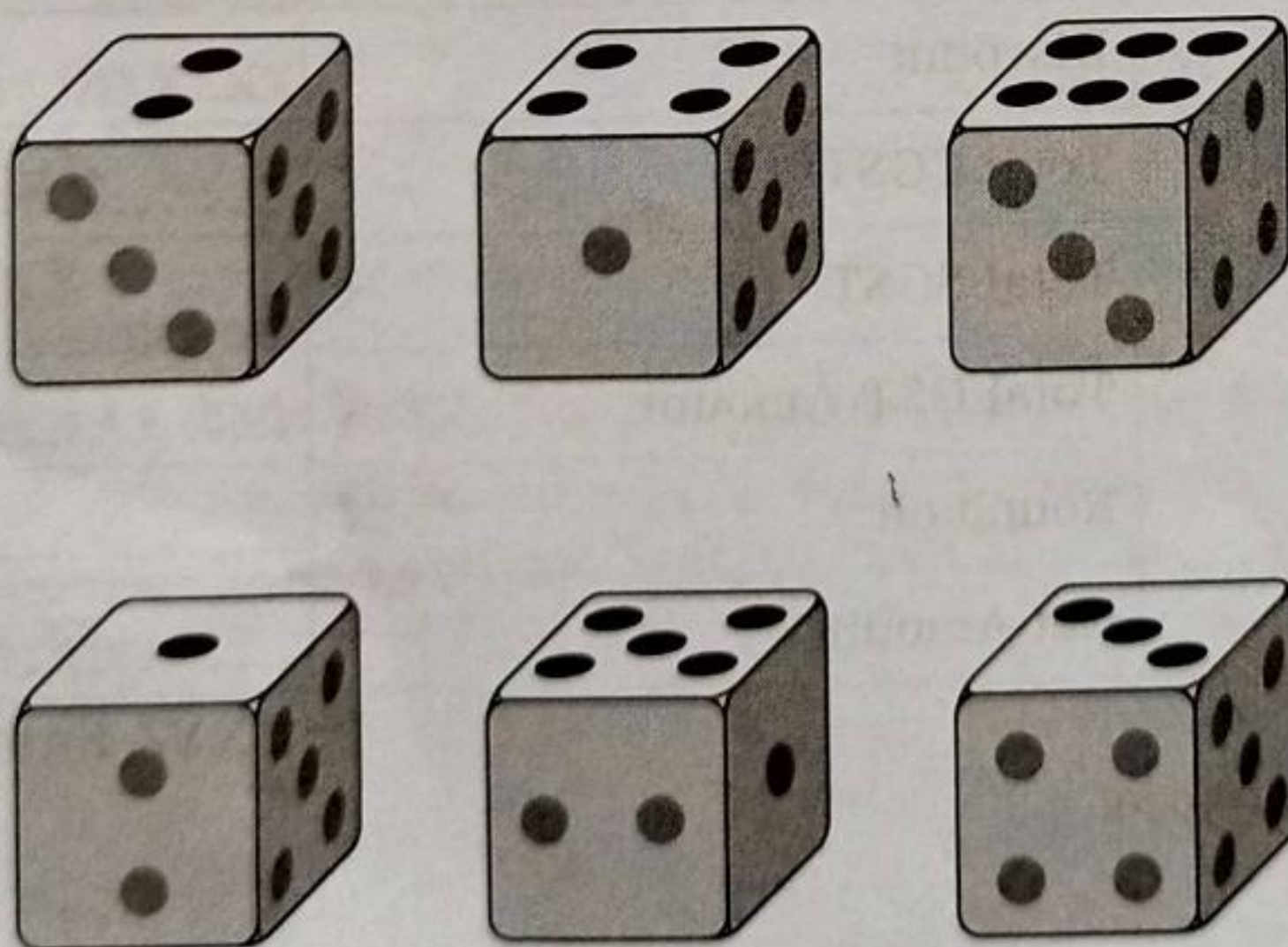
5	2	5	3
6	5	6	1

Data obtained when a dice is rolled 10 times

4	6	2	1	3
1	2	4	5	4

grouped Frequency Distribution Table

come	Tally marks	Frequency (f)
1	||	2
2	|	1
3	||	2
4	–	–
5	|||	3
6	||	2
Total		10

Ungrouped Frequency Distribution Table

Outcome	Tally marks	Frequency (f)
1	||	2
2	||	2
3	|	1
4	|||	3
5	|	1
6	|	1
Total		10

ion : When a die is rolled, any of the numbers from 1 to 6 may appear on the upper surface.

g outcome : The student understands that when a die is rolled, the possible outcome is only one per from 1 to 6.

ur knowledge : Roll a die 20 times. Prepare an ungrouped frequency distribution of the outcome.

Teacher's Signature : _____

achers : Keep all the materials ready for the practicals.

❖ ❖ ❖

Aim : To draw a pie diagram of the contents given on a food packet.

Prerequisite knowledge :

(1) Finding the measure of the central angle (θ) for drawing a pie diagram.

(2) Calculating the measure of the central angle using the formula.

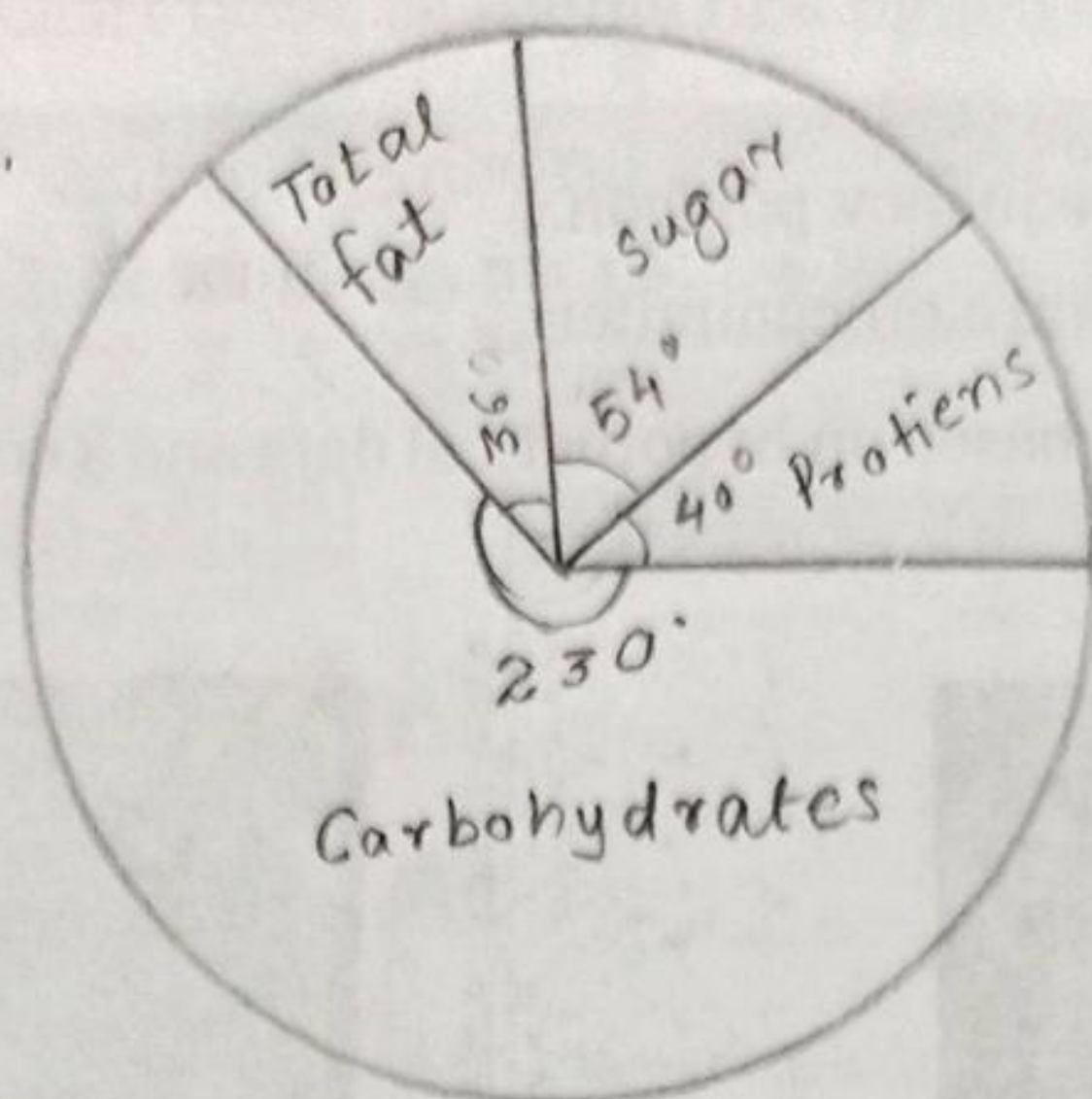**Materials :** Empty wrapper packets of various food articles.

Figure :

Procedure :

(1) Observe the packet of toasts given to you.

(2) You will find a nutritional value chart printed on it.

(3) This chart shows weight of different components such as carbohydrates, proteins, fats, etc. in g

(4) Prepare an observation table and note down the weight of the contents of this chart.

(5) Find the measure of the central angle (θ) related to each content.

(6) Draw a pie diagram showing the proportion of the contents as per the values of θ.

Observation table :

Sr. No.	Components of food	Weight (g)	$\theta = \dfrac{\text{Weight of the component}}{\text{Total weight}} \times 360°$ (Nearest whole number)
1.	Carbohydrates	64	$\theta_1 = \dfrac{64}{100} \times 360° = \underline{230}°$
2.	Sugar	15	$\theta_2 = \dfrac{15}{100} \times 360° = \underline{54°}$
3.	Proteins	11	$\theta_3 = \dfrac{11}{100} \times 360° = \underline{39.6} \approx 40$
4.	Total Fat	10	$\theta_4 = \dfrac{10}{100} \times 360° = \underline{36}$
	Total	**100**	**360°**

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gram :

Total fat
3%
Sugary
54°
40° Protiens
230°
Carbohydrates

sion : Can draw the pie diagram indicating the information of the mass of the components of food
n on the food packet.

ng outcome : Students can draw a pie diagram from the given information.

ur knowledge : Collect a wrapper or a packet of food items of your choice. Note down the weight
fferent components printed on that wrapper/packet. Draw a pie diagram from the information you
er.

----

eachers :

llect various food packets for the practicals.

the information about the quantities of the components are in decimals, convert them to the nearest whole
mbers before giving them to the students for drawing pie diagrams.

❖ ❖ ❖

Aim : To prepare a histogram and a frequency polygon from the given data in MS-Excel software.

Prerequisite knowledge :

(1) Knowledge of a histogram and a frequency polygon.

(2) Knowledge of using MS-Excel software on computer.

Materials : Frequency distribution table based on hypothetical data and a computer with MS-Excel sof

Figure :

Desktop Computer   Laptop

Illustration :

Question slip

Prepare a histogram and a frequency polygon based on the following data :

Height in cm	135 – 140	140 – 145	145 – 150	150 – 155
Number of Students	4	12	16	8

Procedure :

(1) Start MS-Excel on the computer.

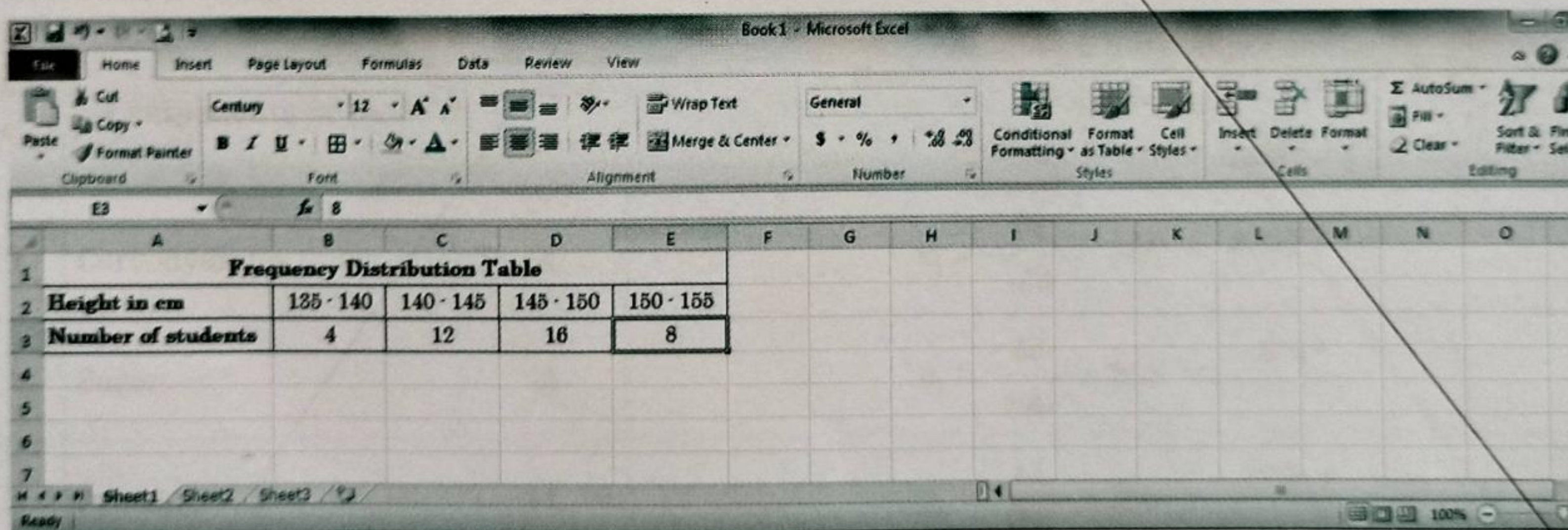(2) Create the frequency distribution table in MS-Excel by entering the data on a worksheet as in Figure 1.

Figure 1

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lect the table and click on

Insert tab ⇒ Column icon (in the charts group.)

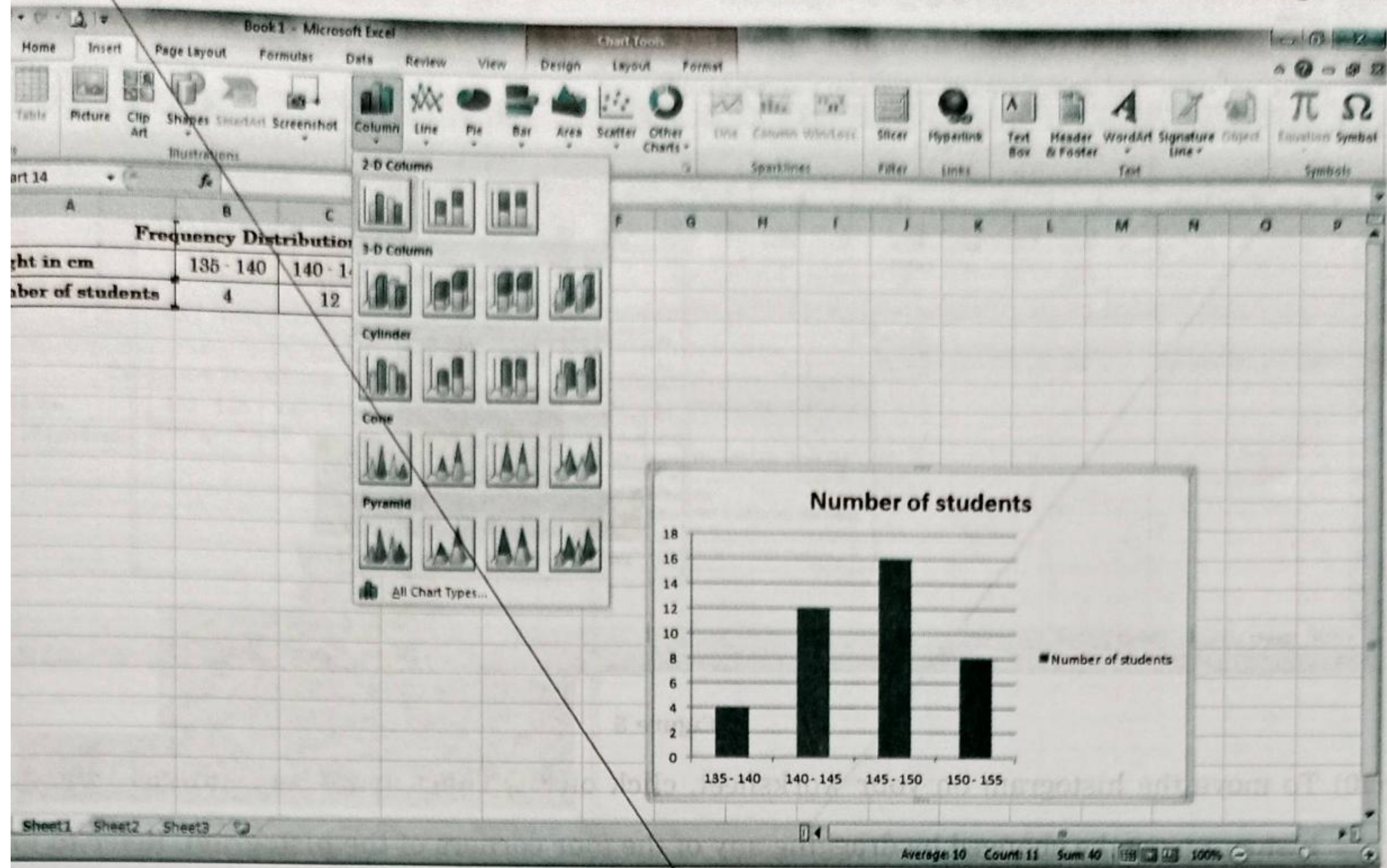rom the dropdown list of chart types, select the first option of the 2-D Column. Refer to Figure 2.

Figure 2

ou may modify the different components of the chart as explained below.

remove the gaps between bars, place the mouse cursor inside the plot area and right-click. From

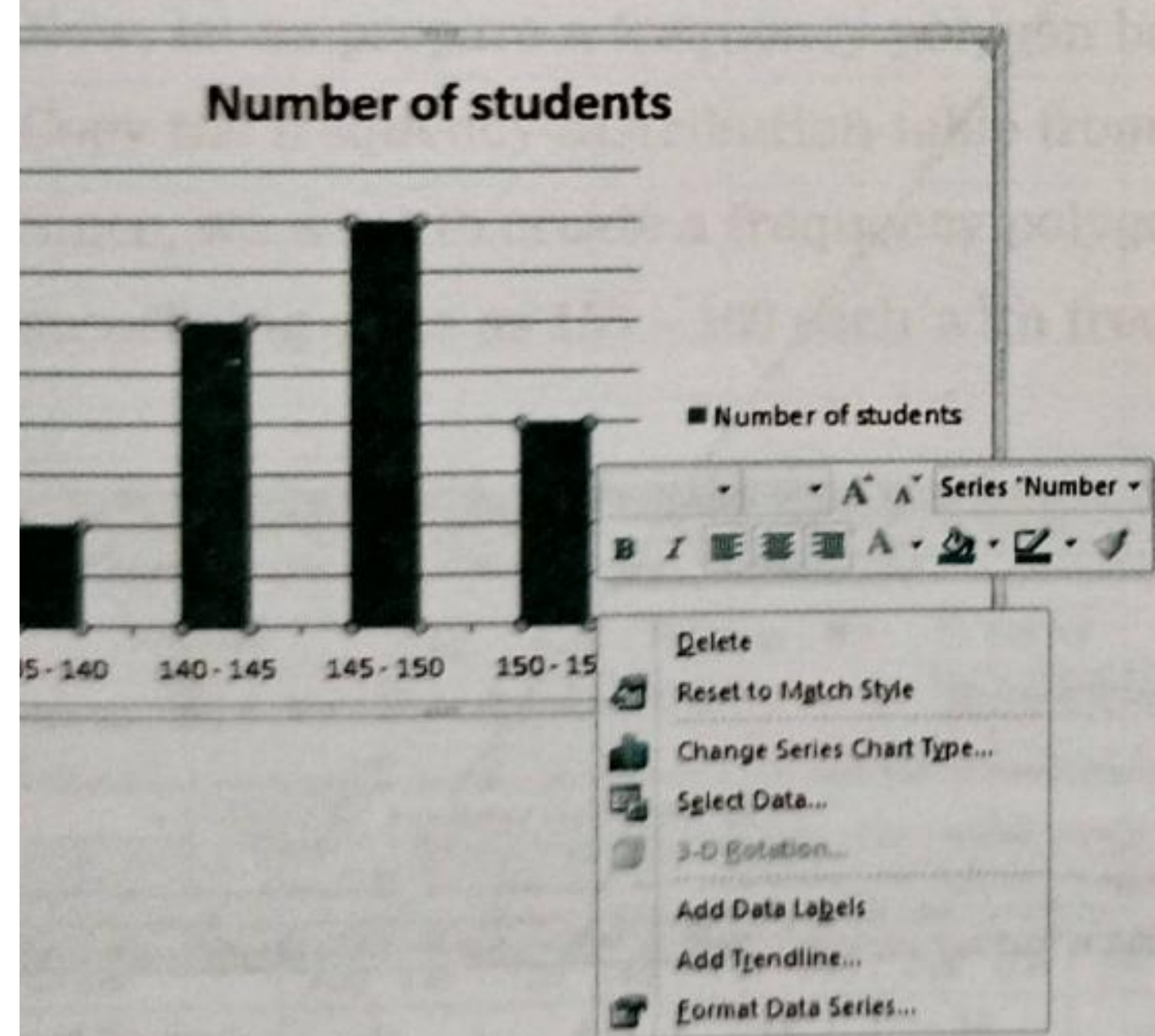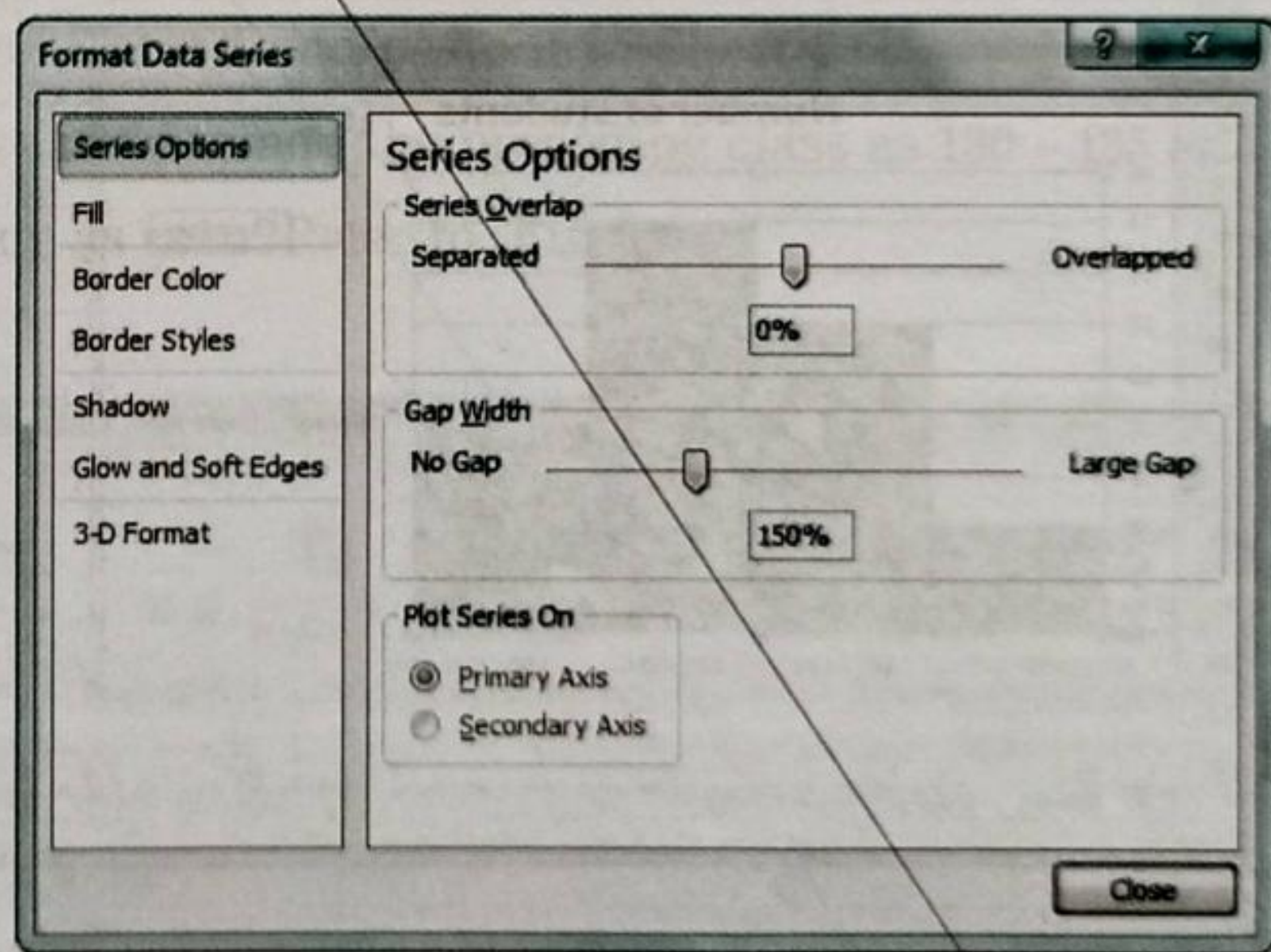e right-click context menu, click on the Format Data Series. Refer to Figure 3.

Figure 3

Figure 4

he Format Data Series dialogue box will open. (See Figure 4)

love the Gap Width slider towards the extreme left to make it 0%.

SECTION 2 : PRACTICALS

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(9) Close the dialogue box to see the desired histogram. Refer to Figure 5.

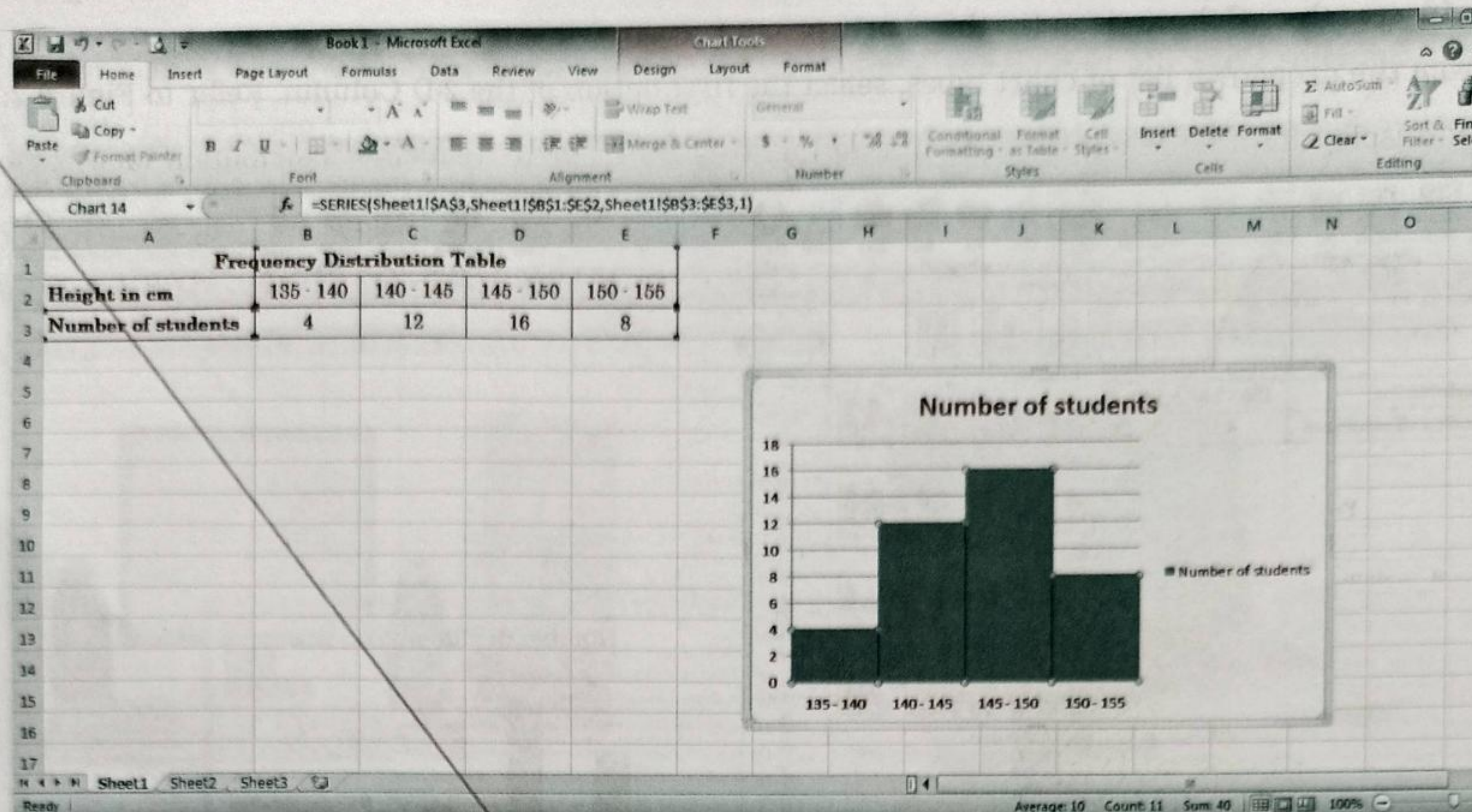**Figure 5**

(10) To move the histogram on your worksheet, click on the chart and drag. Similarly the size histogram can be changed by dragging any of the four corners of the histogram. Refer to Fig

Figure 6
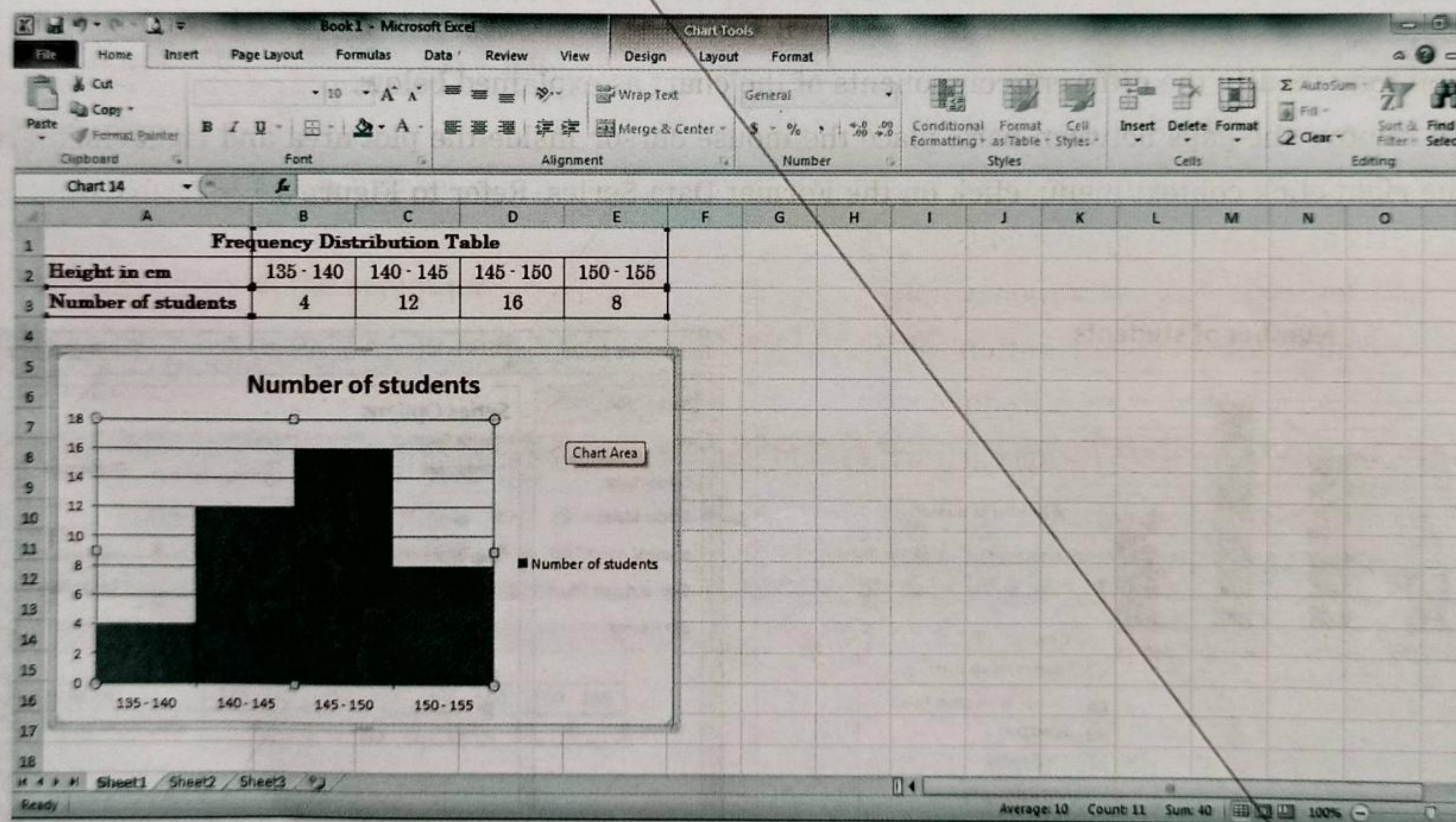
(11) You can also edit/delete Chart Title given on top, Legend given on the right hand side, etc.

your requirements in different ways. To delete the Chart Title and Legend, just select them an

the delete key.

to add axis title, select the chart. In the newly added Chart Tools tabs, click on the Layout tab, click on the Axis Titles icon of the Labels group . Here, you will find two options–Primary Horizontal Axis Title and Primary Vertical Axis Title. Click on both the options one-by-one and select the appropriate position to display the title. Then type the title to the axes as per your frequency distribution table. Refer to Figure 7.
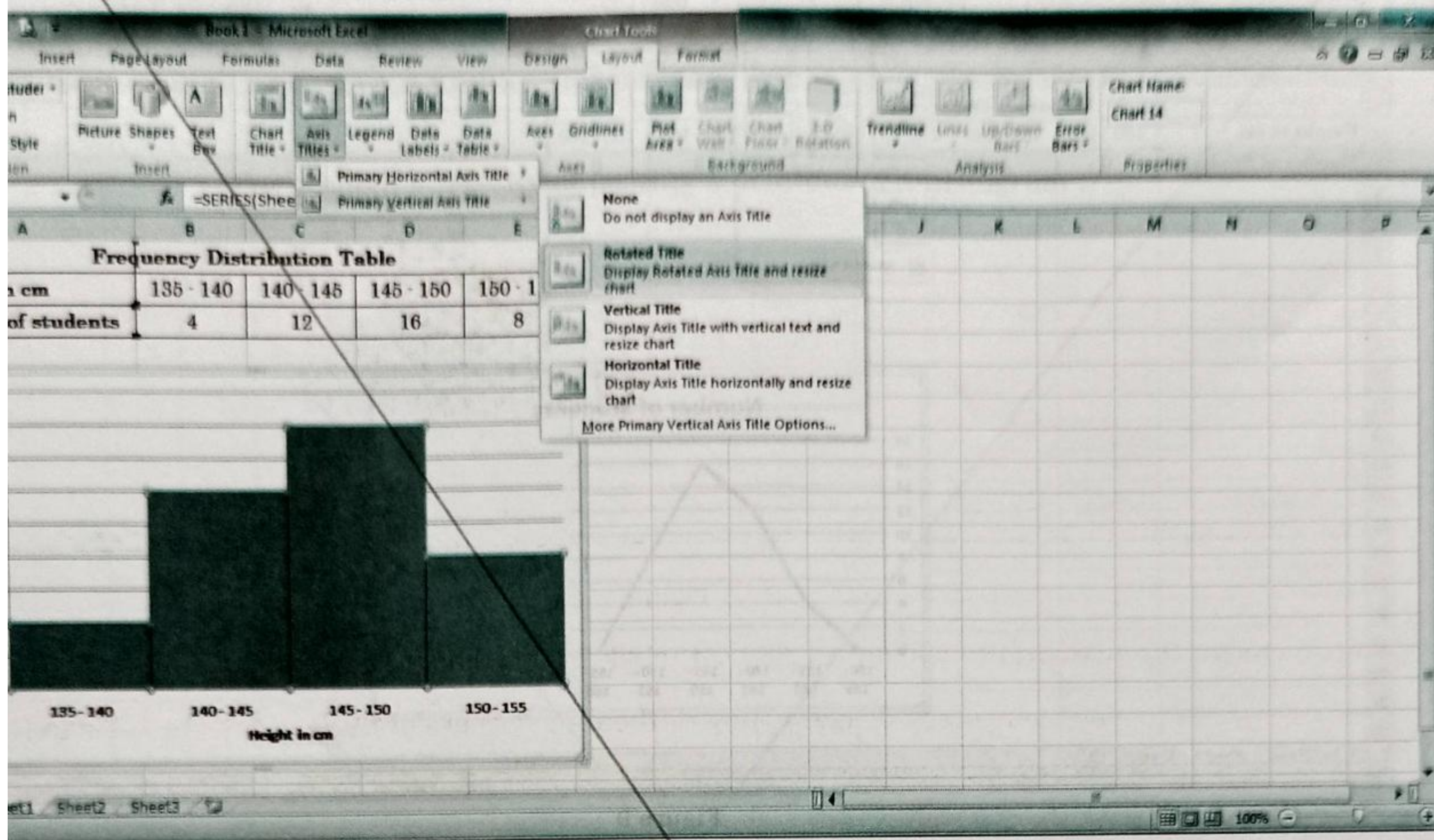

Figure 7

Using various tools under these Design, Layout and Format tabs of Excel, you can customize your charts as per your requirements.

Now, let us prepare a frequency polygon based on the same data in Excel Sheet 2.

Copy the frequency distribution table from Excel Sheet 1 and paste it in Sheet 2.

Since, we want to create a frequency polygon, we need to add the preceding class as 130 – 135 and the succeeding class as 155 – 160 each with frequency as zero. Refer to Figure 8.
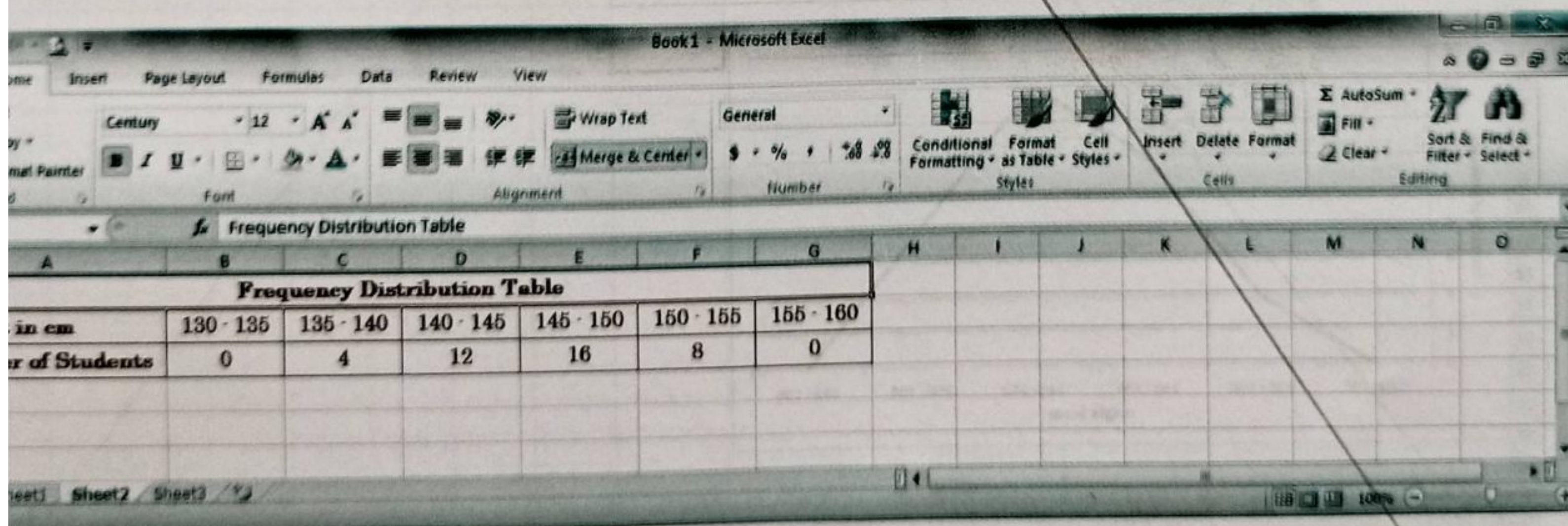

Figure 8

(17) Select the table and click on the Line icon in the Charts group of Insert tab. From the dropdo of chart types, select the first option of the 2-D Line. A frequency polygon based on the data f you in the table will be displayed. Refer to Figure 9.

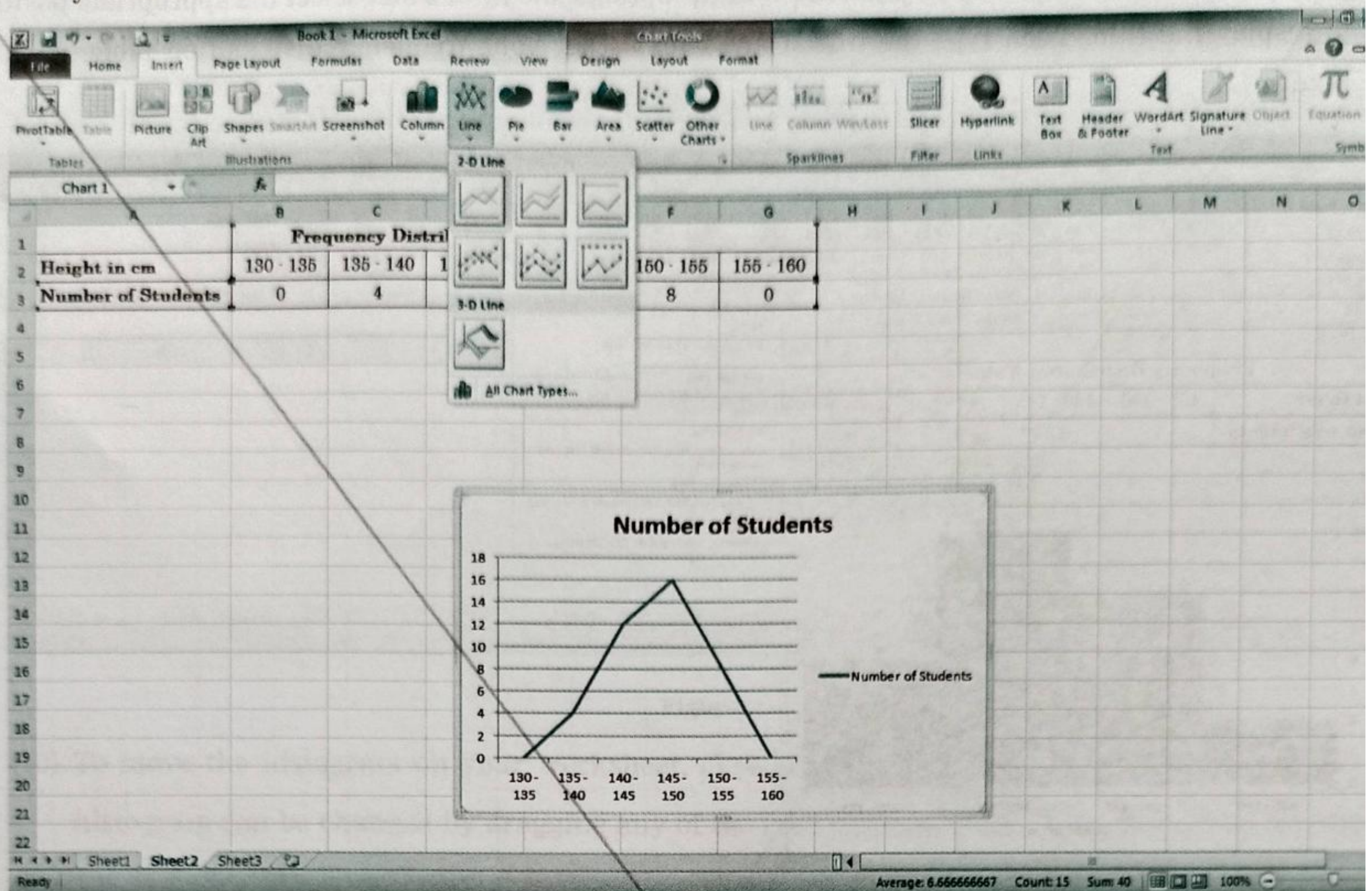**Figure 9**

(18) As explained in points no. 12 and 13, add the chart titles and axis titles. Take printouts of the as instructed by your teacher. Refer to figure 10.

Frequency Distribution Table						
Height in cm	130 - 135	135 - 140	140 - 145	145 - 150	150 - 155	155 - 160
Number of Students	0	4	12	16	8	0
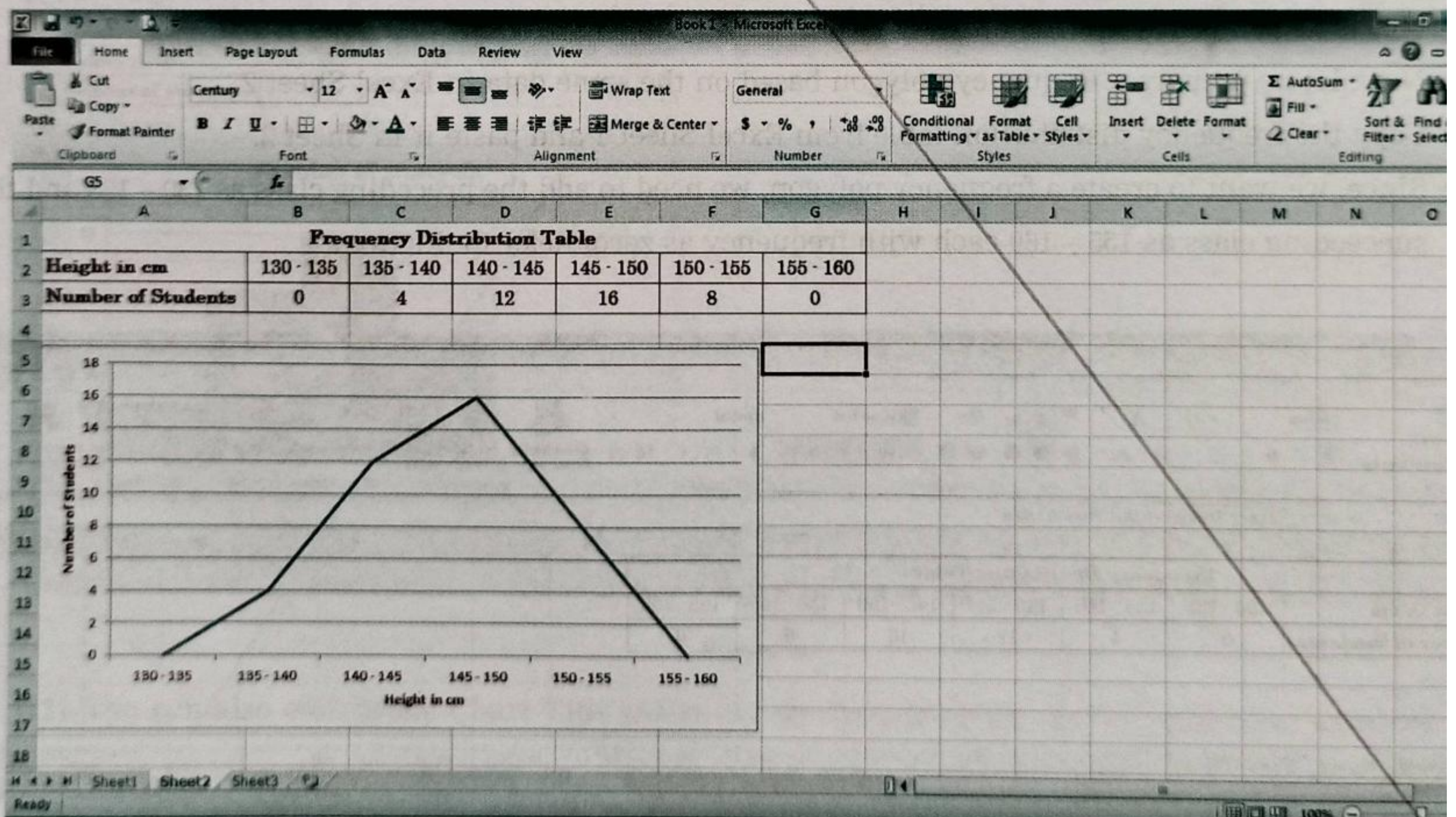
Figure 10

Question slip

(i) a histogram and (ii) a frequency polygon based on the distribution of weight of seeds as per
...owing data on computer :

t in mg	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
...er of Seeds	18	22	30	16	4

...printout of both and paste it in the space provided here.

For student's activity of pasting a printout of a histogram :

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For student's activity of pasting a printout of a frequency polygon :

Conclusion : By just typing data properly, we can get accurate charts in the blink of an eye.

Learning outcome : Different types and varieties of line charts, pie charts, bar charts, column char
can be prepared very fast and accurately with the help of a computer.

Test your knowledge :

(1) Can we prepare a frequency polygon and a histogram so easily on MS-Word software also?

(2) Which activity will take more time, preparing these types of diagrams on computer or by han

Date : --------------------   **Teacher's Signature :** ------------

For Teachers :

(1) In case of shortage of computers, make a group of 4-5 students and ask them to do this practical jointly.

(2) Help students in understanding various formats, layouts & designing tools available for graphs and ch
MS-Excel.
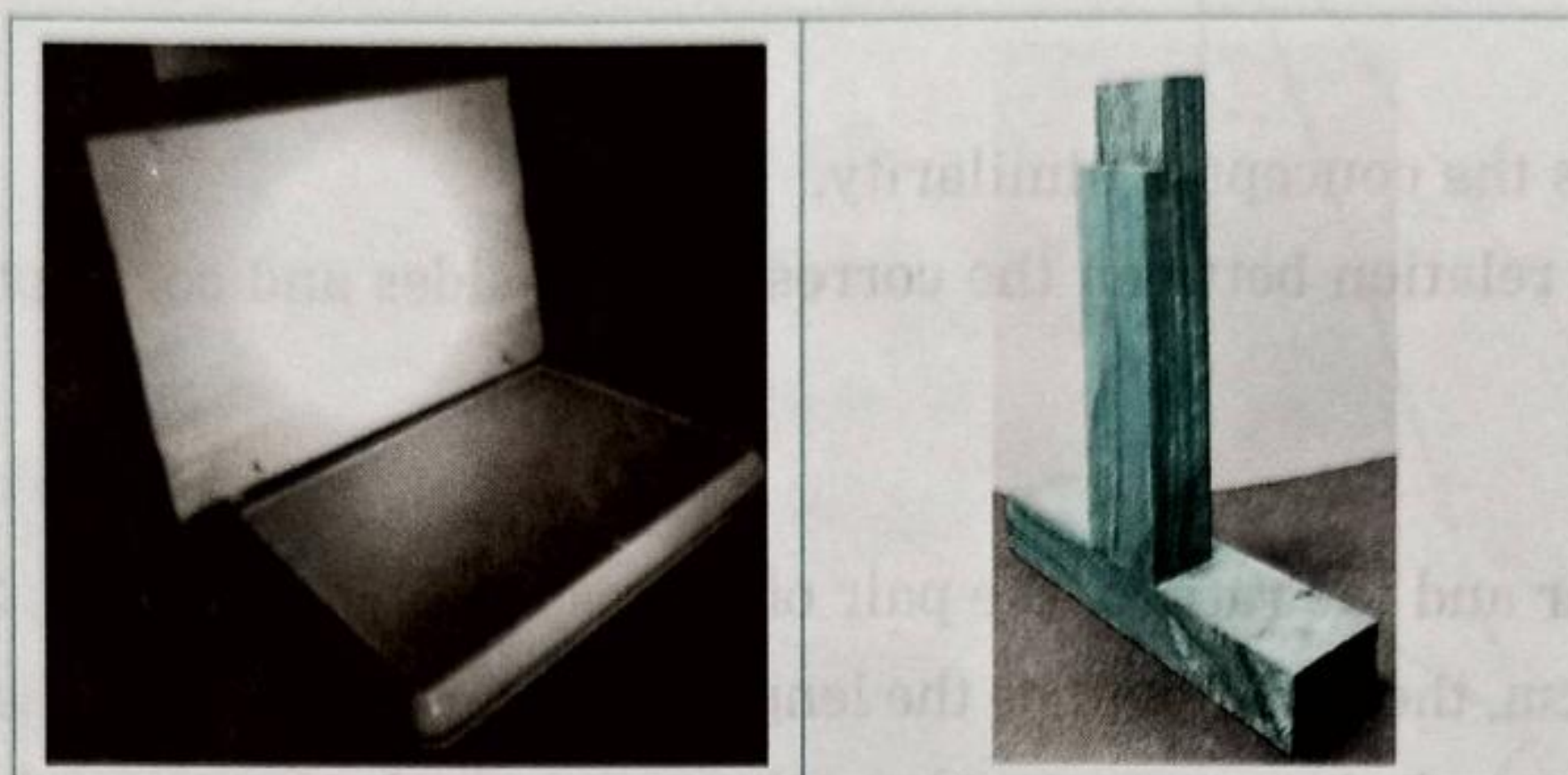
❖ ❖ ❖

MATHEMATICS PART–II

Practical 1

Aim : To decide if the triangle and its shadow are similar or not.

**Prerequisite knowledge :** Concept of similar figures, properties of similar triangles and tests of simila

Materials : Triangular piece of cardboard, stand, white paper, candle/small lamp/torch (any sourc light), scale, pencil and eraser.

Figure :

Procedure :

(1) Attach the white paper on the wall.

(2) Now keep the triangular cardboard piece upright on the stand and place it in front of the wall. Name the vertices as A, B and C.

(3) Arrange the source of light (a lamp/torch or a candle) and place it in front of the triangle such that its shadow falls on the paper.
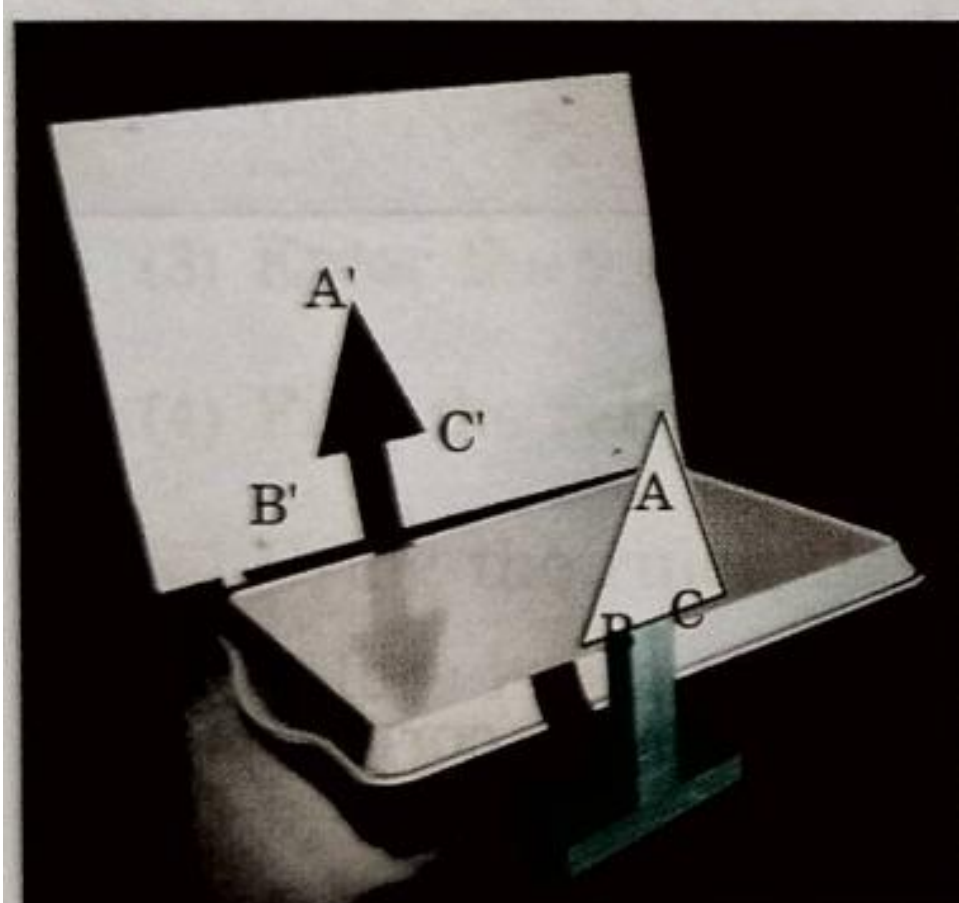
(4) Using pencil, mark the vertices of the triangular shadow.

(5) Name the vertex corresponding to A as A', B as B' and C as C'.

(6) Join the points A' B' C' to obtain the triangle.

(7) Measure the lengths of sides and angles of △ABC and its shadow △A'

(8) Enter your observations in the observation table.

(9) Find the ratios of the corresponding sides. You may round off the v to one decimal place, if required.

(10) Derive conclusions from it.
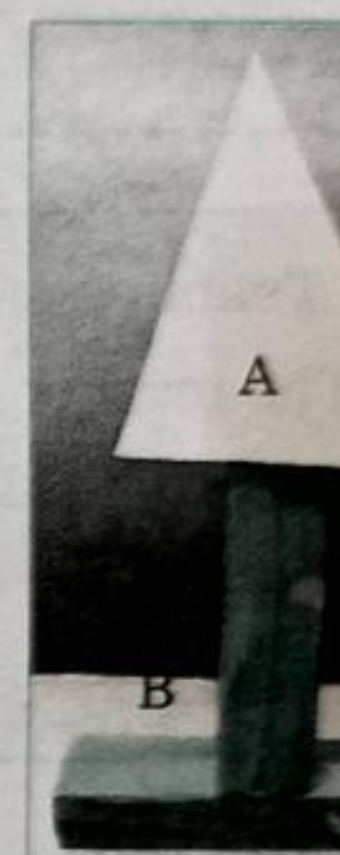
Observation table :

Sides of △ABC (in cm)	Sides of △A'B'C' (in cm)	Ratios of corresponding sides of △ABC and △A'B'C'	Are correspondin sides in proportio
AB = 3cm	A'B' = 6 cm	$\frac{AB}{A'B'} = \frac{3}{6} = \frac{1}{2}$	
BC = 4 cm	B'C' = 8 cm	$\frac{BC}{B'C'} = \frac{4}{8} = \frac{1}{2}$	✓ Yes ~~No~~
AC = 5 cm	A'C' = 10 cm	$\frac{AC}{A'C'} = \frac{5}{10} = \frac{1}{2}$	

Angles of △ ABC	Angles of △ A'B'C'	Are corresponding angles equal?	Are the triangle similar?
∠A = 30	∠A' = 30	✓ Yes / No	✓ Yes / No
∠B = 60	∠B' = 60		
∠C = 90	∠C' = 90°		

Conclusion : The original triangle and its shadow are (similar / not similar).

Learning outcome :

(1) The student understands the concept of similarity.

(2) The student verifies the relation between the corresponding sides and corresponding angles thr practicals.

Test your knowledge :

(1) Two triangles are similar and the ratio of the pair of corresponding sides is 2 : 3. If one of the si the smaller triangle is 4 cm, then what will be the length of its corresponding side of the larger tria

(2) If two triangles are similar, what can you say about the corresponding sides and corresponding a

Date : ....   Teacher's Signature : ....

For Teachers :

(1) The teacher should keep ready white coloured paper, stand, the source of light and other materials require the practical.

(2) The teacher should ensure that the student has necessary instruments to draw the triangle and measur elements.

❖ ❖ ❖

Practical 2

Aim : To verify the relation between the areas of two similar triangles with (i) the square of the correspo perimeters or (ii) the square of the corresponding medians of those two triangles.

Prerequisite knowledge : Concept of similar triangles, understanding of ratios, medians, area and peri of a triangle.

Materials : Cardboard/cardsheet/marble paper, scale, pencil, eraser, ruler and a pair of scissors.

Figure :

rvation tables :

Table 1

	For △ ABC			For △PQR			The ratio of the areas $\dfrac{A_1}{A_2}$
	Base (in cm)	Height (in cm)	Area (A_1) $= \dfrac{1}{2} \times$ base $\times$ height (in sq cm)	Base (in cm)	Height (in cm)	Area (A_2) $= \dfrac{1}{2} \times$ base $\times$ height (in sq cm)	
tration	3	4	$\dfrac{1}{2} \times 3 \times 4 = 6$	6	8	$\dfrac{1}{2} \times 6 \times 8 = 24$	$\dfrac{6}{24} = \dfrac{1}{4}$
ent's ity	6	8	$\frac{1}{2} \times 6 \times 8 = 24$	12	16	$\frac{1}{2} \times 12 \times 16 = 96$	$\dfrac{24}{96} = \dfrac{1}{4}$

Table 2

	For △ ABC				For △ PQR				The ratio of the squares of perimeters of the triangles $\dfrac{P_1^{\;2}}{P_2^{\;2}} = \left(\dfrac{P_1}{P_2}\right)^2$
	AB	BC	AC	Perimeter P_1	PQ	QR	PR	Perimeter P_2	
tration	4	3	5	12	8	6	10	24	$\dfrac{12^2}{24^2} = \left(\dfrac{12}{24}\right)^2 = \dfrac{1}{4}$
ent's ity	2	1.5	2.5	6	4	3	5	12	$\dfrac{6^2}{12^2} = \left[\dfrac{6}{12}\right]^2 = \left[\dfrac{1}{2}\right]^2 = \dfrac{1}{4}$

Table 3

	Medians of △ ABC			Medians of △ PQR			The ratio of squares of corresponding medians		
							$\dfrac{AO^2}{PT^2}$	$\dfrac{BM^2}{QS^2}$	$\dfrac{CN^2}{RX^2}$
	AO	BM	CN	PT	QS	RX	$\dfrac{M_1^{\;2}}{M_2^{\;2}} = \left(\dfrac{M_1}{M_2}\right)^2$		
stration	4.3	2.5	3.6	8.6	5	7.2	$\left(\dfrac{4.3}{8.6}\right)^2 = \left(\dfrac{1}{2}\right)^2 = \dfrac{1}{4}$	$\left(\dfrac{2.5}{5}\right)^2 = \left(\dfrac{1}{2}\right)^2 = \dfrac{1}{4}$	$\left(\dfrac{3.6}{7.2}\right)^2 = \left(\dfrac{1}{2}\right)^2 = \dfrac{1}{4}$
ent's rity	8.6	5	7.2	17.2	10	14.4	$\left[\dfrac{8.6}{17.2}\right]^2 = \left[\dfrac{96}{172}\right]^2 = \left[\dfrac{1}{2}\right]^2 = \dfrac{1}{4}$	$\left[\dfrac{5}{10}\right]^2 = \left[\dfrac{1}{2}\right]^2 = \dfrac{1}{4}$	$\left[\dfrac{7.2}{14.4}\right]^2 = \left[\dfrac{72}{144}\right]^2 = \left[\dfrac{1}{2}\right]^2 = \dfrac{1}{4}$

ith respect to above observations, fill in the details given below.

$\dfrac{A_1}{A_2} = \dfrac{P_1^{\;2}}{P_2^{\;2}}$ ......**YES** ✓........ [YES / ~~NO~~]

Is $\dfrac{A_1}{A_2} = \dfrac{M_1^{\;2}}{M_2^{\;2}}$ ....**YES** ✓........ [YES / ~~NO~~]

Observation table :

For △ ABC	For △ BDC	For △ ADB
∠ABC = 90°	∠BDC = 90°	∠ADB = 90°
∠BAC = 60°	∠DCB = 30°	∠DBA = 30°
∠ACB = 30°	∠CBD = 60°	∠BAD = 60°

With the above observations, fill in the details as given below :

In △ ABC and △ BDC,	In △ ABC and △ ADB,	In △ BDC and △ ADB,
under ABC ↔ BDC	under ABC ↔ ADB	under BDC ↔ ADB
∠ABC ≅ ∠ BDC	∠ABC ≅ ∠ ADB	∠BDC ≅ ∠ ADB
∠BCA ≅ ∠ DCB	∠BCA ≅ ∠ DBA	∠DCB ≅ ∠ DBA
∠CAB ≅ ∠ CBD	∠CAB ≅ ∠ BAD	∠CBD ≅ ∠ BAD
∴ △ABC ~ △ BDC	∴ △ABC ~ △ ADB	∴ △BDC ~ △ ADB
(By AAA test of similarity)	(By AAA test of similarity)	(By AAA test of simi

Conclusion : Thus the theorem of similarity of right angled triangle is verified through practical.

Learning outcome :

(1) The practical verification of the theorem helps the student to understand the concept very wel

(2) The student learns to write the correct correspondence for the similarity of the triangles.

Test your knowledge : If in △PQR, m∠PQR = 90° and seg QS ⊥hypotenuse PR and P-S-R, then menti similarity of all the three triangles with correct correspondence.

Date : _____   **Teacher's Signature :** _____

For Teachers :

(1) Teacher should keep ready cardsheet/marble paper, pair of scissors and other materials required for the prac

(2) Teacher should ensure that the student has necessary instruments to measure the elements of the triangle.

❖ ❖ ❖
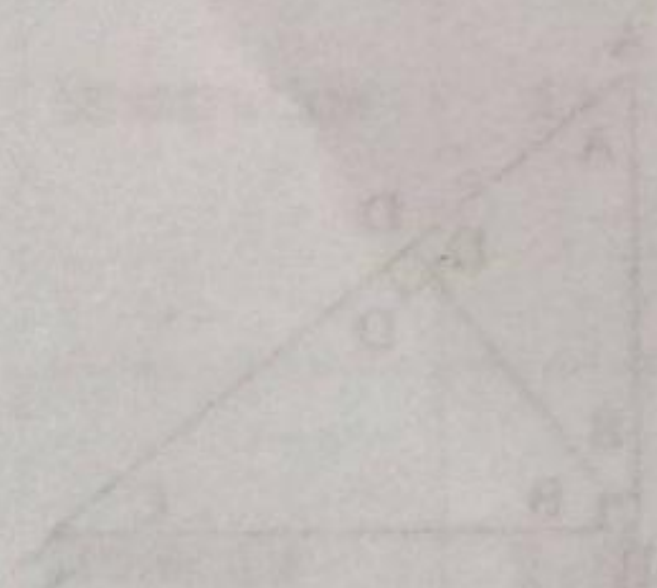
To understand the construction of tangents from the points in the interior of the circle, on the circle and in the exterior of the circle.

quisite knowledge : Basics of circle and tangents.

ials : Paper, compass, pencil, ruler and eraser.

es :

dure :

Draw three different circles on the paper or in the space allotted in the 'Rough figure' column of observation table.

Mark point P in the interior of the circle. From this point, check whether we can draw tangent to the circle. Note your observation.

•P

Q
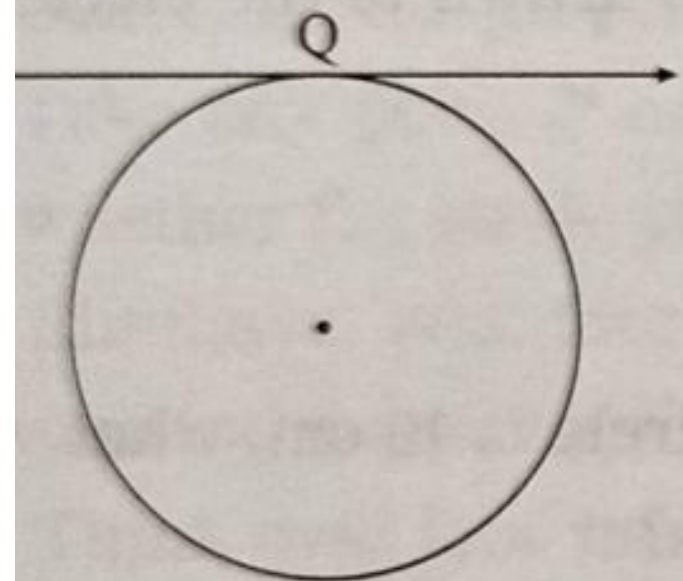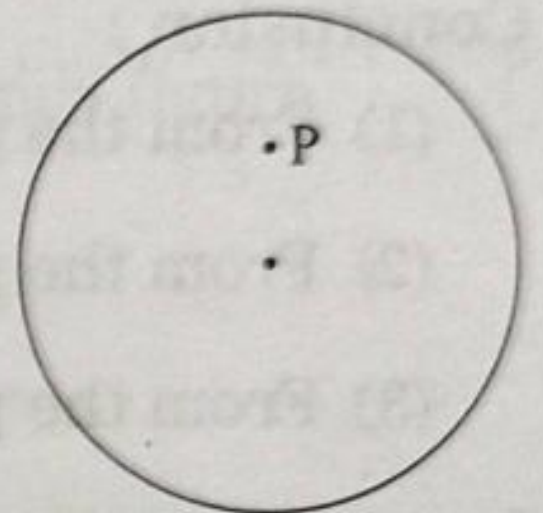
(3) Mark point Q on the circle. Through this point, check whether how many tangents can be drawn to the circle. Draw the tangent (s) if possible. Note your observation.

R

B
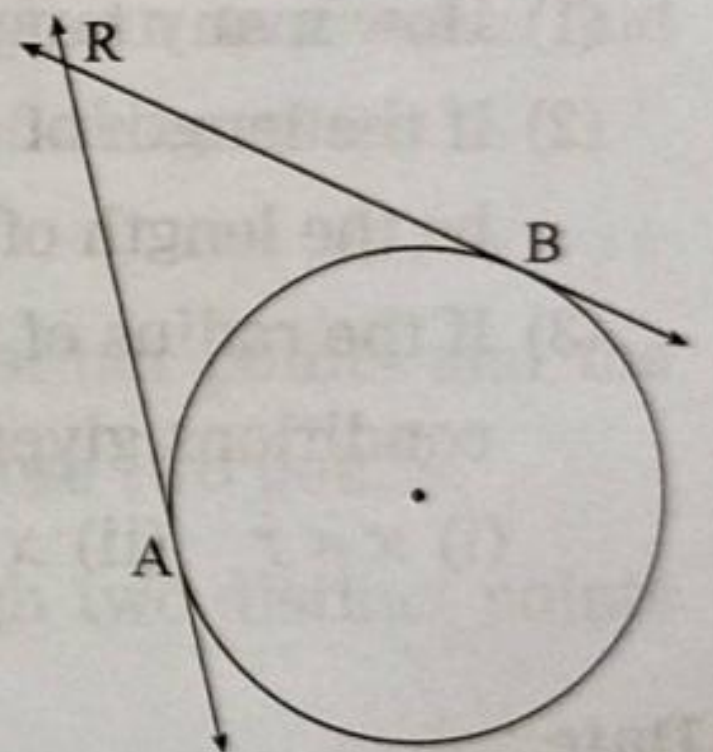
) Mark point R in the exterior of the circle. From this point, check whether we can draw tangent (s) to the circle if possible. Note your observation.

A

rvation table :

Rough figure	Location of point with respect to the circle	Number of tangents that can be drawn
•P	Point P lies in the interior of the circle	Zero (No tangents can be drawn)

Sr. No.	Rough figure	Location of point with respect to the circle	Number of tangents t can be drawn
2.		Point Q lies on the circle	*One*
3.		Point R lies in the exterior of the circle	*Two*

Note : There is no requirement of the actual construction of the tangent. The student may draw tangents rou using the ruler and the pencil.

Conclusion :

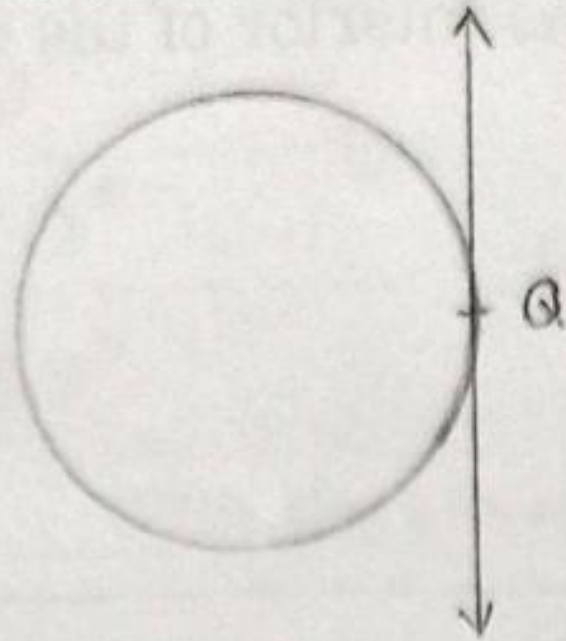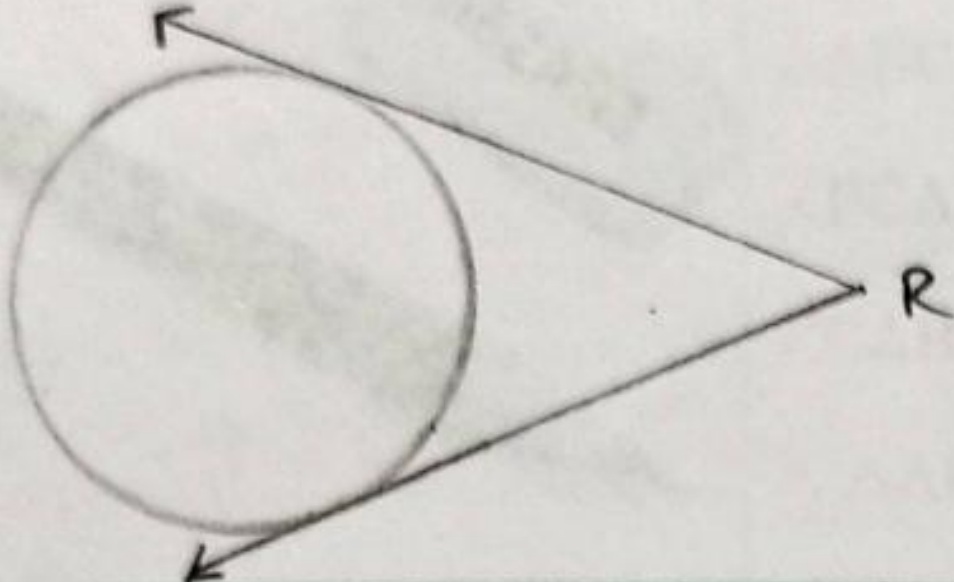(1) From the point in the interior of the circle, *not a single* tangent(s) can be drawn.

(2) From the point on the circle, *One* tangent(s) can be drawn.

(3) From the point outside the circle, *Two* tangent(s) can be drawn.

Learning outcome : The student understands the number of tangents that can be drawn to the circle various points with respect to the circle.

Test your knowledge :

(1) How many tangents can be drawn from an external point to the circle?

(2) If the length of one of the tangent segments from an external point to the circle is 10 cm, what be the length of the other tangent segment from the same point to the circle?

(3) If the radius of the circle is 'r' and the distance of the point from the centre is 'x' then for each conditions given, answer how many tangents can be drawn.

    (i) $x < r$ (ii) $x = r$ (iii) $x > r$.

Date : ----------------   Teacher's Signature : ------------

For Teachers :

(1) The teacher should keep a sheet of the paper ready for the students to perform the practical.

(2) The teacher should ensure that the student has necessary instruments to draw the circle and the tangents.

❖ ❖ ❖

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To show that infinite circles can be drawn passing through two points.

requisite knowledge : Concept of circle and perpendicular bisector theorem.

Materials : A sheet of paper, compass, ruler, pencil and eraser.

For student's activity

Reference figure
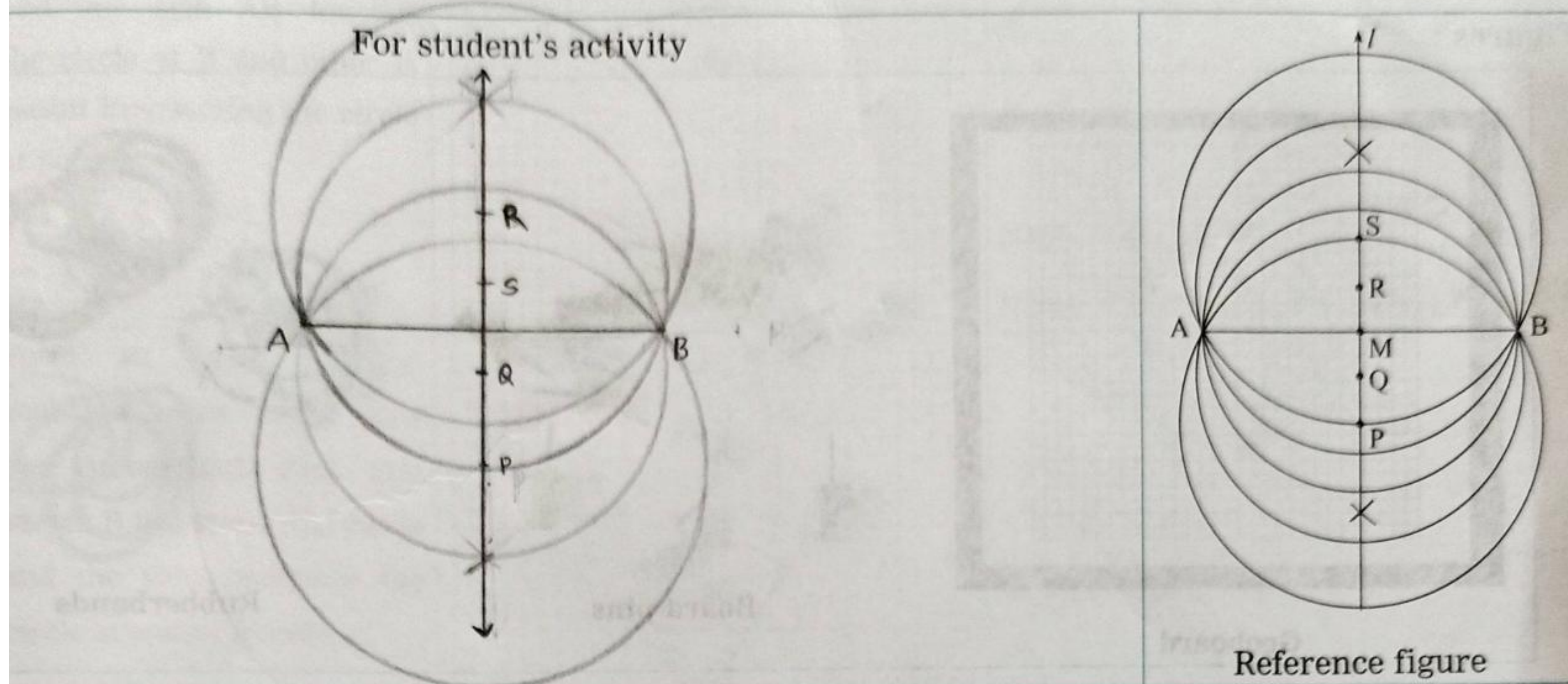
Procedure :

Take any two distinct points say A and B on the given sheet of paper.

Join these points to obtain segment AB.

Construct the perpendicular bisector of seg AB and name it as *l*.

Take any point P on line *l*. With point P as the centre and PA as the radius draw a circle. Verify whether the circle passes through point B. Note your observation.

Similarly, take four different points on the line *l* and draw the circles taking them as centres and passing through point A. Verify whether circles pass through point B. Note your observation.

Think over how many circles can be drawn passing through points A and B.

Conclusion : __Infinite__ circles can be drawn passing through two distinct points and the centres of all these circles lie on __same distance__ of the segment joining those two points.

Learning outcome : The student verifies the number of circles that can pass through two distinct points through practical.

Your knowledge :

How many circles can be drawn passing through two distinct points?

Where do the centres of all the circles lie which pass through two distinct points A and B?

Teacher's Signature : _____

Teachers :

The teacher should keep the sheet of paper ready for the practical.

The teacher should ensure that the student has necessary instruments for the construction.

❖ ❖ ❖

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To understand intercepted arcs by the angle in different situations using geoboard.

quisite knowledge : Concept of circle and an arc of a circle, intercepted arc.

rials : Geoboard, board pins, rubberbands, pencil, scale and eraser.

: Method of preparing geoboard is given at the end of this practical.]

es :
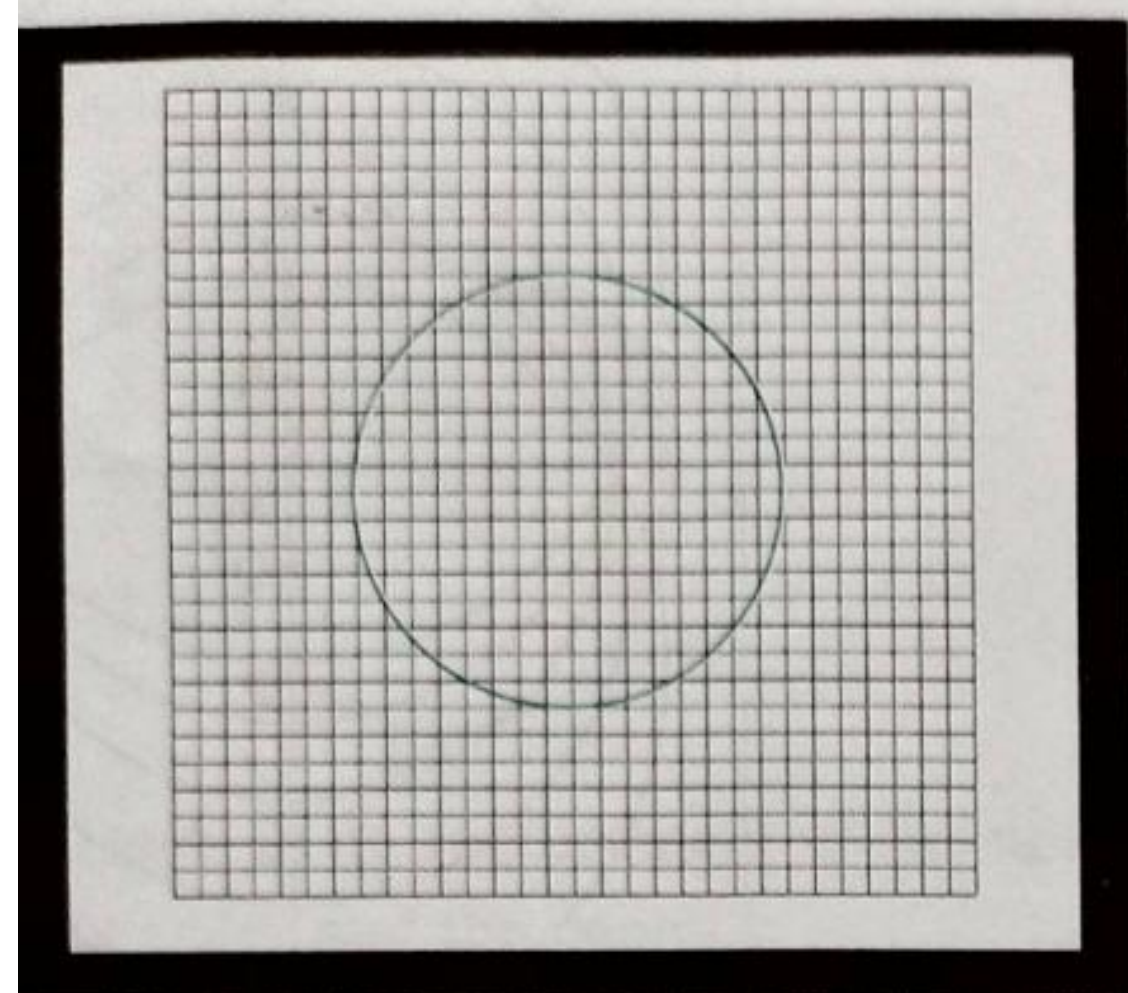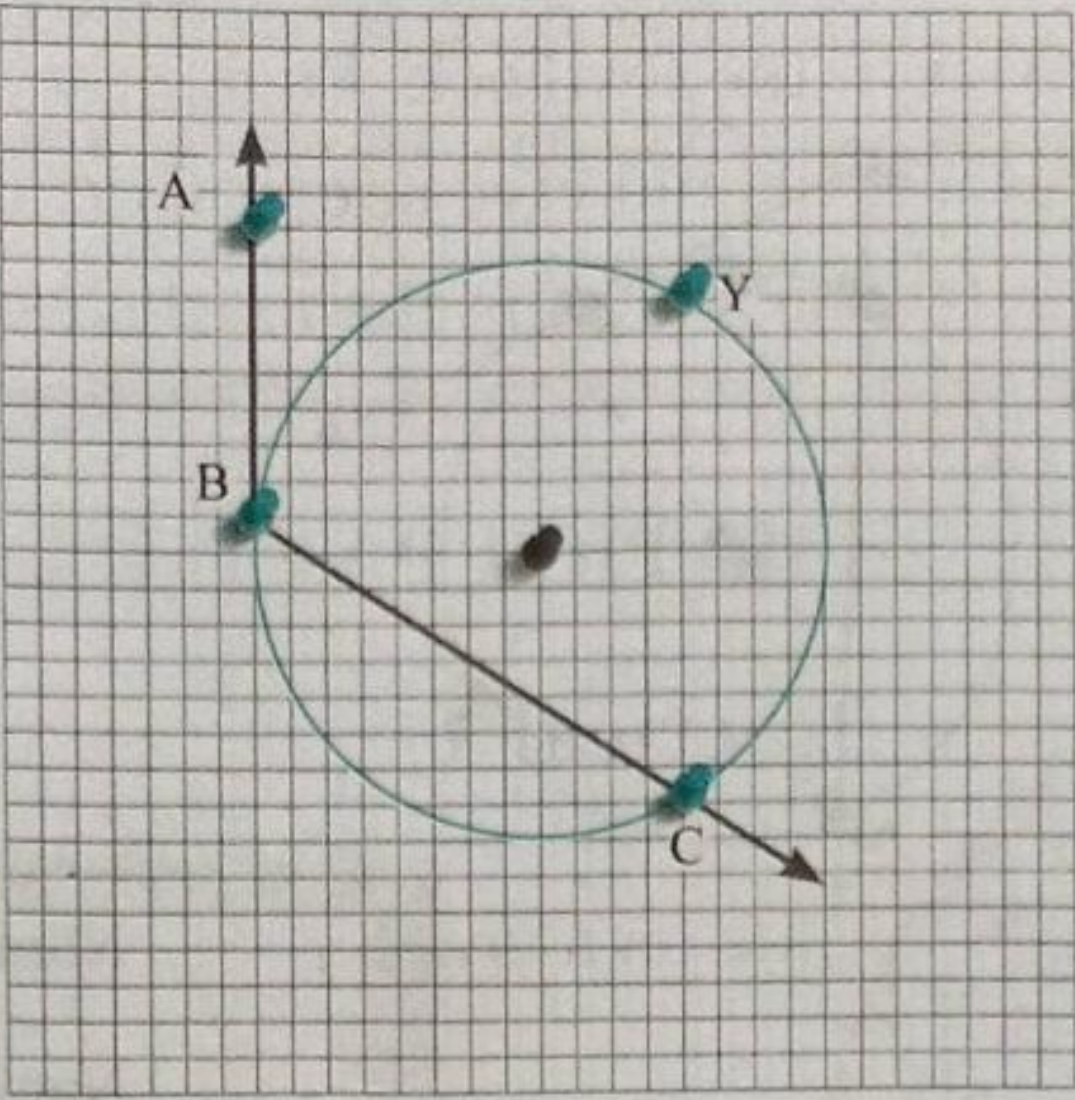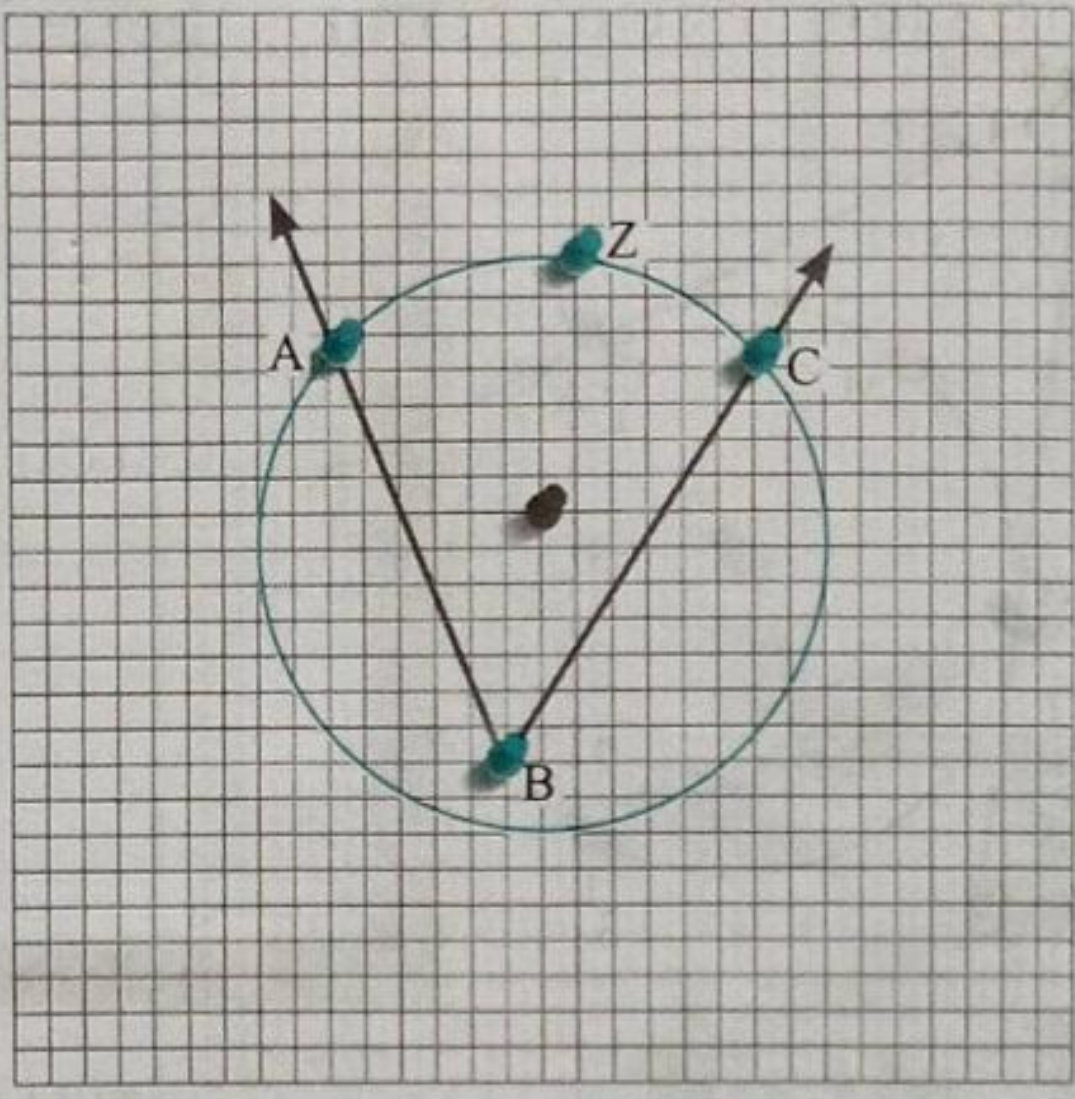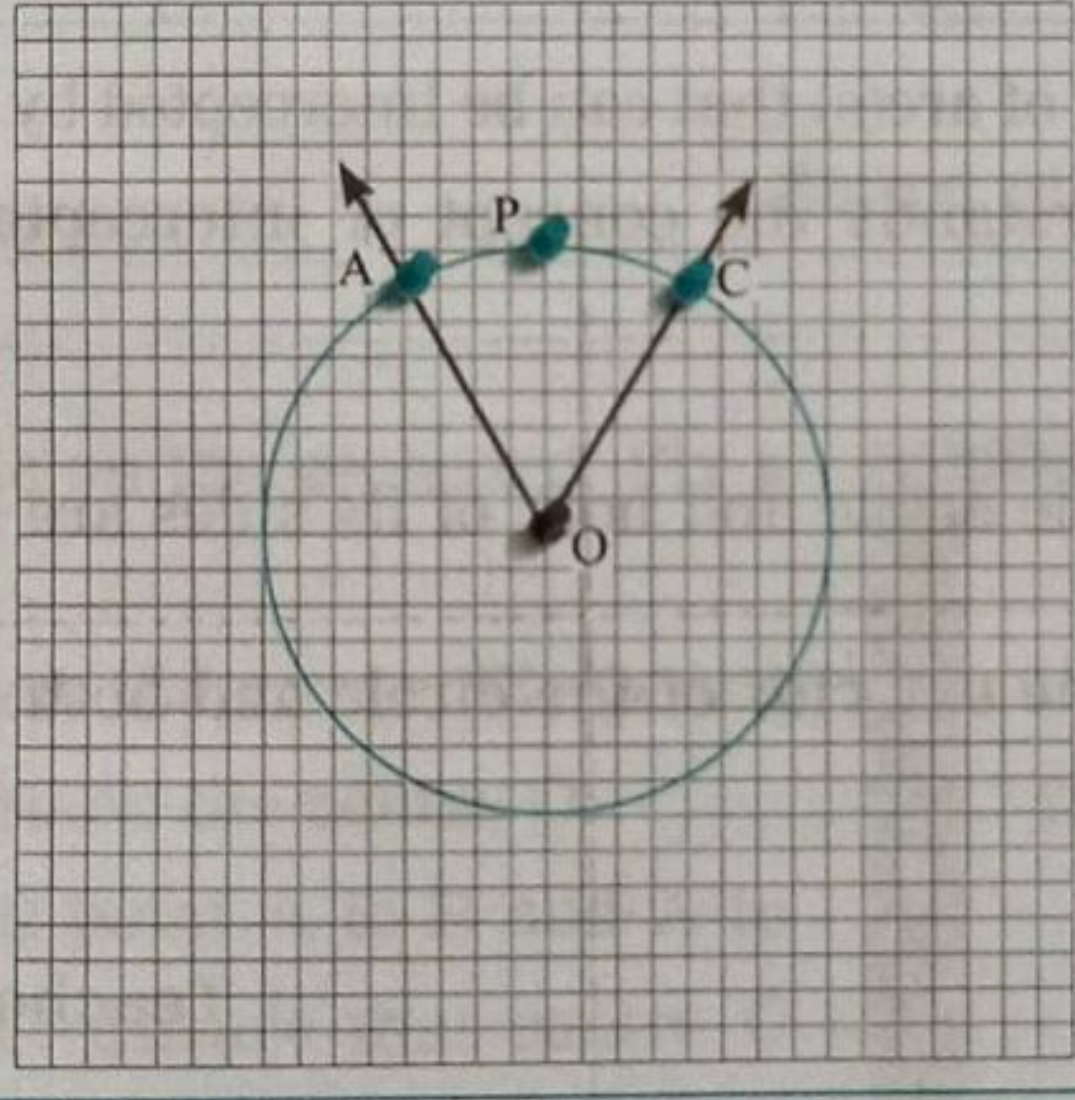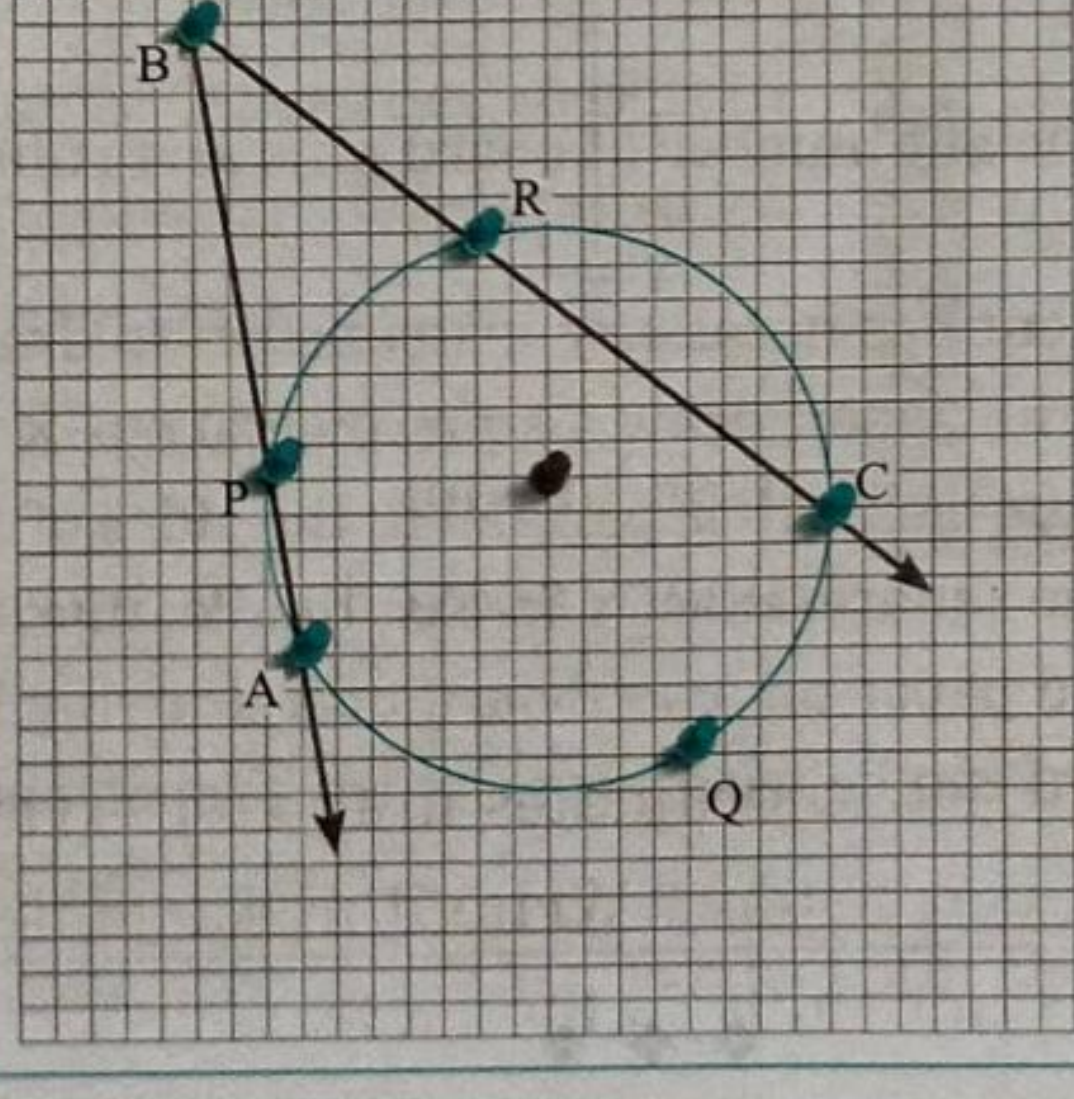
| Geoboard | Board pins | Rubberbands |

edure :

) Take a geoboard with the figure of circle drawn on it.

) Follow the intructions given alongside the observation table, using the board pins and the rubberbands and form the angles on the geoboard. Draw the figure alongside and write the names of the angle and intercepted arc(s).

rvation table :

Instructions	Figure on the geoboard	Student's figure and observation
Form an angle on the geoboard, using board pins and rubberbands such that vertex B lies on the circle and intersects the circle in points A and C.		Name of the angle : $\angle ABC$ Name of the intercepted arc(s) : arc AXC

Instructions	Figure on the geoboard	Student's figure and observation
Form an angle on the geoboard using board pins and rubberbands such that its vertex B lies on the circle and one arm AB touches the circle at B and other is secant intersecting the circle at point C.		Name of the angle : ∠ABC Name of the intercepted arc(s) : arc BYC
Form an angle on the geoboard using board pins and rubberbands such that vertex B lies inside the circle and the sides intersect the circle at points A and C.		Name of the angle : ∠ABC Name of the intercepted arc(s) : AZC
Form an angle on the geoboard using board pins and rubberbands such that the vertex lies on the centre of the circle and the sides of the angle intersect the circle at points A and C.		Name of the angle : ∠AOC Name of the intercepted arc(s) : APC
Form an angle on the geoboard using board pins and rubberbands such that vertex B lies in the exterior of the circle and the two sides are secant intersecting circle at points P, A and R, C.		Name of the angle : ∠ABC Name of the intercepted arc(s) : AQC,PR

Instructions	Figure on the geoboard	Student's figure and observation
Form an angle on the geoboard using board pins and rubberbands such that vertex B lies in the exterior of the circle, side BC touches the circle at C and side BA intersects the circle at points D and A.		Name of the angle : ∠ABC Name of the intercepted arc(s) : ARC, DS
Form an angle on the geoboard using board pins and rubberbands such that vertex B lies in the exterior of the circle, side BC and BA touches the circle at points C and A respectively.		Name of the angle : ∠ABC Name of the intercepted arc(s) : ATC, AMC

...usion : Thus the maximum number of arc(s) that can be intercepted by the angle in various situations is 2.

...ng outcome : The student understands the concept of intercepted arcs by the angle in different ...ations through practical.

...our knowledge :
If the vertex of the angle lies on the circle and both of its sides are secants, then how many arcs will the angle intercept?
If the vertex of the angle lies in the exterior of the circle and both of its sides are secants, then how many arcs will the angle intercept?

Teacher's Signature : _____

...eachers :
...he teachers should keep geoboard, sufficient number of board pins and rubberbands for the student to perform ...e practical.
...he teacher should ensure that the student has necessary instruments to draw the circle and the angles in it.
...w to make a geoboard : (1) On a white paper, draw a square of 30 cm × 30 cm. (2) Construct the horizontal ...vertical lines, at a distance of 1 cm from each other parallel to the sides of square in order to obtain the grid of ...small squares. (3) In the interior of the square, exactly in the middle, mark the centre of the circle and a draw ...rcle of radius 8 cm. (4) Attach the grid paper on a softboard or a drawing board. Thus geoboard is now ready ...e used for practicals. (5) This geoboard can be used to verify the properties of various geometrical figures like ...ngles, quadrilaterals, circles, etc.

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Repeat the same procedure for the cases where the centre lies on the side of ∠BAC and the centre lies n the exterior of ∠BAC. Refer to figures 2 and 3 for proper understanding of the procedure.
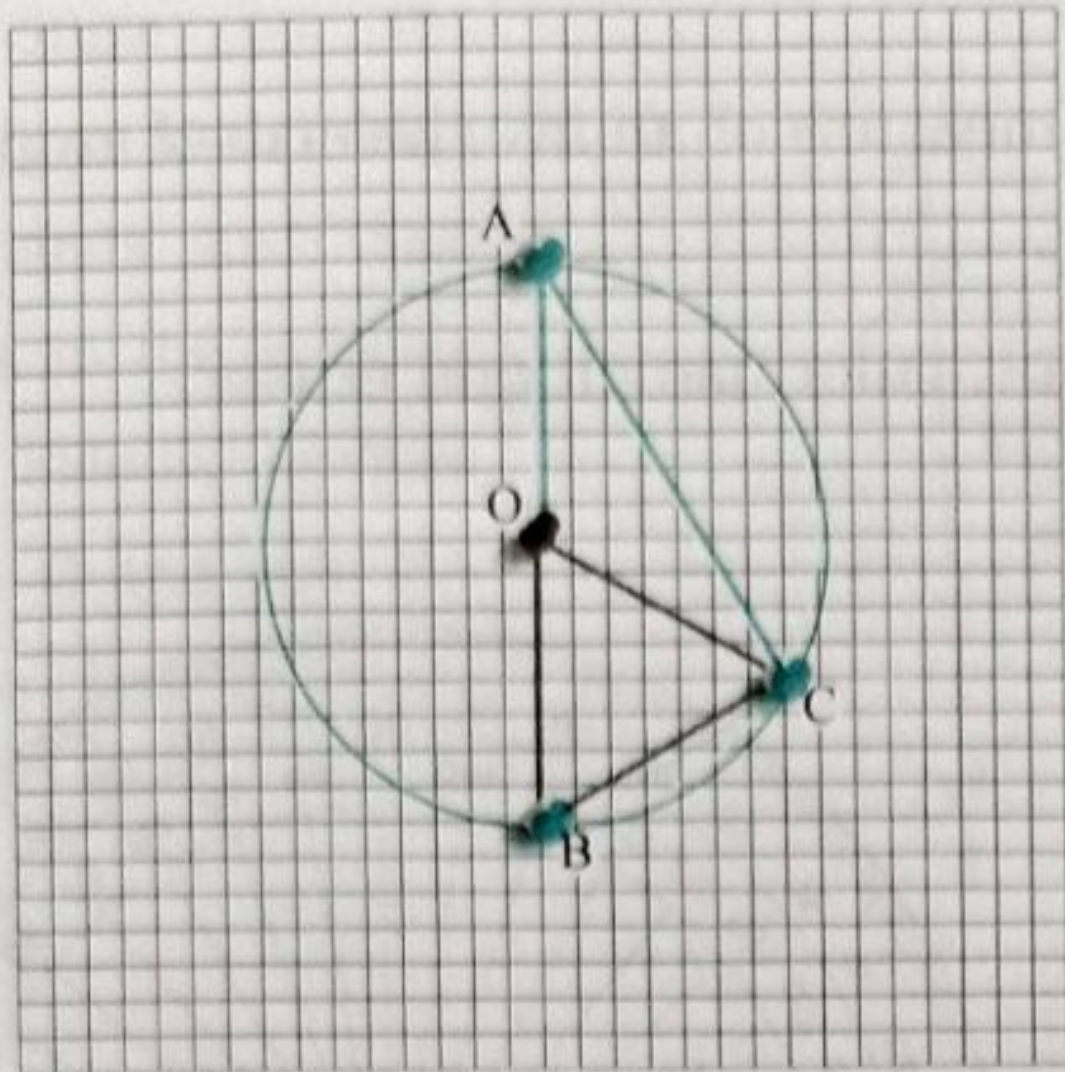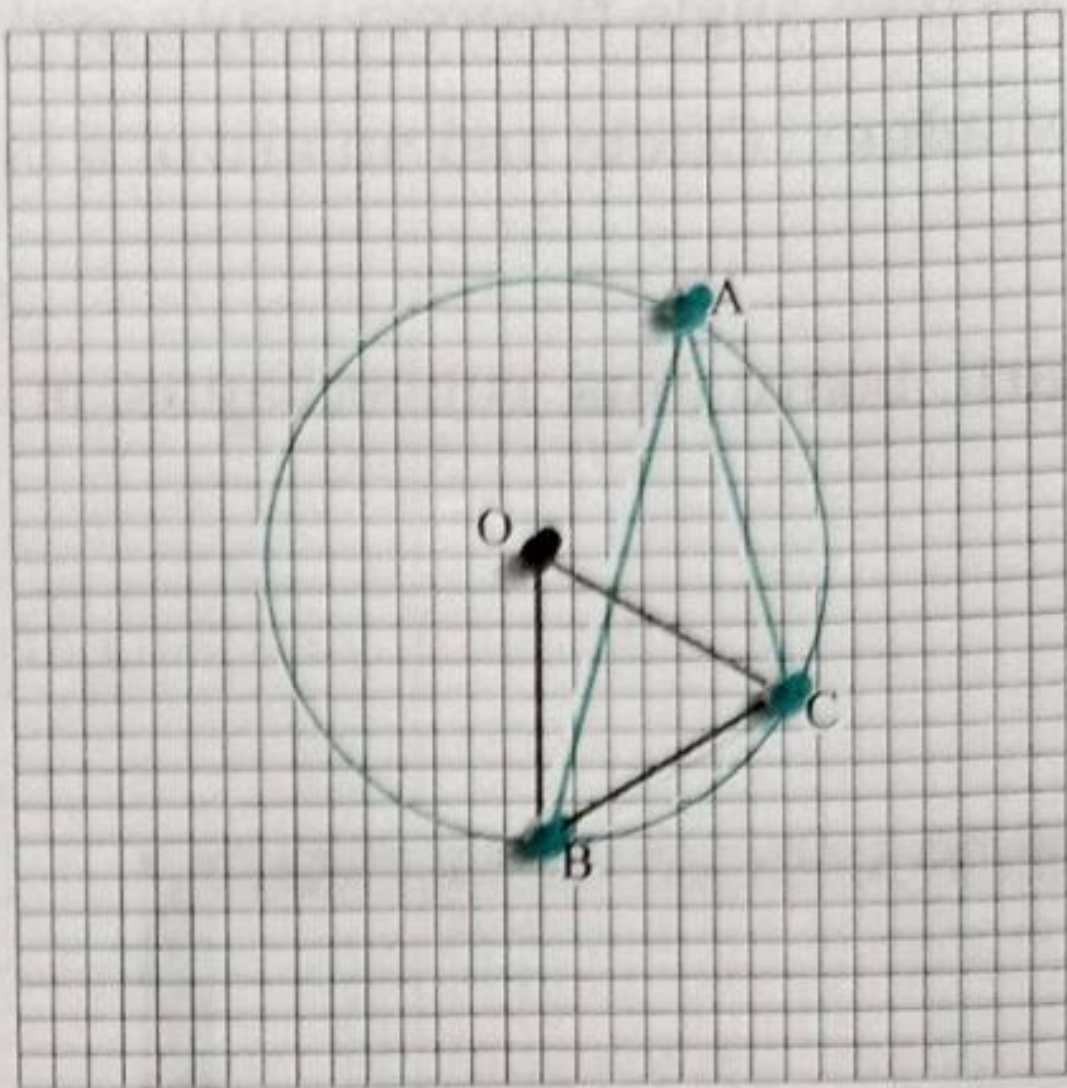
Figure 2   Figure 3

Relate m (arc BC) with measure of ∠BAC in both of the above cases. Write your observation and conclusion.

vation table :

Cases	Measure of ∠BAC	Measure of ∠BOC	m(arc BC)	Relation between m∠BAC and m(arc BC)
: Centre lies in the interior of ∠BAC.	45°	90°	90°	$m∠BAC = \frac{1}{2}m(\overset{\frown}{BC})$
2 : Centre lies on the side of ∠BAC.	30°	60°	60°	$m∠BAC = \frac{1}{2}m(arc\ BC)$
3 : Centre lies in the exterior of ∠BAC.	30°	60°	60°	$m∠BAC = \frac{1}{2}m(arc\ BC)$

lusion : The measure of an inscribed angle is ---------------- the measure of the intercepted arc.

ning outcome :
The student understands the relation between the measure of the inscribed angle and the intercepted arc.
The student understands the inscribed angle theorem through practical verification.

your knowledge :
If the measure of the inscribed angle is 36°, then what would be the measure of its intercepted arc?
If the inscribed angle intercepts semicircle, then identify the type of inscribed angle.

Teacher's Signature :----------------------

: ----------------------

Teachers : The teacher should keep geoboard, sufficient number of board pins, rubberbands and protractor for students to perform the practical.

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1 : Centre O lies in the exterior of ∠BAC.

m∠BAC	m∠AOC	m(arc AC)	Relation between m∠BAC and measure of intercepted arc AC
60°	120°	120°	$m\angle BAC = \frac{1}{2}\, m\,(arc\ AC)$

2 : Centre O lies on the ∠BAC.

m∠BAC	Type of intercepted arc AC. minor arc/semicircle/major arc	m(arc AC)	Relation between m ∠BAC and intercepted arc AC
90°	semicircle	180°	$m\angle BAC = \frac{1}{2}\, m\,(arc\ AC)$

3 : Centre O lies in the interior ∠BAC.

m∠BAC	m∠AOC	m (arc ATC) (x)	m (intercepted arc ADC) = 360° – x	Relation between m ∠BAC and intercepted arc ADC
120°	120°	120°	$m\angle ADC = 360° - x$ $= 360° - 120$ $= 240$	$m\angle BAC = \frac{1}{2} m\,(\overset{\frown}{ADC})$

:lusion : The measure of a tangent secant angle is ----------------- **Half** ----------------- the measure of the
Itercepted arc.

:ning outcome :

) The student understands the relation between the measure of the tangent secant angle and the
   intercepted arc.

:) The student understands the tangent secant theorem through practical verification.

your knowledge :

) If the measure of the arc intercepted by tangent secant angle is 150°, then what would be the measure
   of tangent secant angle?

:) It the measure of the tangent secant angle is 90°, then where does the centre lie with respect to tangent
   secant angle?

: **Teacher's Signature :** -----------------

r **Teachers :** The teacher should keep geoboard, sufficient number of board pins, rubberbands and protractor for
: student to conduct the practical.

❖ ❖ ❖

: To draw an angle and divide it into four equal parts using compass and ruler.

requisite knowledge : To draw angles of different measures. Draw bisector of the angle.

erials : Paper, protractor, compass, scale, pencil and eraser.

ures :

For student's activity
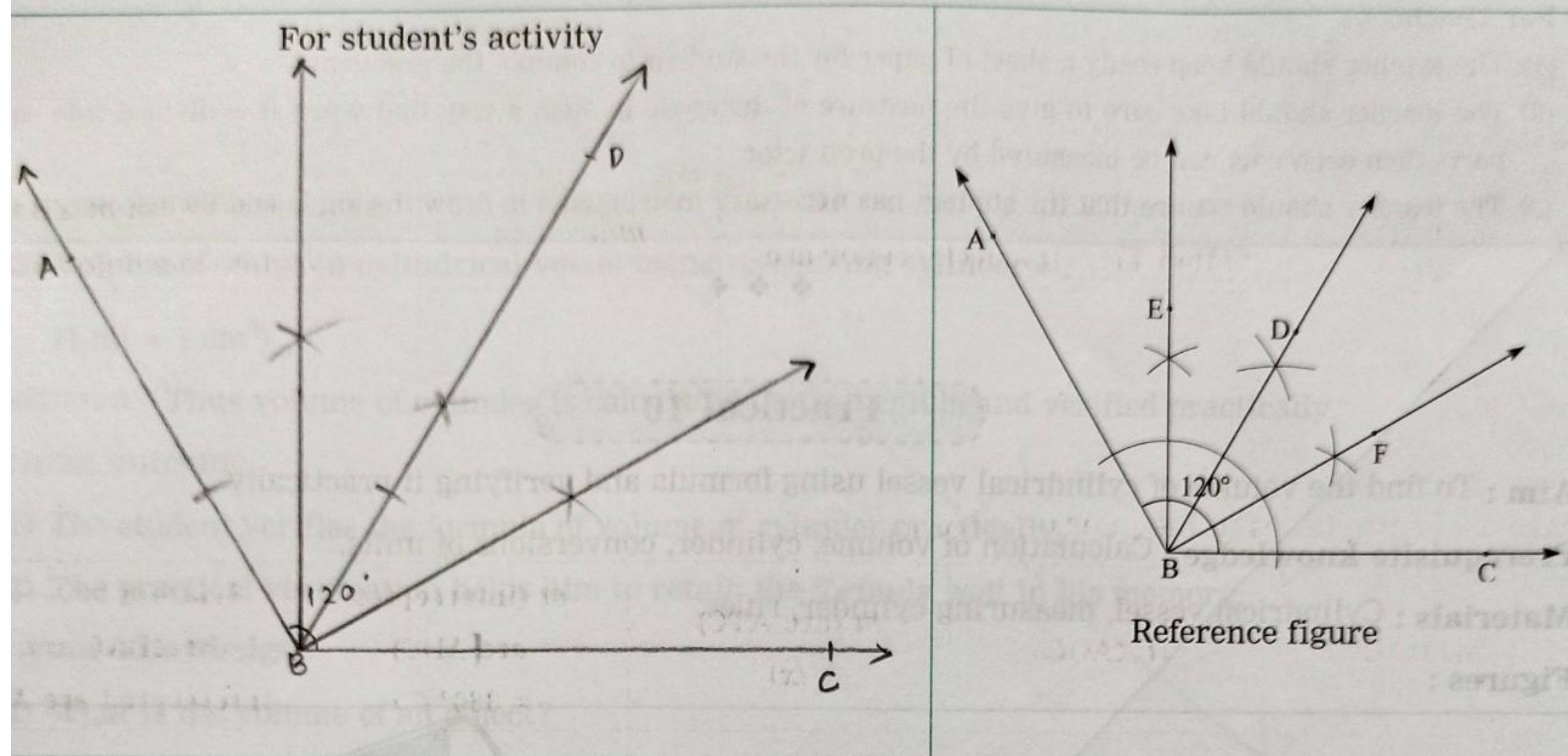
Reference figure

cedure :

) Draw an angle of the given measure by the teacher using the protractor.

) Name the angle as ABC [in reference figure, $m\angle ABC = 120°$]

) Construct ray BD as the bisector of $\angle ABC$ thus dividing $\angle ABC$ into two equal parts $\angle ABD$ and $\angle DBC$.

) Construct ray BE as the bisector of $\angle ABD$ thus dividing $\angle ABD$ into two equal parts $\angle ABE$ and $\angle EBD$.

) Construct ray BF as the bisector of $\angle DBC$ thus dividing $\angle DBC$ into two equal parts $\angle DBF$ and $\angle FBC$.

) Using protractor, find the measures of $\angle ABE$, $\angle EBD$, $\angle DBF$ and $\angle FBC$. Verify whether they have the same measures or not. Note your observations.

ervation table :

m∠ABC	m∠ABE (x)	m∠EBD (y)	m∠DBF (z)	m∠FBC (t)	Is x = y = z = t ?
120°	30°	30°	30°	30°	x = y = z = t = 30°

clusion : Using the compass and ruler, the given angle can be divided into given number of equal parts.

rning outcome : The student understands to divide the angle into equal parts using compass and ruler.

Test your knowledge :

(1) If ∠ABC is divided into eight equal parts and measure of each part is 20°, then what is m∠A

(2) If ∠ABC = 80° and is divided into 8 equal parts, then what is the measure of each part?

Date : ·························   Teacher's Signature : ···········

For Teachers :

(1) The teacher should keep ready a sheet of paper for the student to conduct the practical.

(2) The teacher should take care to give the measure of the angle in such a way that when it is divided int parts then each part can be measured by the protractor.

(3) The teacher should ensure that the student has necessary instruments to draw the angle and its bisector

❖ ❖ ❖

Practical 10

Aim : To find the volume of cylindrical vessel using formula and verifying it practically.

Prerequisite knowledge : Calculation of volume, cylinder, conversions of units.

Materials : Cylindrical vessel, measuring cylinder, ruler.

Figures :
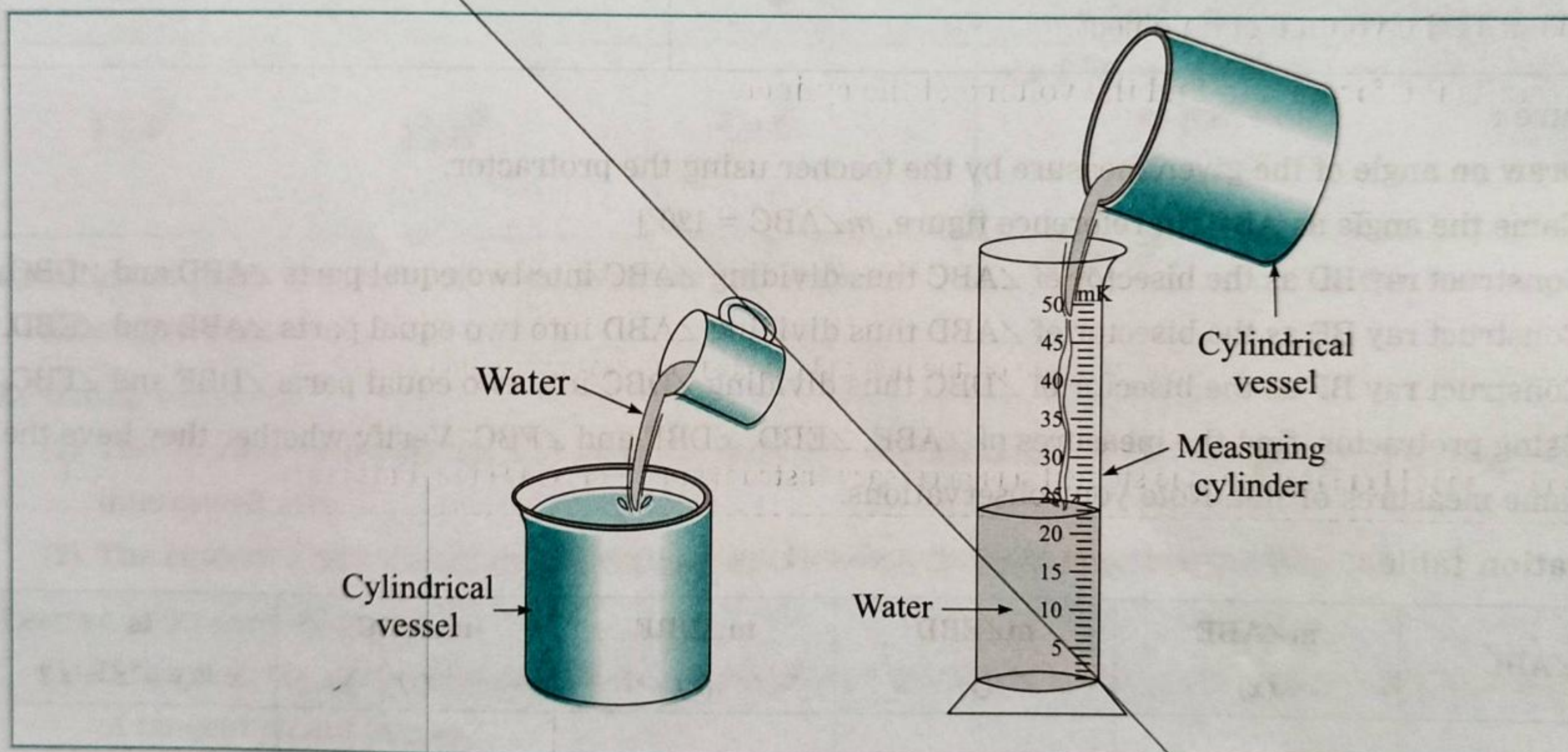
Procedure :

(1) Take the cylindrical vessel. Measure its radius and the height. Note the dimensions.

(2) Calculate its volume using the formula $\pi r^2 h$. You can take $\pi = \dfrac{22}{7}$ or 3.14 and get the appro answer.

(3) Fill this vessel with water completely to the brim.

(4) Pour this water carefully into measuring cylinder and note the value. [If measuring cylinde answer in litres, you can make necessary conversions.]

(5) Fill in the observations.

ation :

Radius of the cylindrical vessel (.....R.....) = ...2 cm.....

Height of the cylindrical vessel (.....H.....) = ...7 cm.....

Volume of the cylindrical vessel = ...$\pi R^2 H$.....

$$= \frac{22}{7} \times (2)^2 \times 7$$

$$= 22 \times 4$$

$$= 44 \text{ cm}^3$$

$$= 44 \text{ mL}$$

Volume of water in cylindrical vessel using measuring cylinder = ...44 mL.....

(1 ml = 1 cm³)

sion : Thus volume of cylinder is calculated using formula and verified practically.

ing outcome :

The student verifies the formula of volume of cylinder practically.

The practical verification helps him to retain the formula well in his memory.

our knowledge :

What is the volume of an object?

What is the formula to find the volume of the cylinder?

Teacher's Signature : .....

Teachers :

Teacher should keep the cylinder whose volume has to be measured, water and measuring cylinder ready for the student.

Teacher should ensure that the student has necessary instruments to measure the dimensions of the cylinder.

❖ ❖ ❖

Aim : To find the volume of the paper cup of the shape of the frustum of a cone and verifying

practical.

Prerequisite knowledge : Frustum of the cone, volume, conversion of units.

Materials : Paper cup of the shape of the frustum, measuring cylinder and water.

Figures :

(Frustum-shaped paper cup)

Water — Paper cup

Measuring cylinder

Water
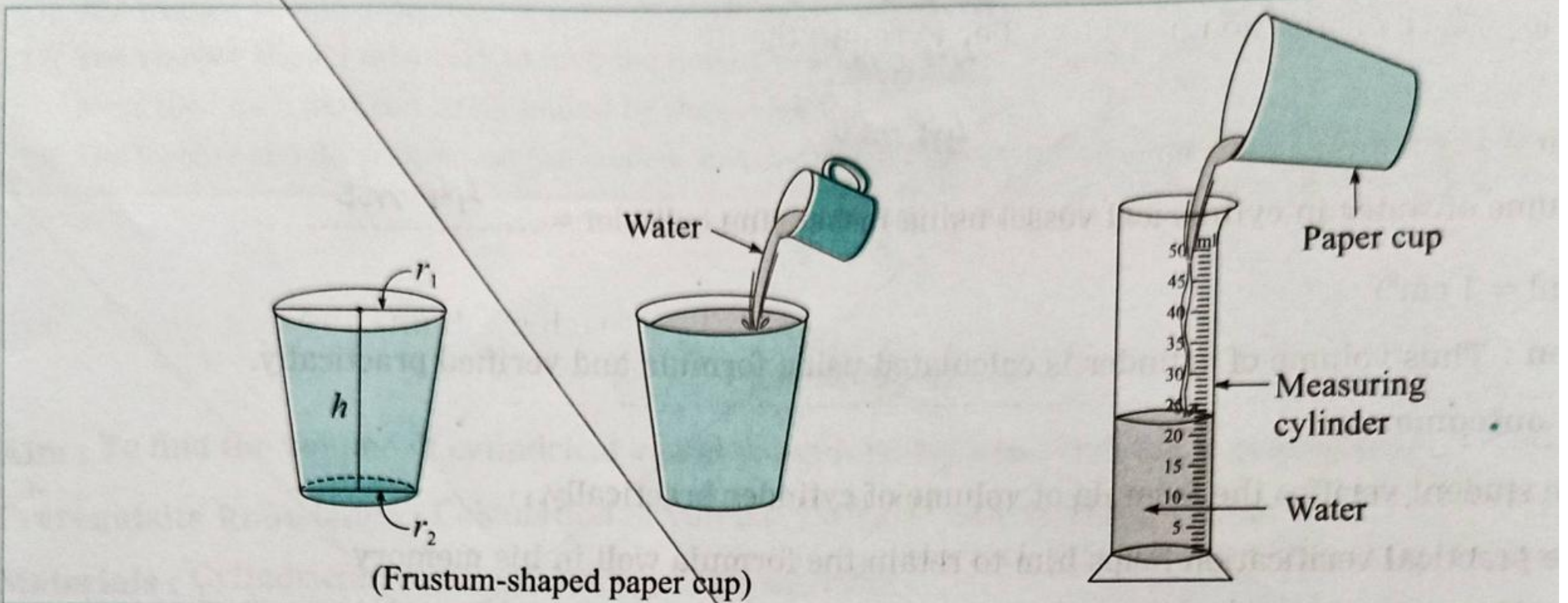
Procedure :

(1) Take a paper cup of the shape of the frustum of a cone. Obtain its dimensions like the radi
height.

(2) Calculate the volume of the cup using the formula $\frac{1}{3} \pi h (r_1^2 + r_2^2 + r_1 \times r_2)$. You can take $\pi =$
and get the approximate answer.

(3) Fill the cup with water to the brim.

(4) Pour this water carefully into measuring cylinder and note the value. [If measuring cylinder
answer in litres or ml, you can make necessary conversions.]

(5) Note your observations.

Observation table :

Radii of the circular surface of the cup	$r_1 =$ 1.5 cm $r_2 =$ 3 cm
Height of the cup	$h =$ 7 cm
Volume of the cup using the formula	$\frac{1}{3} \pi h (r_1^2 + r_2^2 + r_1 \times r_2)$ = 115.5 cm³
Volume of water in cup using measuring cylinder.	= 115.5 mL $\begin{bmatrix} 1 \text{ ml} = 1 \text{ cm}^3 \text{ and} \\ 1 \text{ litre} = 1000 \text{ cm}^3 \end{bmatrix}$

sion : The volume of the frustum-shaped cup is calculated using formula and verified through tical.

Students, please note that the volume of the frustum shaped cup using formula and by using measuring ader may not be exactly the same. These values will be nearly equal. This difference is neglected and nissible as it is an experimental error.

ng outcome :

The student verifies the formula of the volume of the frustum of cone through practical.

The practical verification helps him/her to retain the formula well in his/her memory.

ur knowledge :

What is the volume of an object?

What is the formula to find the volume of the frustum of the cone?

.... **Teacher's Signature :** ....

Teachers :

The teacher should keep the paper cup of the shape of the frustum of a cone whose volume has to be measured, ater and measuring cylinder ready for the students.

The teacher should ensure that the student has necessary instruments to measure the dimensions of the cylinder.

❖ ❖ ❖

MARKSHEET FOR THE PRACTICALS

Mathematics Std. X	Mathematics Part–I	Mathematics Part–II	Total Marks (Parts–I & II)	Converted Marks
Total Marks	10	10	20	10
Marks obtained				

Teacher's Signature : ....

For Teacher :
- The students who are unable to give practical exam, may opt for MCQ test.
- 1 test each in Mathematics Part–I and Mathematics Part–II to be taken.
- Each test will be of 10 marks.
- $10 \times 2 = 20$ marks to be converted into 10 marks.

MATHEMATICS PART–I

Test 1

- Choose the correct alternative from each of the following questions and write the answer letter in the box :

1. For simultaneous equations in x and y, if $D_x = 25$, $D_y = 50$, $D = 5$, then what is the value of x?

   (A) -5 (B) $\dfrac{1}{5}$ (C) 10   (D) 5   **D**

2. For simultaneous equations in x and y, if $D = 30$, $D_x = -18$, $D_y = -12$, then what is the value of y?

   (A) $-\dfrac{3}{5}$ (B) $\dfrac{3}{5}$ (C) $-\dfrac{2}{5}$ (D) $\dfrac{2}{5}$ **C**

3. Which of the following is a quadratic equation?

   (A) $11 = 5x^2 + x^3$ (B) $\dfrac{3y}{4} = \dfrac{2}{y} + 7$ (C) $4x^2 + 3\sqrt{x} - 2 = 0$ (D) $y(y+2) = y^2 + 3y$ **B**

4. What is the value of the discriminant for $25x^2 - 15x + \dfrac{9}{4} = 0$?

   (A) 225   (B) 450   (C) 0   (D) -225 **C**

5. Which of the following is the sum of the first 20 natural numbers?

   (A) 200   (B) 400   (C) 420   (D) 210   **D**

6. If for an A.P. $d = 10$, what is the value of $t_6 - t_2$?

   (A) 10   (B) 20   (C) 30   (D) 40   **D**

7. The rate of GST on bread is _____ .

   (A) 5%   (B) 12%   (C) 0%   (D) 18%   **C**

8. If a share is at a premium, then

   (A) MV > FV   (B) MV < FV   (C) MV = FV   (D) MV ⩽ FV   **A**

9. Which of the following cannot represent probability?

   (A) $\dfrac{3}{2}$ (B) $\dfrac{2}{3}$ (C) $\dfrac{5}{6}$ (D) $\dfrac{2}{5}$ **A**

10. A card is drawn at random from a well-shuffled pack of 52 cards. What is the probability of getting a king?

    (A) $\dfrac{1}{13}$ (B) $\dfrac{2}{13}$ (C) $\dfrac{3}{13}$ (D) $\dfrac{4}{13}$ **A**

• Choose the correct alternative from each of the following questions and write the answer letter in the box :

1. What is the value of the determinant $\begin{vmatrix} 7 & 31 \\ -1 & -5 \end{vmatrix}$?

   (A) 66   (B) −66   (C) 4   (D) −4   [D]

2. For drawing the graph of $2x + 5y = 16$, if $x = 3$, what is the value of y?

   (A) 2   (B) −2   (C) $\dfrac{1}{2}$ (D) $-\dfrac{1}{2}$ [A]

3. What is the nature of the roots of the quadratic equation $4x^2 - 8x + 9 = 0$?

   (A) Real   (B) Not real   (C) Real and equal   (D) Real and unequal   [B]

4. If one of the roots of the quadratic equation $kx^2 + 2x - 8 = 0$ is −2, then what is the value of k?

   (A) 1   (B) 2   (C) 3   (D) 4   [C]

5. For an A.P., if $t_n = 24$, $n = 12$, $d = 2$, then what is the value of a?

   (A) 2   (B) 1   (C) 12   (D) 24   [A]

6. What is the common difference of the A.P. 307, 323, 339, ... ?

   (A) 30   (B) −16   (C) 16   (D) −30   [C]

7. The rate of GST on stainless steel is 18%. What is the share of the state government?

   (A) 18%   (B) 12%   (C) 36%   (D) 9%   [D]

8. What is the amount of dividend received per share of face value ₹ 100, if dividend declared is 25% ?

   (A) ₹ 125   (B) ₹ 25   (C) ₹ 2.50   (D) ₹ 0.25   [B]

9. A die is rolled. What is the probability of getting a prime number on the upper face?

   (A) $\dfrac{1}{4}$ (B) $\dfrac{1}{2}$ (C) $\dfrac{1}{3}$ (D) $\dfrac{3}{4}$ [B]

10. If $P(B) = \dfrac{3}{13}$ and $n(S) = 52$, then $n(B) = ?$

    (A) 13   (B) 3   (C) $\dfrac{13}{3}$ (D) 12   [D]

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• **Choose the correct alternative from each of the following questions and write the answer letter in the box :**

1. What is the value of D for solving the simultaneous equations $3x - 2y = 4$ and $x + y = 3$ by Cramer's rule?

   (A) 5   (B) -5 (C) -1 (D) 1   `A`

2. What is the value of k, if the roots of $kx^2 + 24x + 16 = 0$ are real and equal?

   (A) 9   (B) -9 (C) 25   (D) -25 `A`

3. For an A.P., the first two terms are 100, 105. What is t_{16}?

   (A) 165   (B) 170   (C) 175   (D) 180   `C`

4. How many alpha numerals are there in GSTIN of a registered dealer?

   (A) 15   (B) 10   (C) 16   (D) 9   `A`

5. What is the market value of a share with face value ₹ 10 at a discount of ₹ 2?

   (A) ₹ 2   (B) ₹ 8   (C) ₹ 12   (D) ₹ 10   `B`

6. What is the probability of the event that a number chosen from 1 to 50 is an odd number?

   (A) 20%   (B) 40%   (C) 50%   (D) 60%   `C`

7. What is the class mark of the class 100–190?

   (A) 45   (B) 90   (C) 145   (D) 190   `C`

8. What is the degree of the determinant $\begin{vmatrix} p & q \\ r & s \end{vmatrix}$?

   (A) 1   (B) 3   (C) 4   (D) 2   `D`

9. If one root of the quadratic equation is $3 - 2\sqrt{5}$, what is the other root?

   (A) $2 + 3\sqrt{5}$ (B) $3 - 2\sqrt{5}$ (C) $3 + 2\sqrt{5}$ (D) $2 - 3\sqrt{5}$ `C`

10. If two-digit numbers are formed using the digits 0, 1, 2, 3, 4 without repetition of the digits, then what is $n(S) = ?$

   (A) 14   (B) 16   (C) 18   (D) 20   `B`

MATHEMATICS PART–II

Test 1

- **Choose the correct alternative from each of the following questions and write the answer letter in the box :**

1. The sides of two similar triangles are in the ratio 5 : 7, then find the ratio of their areas.

   (A) 25 : 49   (B) 49 : 25   (C) 5 : 7   (D) 7 : 5 $\boxed{A}$

2. If $\sec\theta = \dfrac{25}{7}$, then what is the value of $\tan\theta$?

   (A) $\dfrac{7}{25}$ (B) $\dfrac{25}{24}$ (C) $\dfrac{7}{24}$ (D) $\dfrac{24}{7}$ $\boxed{D}$

3. The radius of a cone is 7 cm and height is 24 cm. What is its curved surface area?

   (A) 440 cm²   (B) 550 cm²   (C) 330 cm²   (D) 110 cm² $\boxed{B}$

4. How many tangents can be drawn to a circle from a point on the circle?

   (A) 3   (B) 2   (C) 1   (D) infinite $\boxed{C}$

5. If the side of a square is 10 cm, then what is the length of its diagonal?

   (A) $10\sqrt{3}$ cm   (B) $10\sqrt{2}$ cm   (C) 10 cm   (D) $5\sqrt{2}$ cm $\boxed{B}$

6. How many circles can pass through one point?

   (A) one   (B) two   (C) three   (D) infinite $\boxed{D}$

7. If $\triangle ABC \sim \triangle DEF$ and $\angle A = 45°$, $\angle E = 87°$, then $\angle C =$ ....

   (A) 45°   (B) 87°   (C) 48°   (D) 90° $\boxed{C}$

8. Distance of a point $(-3, 4)$ from the origin is ....

   (A) 7   (B) 1   (C) 5   (D) 4 $\boxed{C}$

9. The measure of an arc of the circle is 36° and its length is 10 cm, then its circumference is ....

   (A) 100 cm   (B) 36 cm   (C) 360 cm   (D) 10 cm $\boxed{A}$

10. Distance between two points $P(-1, 1)$ and $Q(5, -7)$ is ....

    (A) 11   (B) 10   (C) 5   (D) 7 $\boxed{B}$

• **Choose the correct alternative from each of the following questions and write the answer lette**

in the box :

1. Which of the following is not the test of similarity?

   (A) AAA test   (B) SAS test   (C) SAA test   (D) SSS test   `B`

2. In $\triangle$LMN, LM = 10 cm, $\angle$LNM = 90° and $\angle$LMN = 30°, then NM = ?

   (A) $5\sqrt{2}$ cm   (B) 5 cm   (C) $10\sqrt{3}$ cm   (D) $5\sqrt{3}$ cm   `D`

3. $\angle$ACB is inscribed in arc ACB of a circle with centre O. If $\angle$ACB = 65°, then m (arc ACB) = ?

   (A) 65°   (B) 130°   (C) 295°   (D) 230°   `D`

4. Seg AB is parallel to the X-axis and the coordinates of point A are (1, 3), then the coordinates

   of point B are ....

   (A) (3, 1)   (B) (5, 3)   (C) (3, 0)   (D) (1, −3)   `B`

5. If $\sin\theta = \dfrac{15}{17}$, then what is the value of $\tan\theta$?

   (A) $\dfrac{8}{17}$ (B) $\dfrac{15}{8}$ (C) $\dfrac{17}{15}$ (D) $\dfrac{9}{17}$ `B`

6. In a cyclic $\square$ ABCD, twice the measure of $\angle$A is thrice the measure of $\angle$C, then what is the

   measure of $\angle$C?

   (A) 36°   (B) 72°   (C) 90°   (D) 108°   `A`

7. Side of an equilateral $\triangle$PQR is 8 cm, then what is its height?

   (A) $2\sqrt{3}$ cm   (B) $4\sqrt{8}$ cm   (C) $8\sqrt{4}$ cm   (D) $4\sqrt{3}$ cm   `D`

8. Slope of X-axis is ....

   (A) 1   (B) 0   (C) −1   (D) cannot be defined   `B`

9. Area of a circle is 314 cm². If the area of a major sector is 214 cm², then what is the area of the

   corresponding minor sector?

   (A) 314 cm²   (B) 100 cm²   (C) 114 cm²   (D) 214 cm²   `B`

10. If $\sin\theta = \cos\theta$, then θ = ?

    (A) 45°   (B) 90°   (C) 0°   (D) 30°   `A`

Choose the correct alternative from each of the following questions and write the answer letter in the box :

1. In △ABC, seg AD is bisector of ∠BAC, B–D–C. AB=8 cm, BD=6 cm and DC=3 cm, then the length of seg AC is ....

   (A) 4 cm   (B) 3 cm   (C) 6 cm   (D) 8 cm   `A`

2. The measure of an arc of the circle is 60°, then the measure of its corresponding arc is ....

   (A) 60°   (B) 120°   (C) 30°   (D) 300°   `D`

3. Area of seg = ... $\times \pi r^2 - \dfrac{1}{2} r^2 \sin\theta$.

   (A) $\dfrac{\theta}{180}$ (B) θ (C) $\dfrac{\theta}{360}$ (D) $\dfrac{360}{\theta}$ `C`

4. Line P is parallel to Y-axis. Which of the following statements is true for line P?

   (A) slope of zero   (B) slope cannot be defined

   (C) slope is positive   (D) slope is negative   `B`

5. What is the value of $(1 - \cos^2\theta)\cdot\operatorname{cosec}^2\theta$?

   (A) −1   (B) −2   (C) 1   (D) $\dfrac{1}{2}$ `C`

6. How many circles can pass through three non-collinear points?

   (A) 1   (B) 0   (C) 2   (D) 3   `A`

7. For a cuboid, $l^2 + b^2 + h^2 = 484$ cm², then what is the length of its diagonal?

   (A) 12 cm   (B) 11 cm   (C) 24 cm   (D) 22 cm   `D`

8. A (2, 4) and B (m, 6). The slope of line AB is 2, then what is the value of m?

   (A) −3   (B) 3   (C) 2   (D) $\dfrac{2}{3}$ `B`

9. The area of two similar triangles are 9 cm² and 16 cm², then the ratio of its corresponding heights is ....

   (A) 9 : 16   (B) 3 : 4   (C) 4 : 3   (D) 16 : 9   `B`

10. If $\sin\theta = \dfrac{20}{29}$, then $\cos\theta = ?$

    (A) $\dfrac{21}{20}$ (B) $\dfrac{20}{21}$ (C) $\dfrac{29}{21}$ (D) $\dfrac{21}{29}$ `D`

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Internal Evaluation : Student's Details

Internal Evaluation of MATHEMATICS Std. X

Name of the Student : ....

Name of the School : ....

Std. : ....X........   Division : ....   Roll No. : ....

Academic Year : 20...... to 20......

Centre no. : ....

S.S.C. Seat no. [ ][ ][ ][ ][ ][ ]

Seat no. in words : ....

....

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(Signature of the Subject Teacher)   (Signature of Student)

Internal Evaluation : Final Marksheet

Total Marks : 20

	(A) Home Assignment	(B) Practical Examination OR MCQ Examination	Total Marks (A) + (B)
Maximum Marks	10	10	20
Marks Obtained			

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(Signature of the Examiner)   (Principal's Signature with Stamp)

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CERTIFICATE

Board's Examination Number

This is to certify that the Activities and Practicals

in this Internal Evaluation Handbook have been satisfactorily

performed by

Kumar/Kumari ....

Standard : ...X...   Division : ...A...   Roll No. : ....

during the academic year 20.20.... – 20.21.....

He/she is a bonafide candidate appearing for

S.S.C. Examination of Maharashtra Board.

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Mathematics Teacher   **Headmaster**

(Signature with date)   (Signature with stamp)