Class IX

Subject : Mathematics

Chapter : 1

Topic : Number System

1. P.K. Testing :-

What are Rational Numbers, Explain all Laws of Exponents and Powers.

2. Vocabulary :-

Natural numbers, whole numbers, Integers, Rational No's, Irrational Numbers, Real Numbers

3. Important Spellings :-

Irrational Numbers, Rationalise, Recurring Decimal.

4. AIDS

Review Questions given by the teacher.

Charts representing square roots and real no's on Number line. Presentation on the operations

of various properties on real no's, the identities of square roots and the laws of exponents.

5. Procedure :-

(i) Defining Irrational no's, Real No's with the help f various examples.

(ii) Decimal expansion of Real no's in P/q form

(iii) Representation of Real Numbers on no line.

(iv) Operations on real no's.

(v) Square root of a real no on the No line.

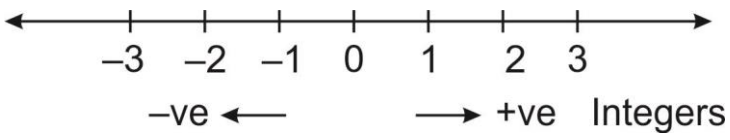
(vi) Rationalising Denominator of irrational no's

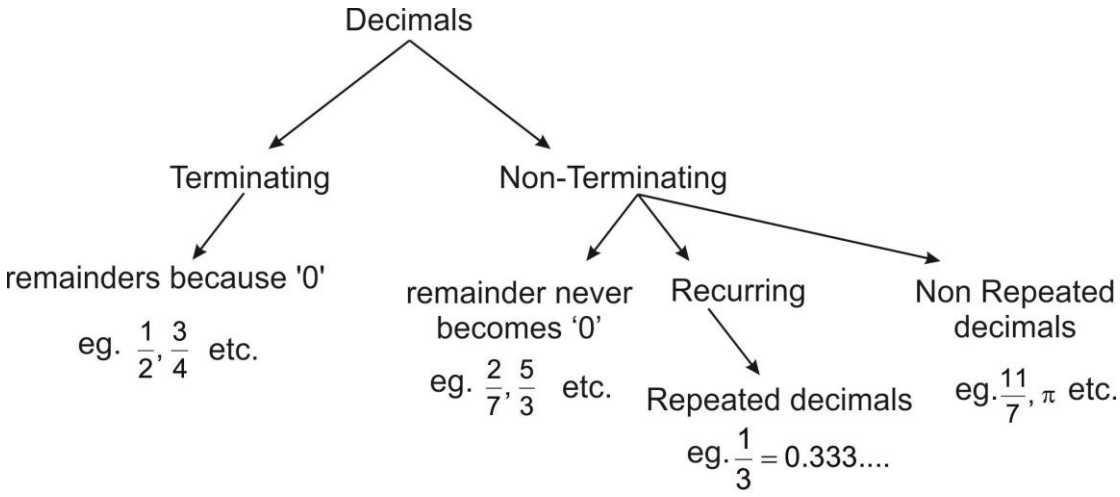
(vii) Laws of Exponents.

6. Participation of Students :

Students asked questions about different properties of Rational no's. Representation of rational no's on number line again. They discussed laws of exponents again.

7. Recapitulation :





8. Assignments :

- Representation of square roots of natural numbers on Number line.
- Magnification of Non-Terminating repeating decimals on the Number line.

ACTIVITY

9. Topic:

Representation of Irrational Number on Number Line.

10. Objective : To obtain the square root of 2.5 on the number line experimentally.

11. Material Required :-

Coloured paper / pens, scissors, geometry box, fevistick.

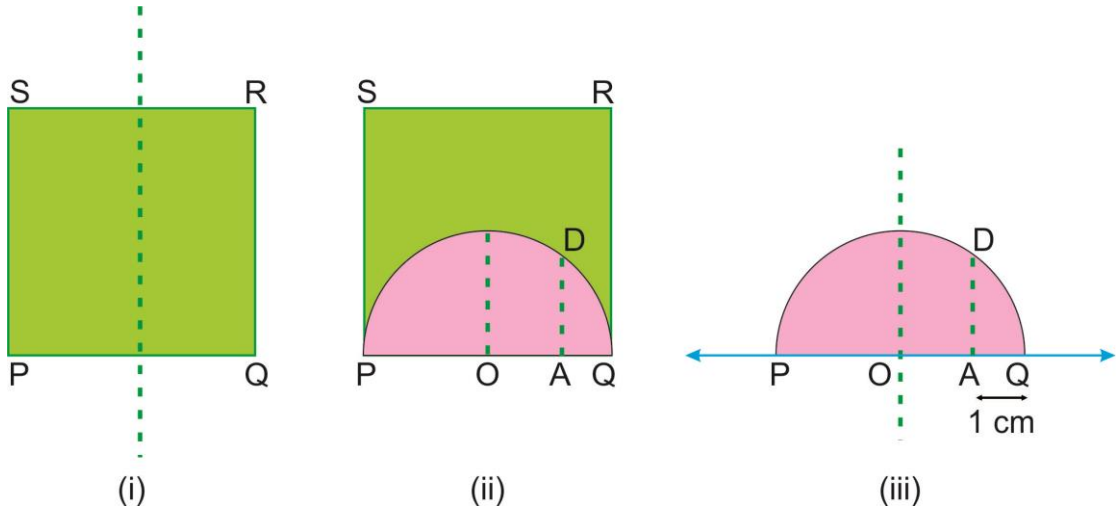
12. Procedure

(i) Take a coloured square paper f 3.5cm × 3.5cm and name it PQRS

(ii) Make a point A on PQ s.t PA = 2.5cm

(iii) Fold the square paper to find the curd point of PQ

(iv) Draw a semicircle with centre O and rad = OP = OQ



(v) Fold the semicircle at vertex A st folded line must be perpendicular to PQ. Name it as AD.

(vi) Take replica of the semicircle and paste it on the line named *l*.

(vii) Cut the semicircle w.r.t ⊥ar AD (faded line)

(viii) Paste AD from figure 4 to figure 5 s.t D point lies on the line l as shown in figure 6.

(ix) AD point represents $\sqrt{2.5}$ on the no line.

Class IX

Subject : Mathematics

Chapter : 2

Topic : Polynomials

1. Learning Objective :- Teacher will asked expansion of Identities.

2. P.K. Testing :-

(i) $(a + b)^2 = a^2 + b^2 + 2ab$

(ii) $(a – b)^2 = a^2 + b^2 – 2ab$

(iii) $a^2 – b^2 = (a – b)(a + b)$

3. Vocabulary :-

Polynomials, Monomials, Binomials, Trinomials, Linear Polynomial, Quadratic, Cubic, Degrees, Zeros factors

4. Important Spellings :-

Polynomials, Quadratic, Constant, Theorem

5. AIDS / Innovative Methods Used to explain the topic :-

Access the videos relevant to the lesson from the library resources.

6. Procedure :-

(viii) Poly – more than two

(ix) Nomial – Terms

(x) Sum of two terms or more than two terms, each term including a variable.

Variable : Its value varies (not constant) eg. x, a, b...

Term : Each expression in Term

Zero Polynomial : Constant Polynomial '0' is called zero Poly

Term	Name
1	Monomial
2	Binomial
3	Trinomial
>0	Polynomial

Degree of Polynomial : Highest Power of the variable in polynomial eg. $5x^3 – 2x^2 + x – 3$

Degree = 3

Degree of a non-zero constant poly. Is zero.

Degree	Name of Polynomial	General form $(a \neq 0)$
1	Linear Poly	$ax + b$
2	Quadratic	$ax^2 + bx + c$
3	Cubi	$ax^3 + bx^2 + cx + d$

Zeros of Poly : Where the value of poly becomes zero

Eg : $p(x) = 5x^2 + 3x - 2$

at $x = 1 \quad \therefore p(1) = 5(1)^2 + 3(1) - 2$

$= 6 \neq 0$

So $p(1)$ is not zero polynomial

at $x = -1$

$p(-1) = 5(-1)^2 + 3(-1) - 2$

$= 5 - 3 - 2 = 0$

$\therefore p(-1)$ is a zero poly

Remainder theorem : If p(x) is any poly of degree greater than or equal to 1 and p(x) is divided by the linear poly x – a, then the remainder is p(a)

Dividend = Divisor X quotient + Remainder

Factor Theorem : x – a is a factor of the poly p(x).

Algebraic Identities : $(x + a)(x + b) = x^2 + (a + b)x + ab$

$$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

$(a \pm b)^3 = a^3 \pm b^3 \pm 3ab(a \pm b)$

$a^3 + b^3 = (a + b)(a^2 + b^2 – ab)$

$a^3 – b^3 = (a – b)(a^2 + b^2 + ab)$

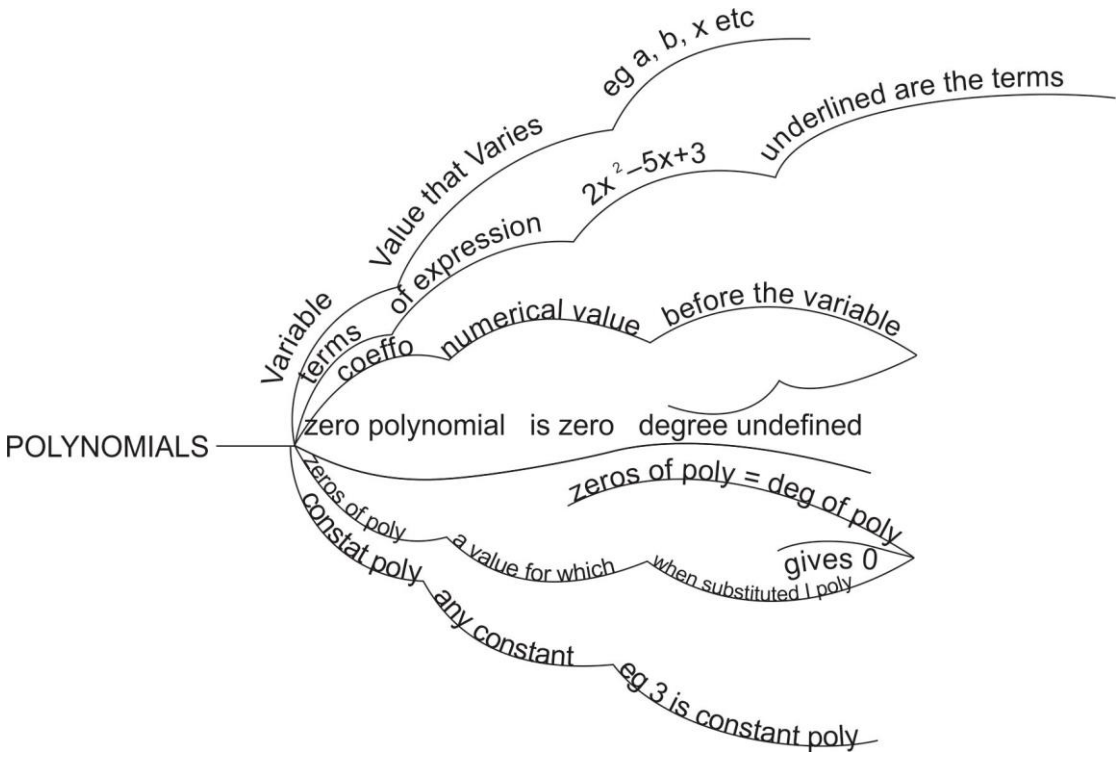
$x^3 + y^3 z^3 – 3xyz = (x+y+z)(x^2+y^2+z^2 – xy – yz – yx)$

$x^3 + y^3 z^3 = 3xyz$ if $x + y + z = 0$

7. Participation :-

Students will be learning identities by heart.

8. Recapitulation :



9. Assignment :-

Make chart on Algebraic Identities

Activity :

Topic : Algebraic Identities

Objective : To verify the algebraic Identity

$$(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

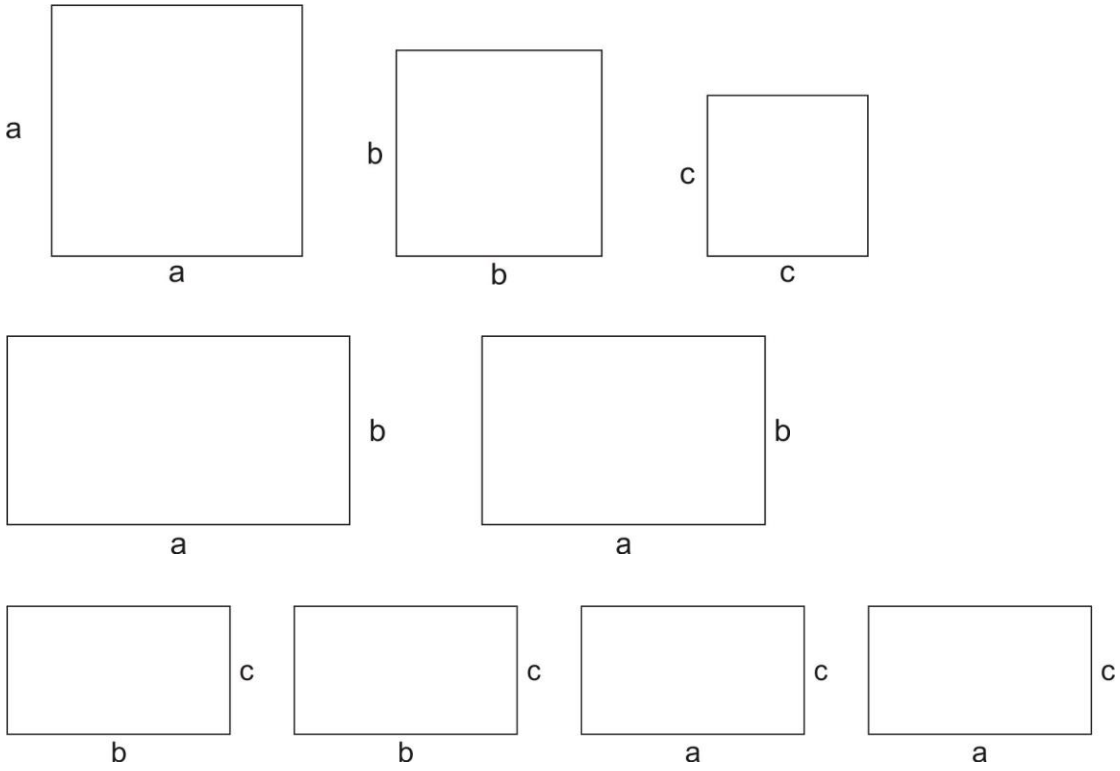
Prior Knowledge : Area of square = s × s

Area of rectangle = *l* × b

Material required : White drawing sheet, glazed sheets, cutter, sketch pens, fevistick

10. Procedure :-

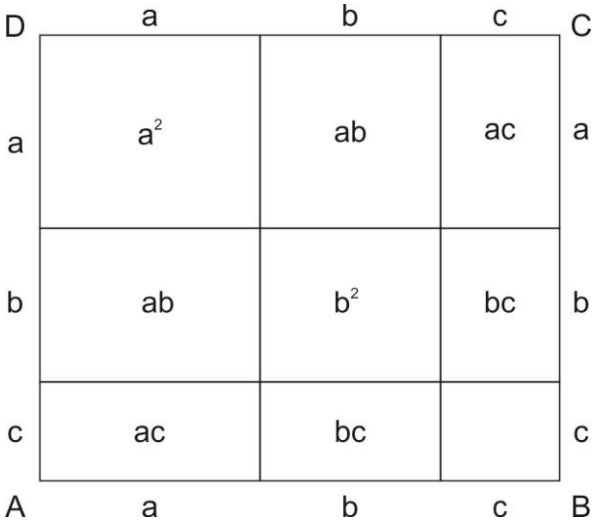
Cut three spheres of side a unit, b unit and c unit (a > b > c) from a red paper.



(i) Cut 2 rectangles of b × c units

(ii) Cut 2 rectangles of a × c units

(iii) Paste the above 9 quad. on the sheet as shown below.



Area of square = $(a + b + c)^2$

Area of all three squares and six rectangles

$= a^2 + b^2 + c^2 + ab + bc + bc + bc + ca + ca$

$= a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

Class IX

Subject : Mathematics

Chapter : 3

Topic : Coordinate Geometry

1. P.K. Testing :-

(i) Introduction to Graphs / number line what do you mean by xy-plane

2. Vocabulary :-

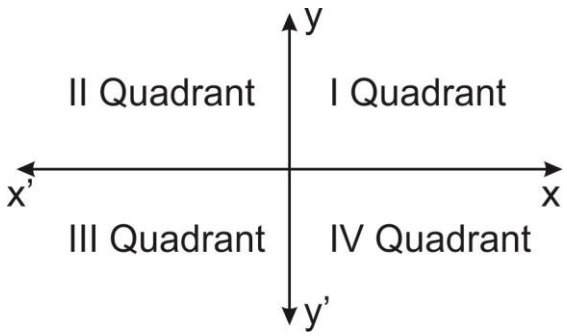
x-axis, y-axis, Cartesian plane, quadrants origin, abscissa, ordinate, plotting

3. Important Spellings :-

Cartesian plane, Quadrants, Abscissa, Ordinate

4. AIDS :-

Graph Sheets, Audio Visual aids



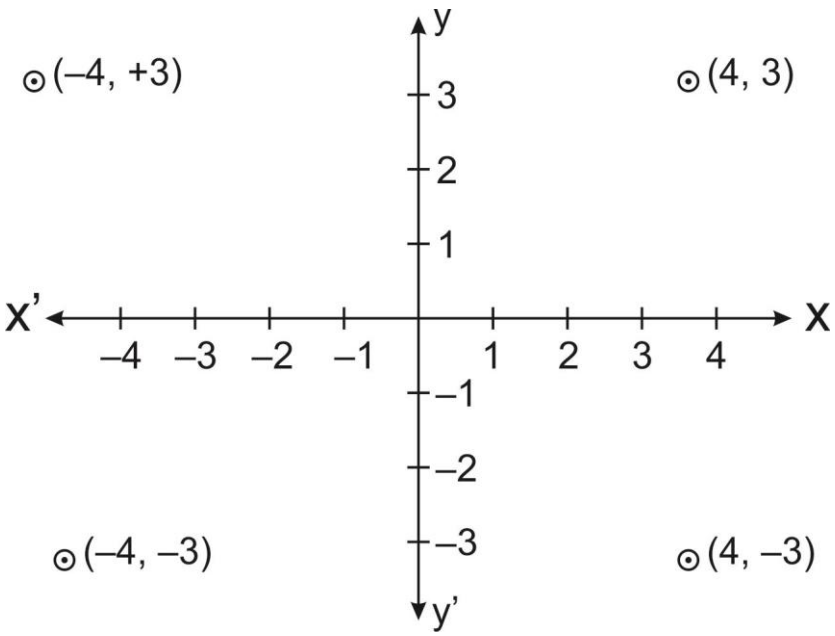
5. Procedure :-

The system of used for describing the position of a point in a plane is called Cartesian system. Developed by the French Mathematician Rene Descartes denoted by (x, y)

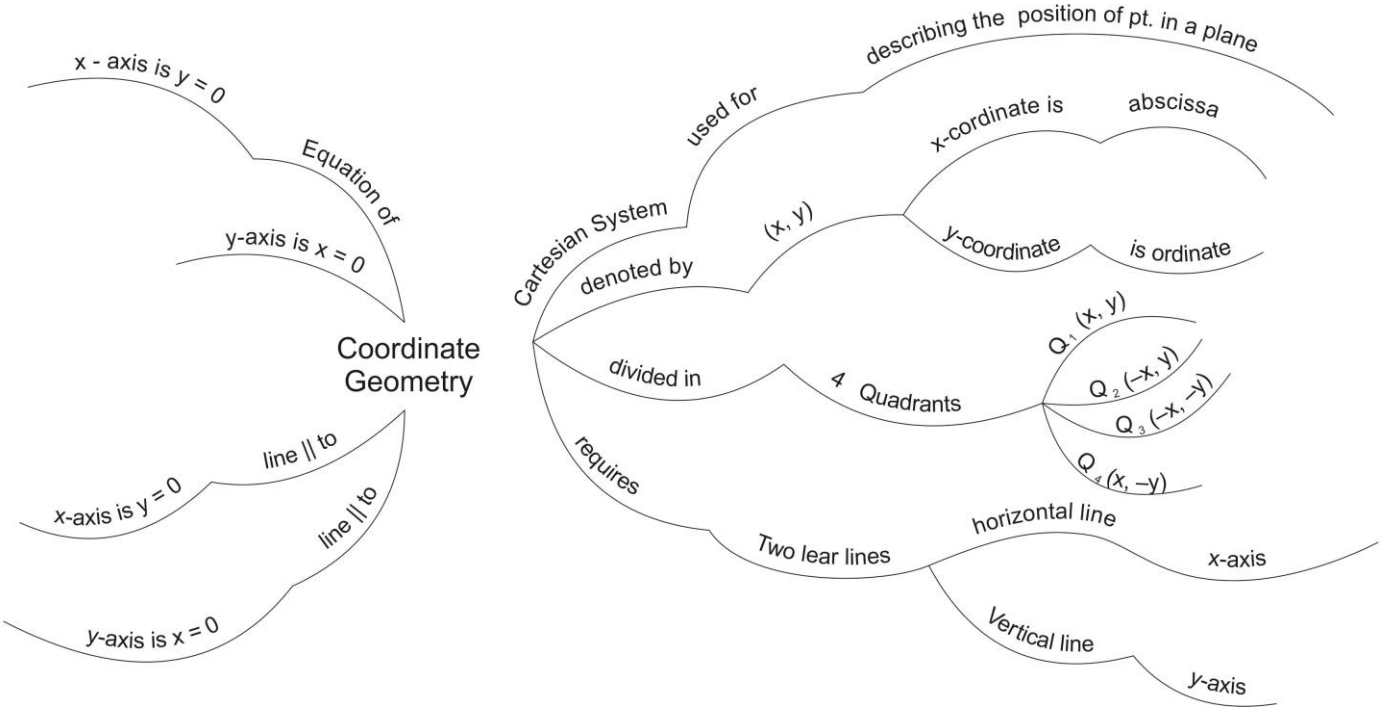
Fixed point is origin (0, 0), left of origin (–x, 0) is negative x-axis, right of origin is (x, 0), +ve x-axis, top of origin (0, y) is +ve y-axis and bottom of origin (0, –y) is –ve y-axis Cartesian Plane is divided into 4 parts known as quadrants.

The x-coordinate is called abscissa

The y-coordinate is called ordinate



6. Recapitulation



7. Assignment:

Learning / Plotting in Cartesian Plane

Forming different polygon with the help of given co-ordinates, hence finding the area also.

Class IX

Subject : Mathematics

Chapter : 4

Topic : Linear Equations in Two Variables

1. P.K. Testing :-

(i) Define Liner Equations

(ii) Find out the solution for a linear Equation in one variable eg. $2x + 4 = 0$

2. Vocabulary Used :-

Linear Equation, Variables, Constants, paralle,

3. Spellings :-

Variables, Affected, Equations

4. AIDS :-

Representation of graphs, audio-video aids

5. Procedure :-

Variable – The value which varies eg a, b, c….

Linear Equation – Degree of Equation is 1 and have only solution

The Solutions of a liner equation is not affected when

(i) The same number is added or subtracted both the sides of equation

(ii) The same number is multiplied or divided on both the sides of equation by non-zero number.

General forum is $ax + by + c = 0$, $a \neq 0$

$b \neq 0$

$x, y \rightarrow$ variables

a, b, c are constants

A solution if $4x + 3y = 12$

x	0	3
y	4	0

Solution of $4x + 3y = 12$ are (0, 4), (3, 0)….

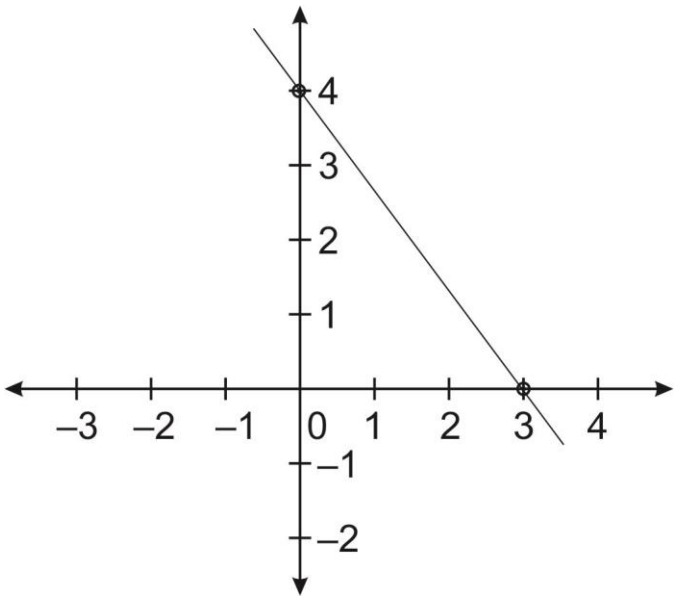
(i) $x = 0$ is the equation of y-axis

(ii) $y = 0$ is the equation of x-axis

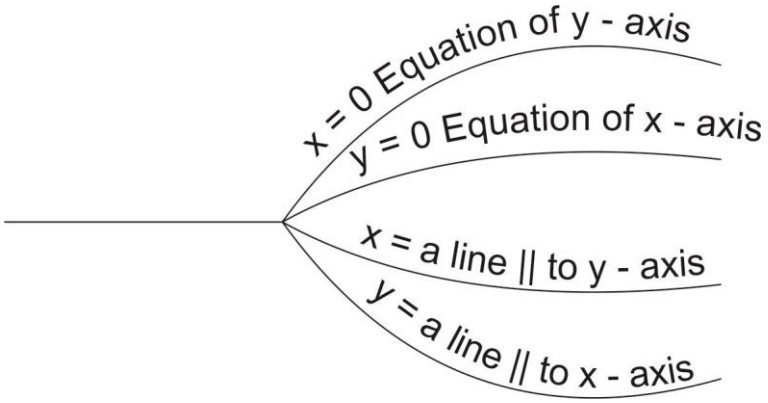
(iii) The graph x = a is a straight line parallel to y-axis

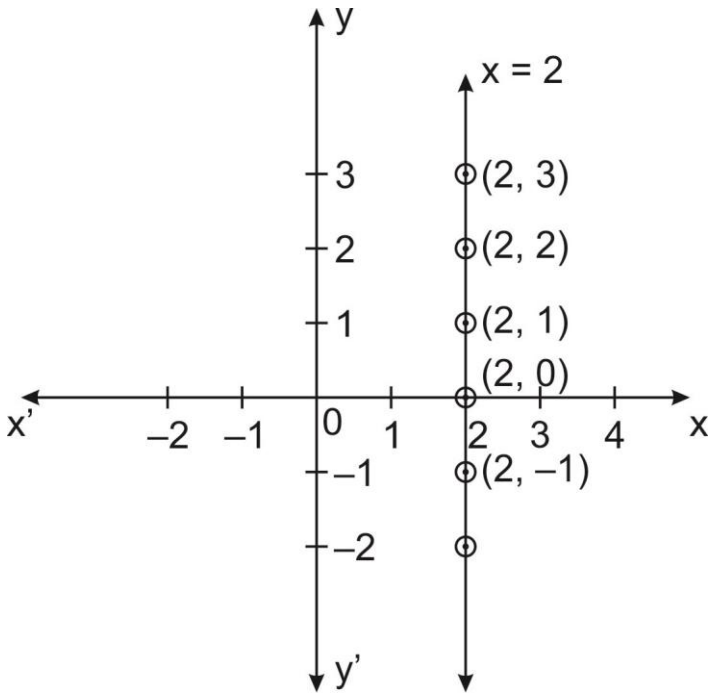
(iv) The graph y = a is a straight line parallel to x-axis\

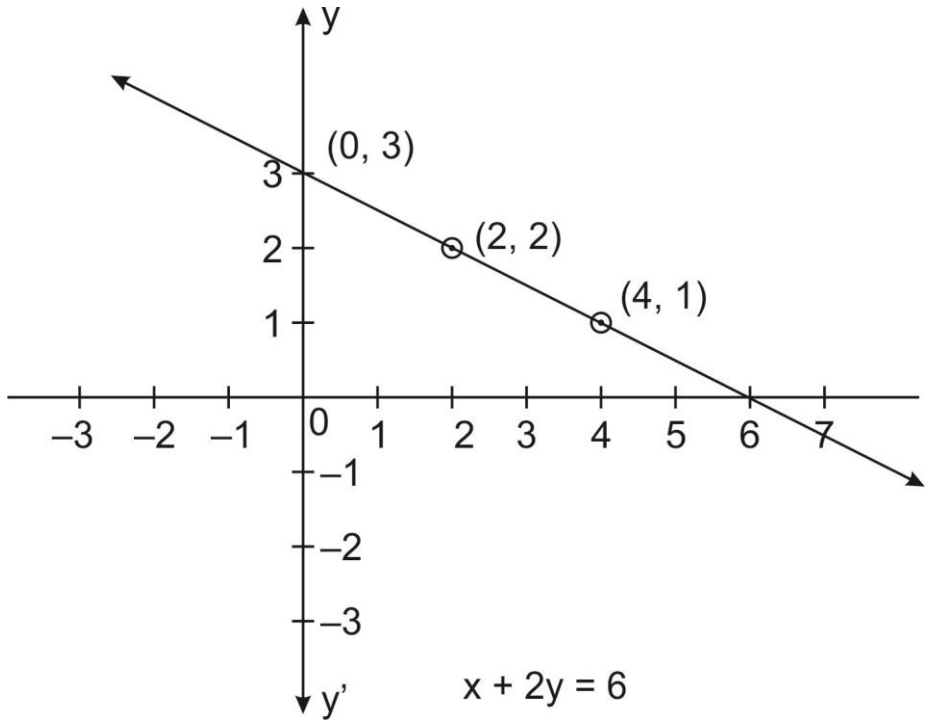
(v) The equation y = mx represents a line passing through the origin.



6. Recapitulation :-







7. Assignments:

Practice work sheet will be given.

Class IX

Subject : Mathematics

Chapter : 6

Topic : Lines & Angles

1. P.K. Testing :-

Teacher will ask questions regarding different types of angles.

Angle sum property of triangle

Exterior angle property of triangle etc.

2. Vocabulary :-

Parallel, perpendicular corresponding, vertically opposite angles.

3. Important Spellings :-

Supplementary, Interior, Alternate, Interior

4. AIDS

Audio-Video Aids

5. Procedure :-

(xi) Line is a collection of points denoted by $\overleftrightarrow{AB}$.

(xii) No End Points

(xiii) A line with two end points is line segments, denoted by $\overline{AB}$.

(xiv) A line with one end point is a ray, denoted by $\overrightarrow{AB}$.

(xv) If three or more than three points lying on the same line, then they are collinear points.

(xvi) Any 3 non-collinear points form a triangle.

(xvii) Angle is formed when two rays originate from the same end point, rays are called arms.

Types:

Acute $O < \theta < 90^o$

Right = $\angle 90^o$

Obtuse = $90^o < \theta < 180^o$

Straight $\angle$ = 180^o

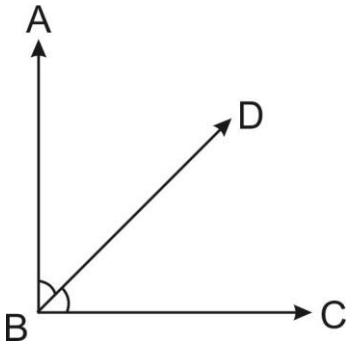
Reflex $\angle$ = $180^o < \theta < 360^o$

Complete $\angle$ = 360^o

(i) Two angles whose sum is 90^o are called complementary.

(ii) Two angles whose sum is 180^o are called supplementary.

(iii) If 2 angles have common vertex and one common arm then they are adjacent

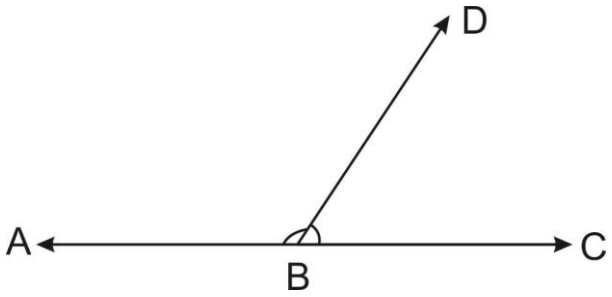


(iv) Sum of two adjacent angles is 180^{o} then they are linear pair

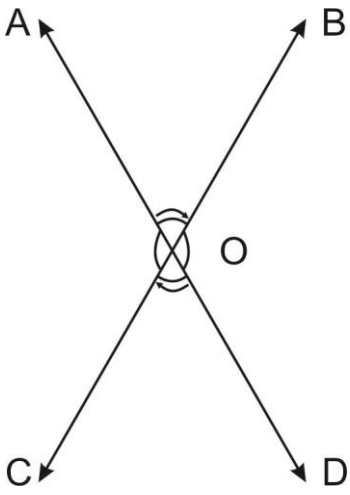
(v) Adjacent angles - $\angle ABD$, $\angle DBC$ and

$\angle ABC = \angle ABD + \angle DBC$

(vi) If non common a arms from a straight line, $\angle ABD$ and $\angle DBC$ are called linear pair of angles



(vii) Vertically opposite Angles.



(viii) $\angle AOB = \angle COD$; $\angle AOC = \angle BOD$

If a transversal intersect two parallel lines then

- Each pair of corresponding angles is equal or
- Each pair of alternate interior / exterior angles is equal
- Army pair of interior angles on the save side of the transversal is supplementary then the lines are parallel.

ACTIVITY

6. **Objective :** To verify that sum of the interior angles of a Δ is 180^o.

7. **Prior Knowledge :**

Straight line angle

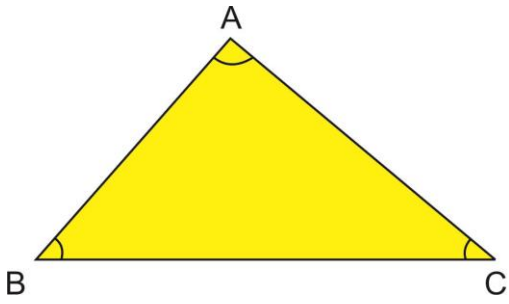
Angle sum property of triangle

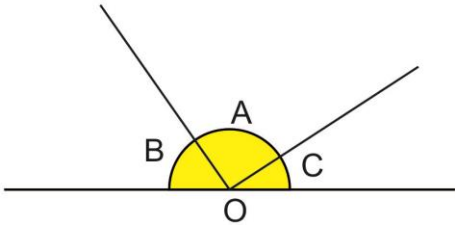
8. **Material :**

Glazed paper, sheets, Geo Box, Scissors, Glue etc.

9. **Procedure:**

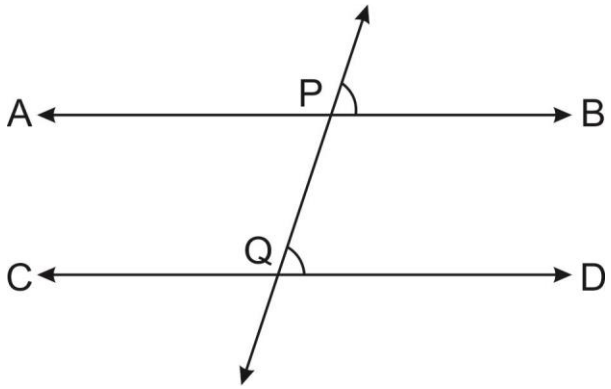
Cut out a triangle from a coloured sheet and paste it on white sheet and ΔABC.





- Cut out the angles equal to $\angle A, \angle B$ and $\angle C$.
- Paste them in such a way that they form $\angle A + \angle B + \angle C = 180^{o}$.

10. Observation: Thus we have verified that is a triangle sum of all angles is 180º



- The sum of three angles in a triangle is 180º.
- If sides of triangle is produced, the exterior angle so formed is equal to the sum of two opposite interior angles.

11. Recap :-

All types of angles will be discussed again with the students.

12. Assignment

Practice worksheets will be given.

Class Test will be conducted.

Class IX

Subject : Mathematics

Chapter : 7

Topic : Triangles

1. P.K. Testing :-

(i) Teacher will ask from student about the types of triangles, Angle scan properly of a triangle.

2. Vocabulary :-

Congruence, Inequality

3. Spellings :-

Congruence, Inequalities, Figures

4. AIDS :-

Smart Class

5. Procedure :-

Two figures are congruent, (equal in all aspects i.e. shape, size etc), if they are of the same shape and of save size.

e.g. circles of same radii, squares of same sides.

SAS congruence rule : If two sides and the included angle of one triangle are equal to two sides and the included angle of the other side of triangle, then the two triangles are congruent.

ACTIVITY

6. Congruency of Triangles

7. Objective :

To verify experimentally the different criteria for congruency of triangles using triangle cut outs.

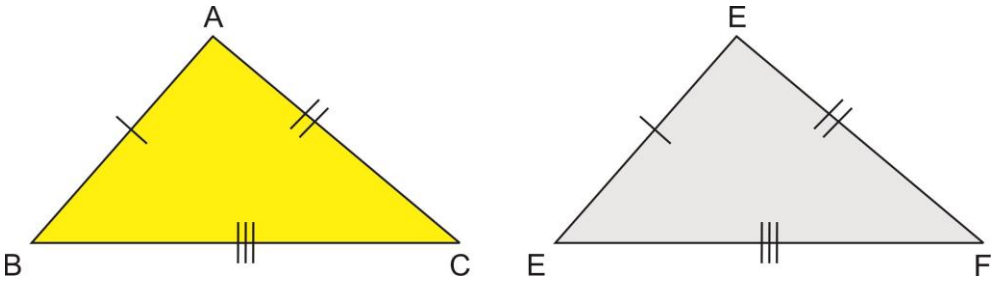
8. Prior Knowledge:-

Concept of congruent triangles

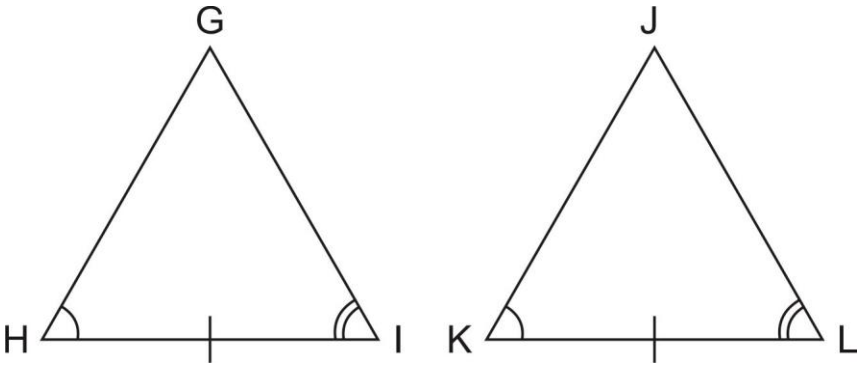
Properties of triangles

9. Procedure:-

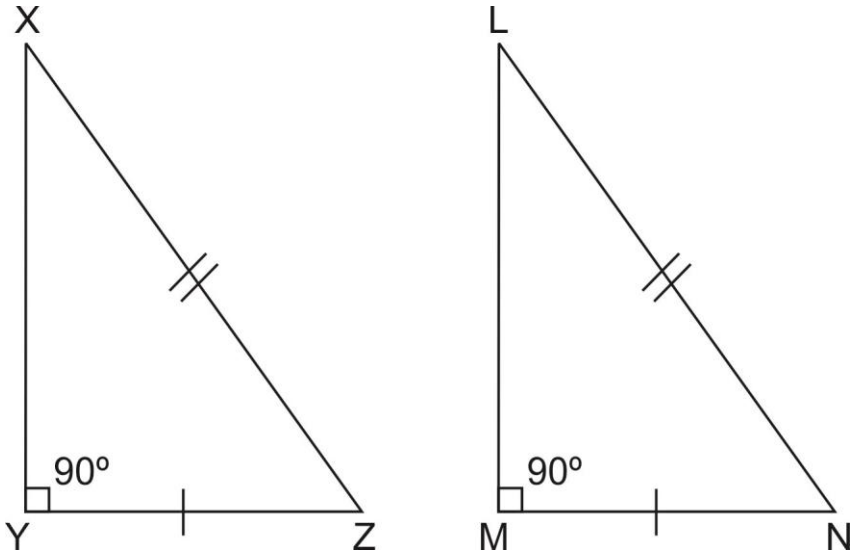
Cut out a pair of two Δ's ABC, DEF s.t AB = DE; BC = EF and AC = DF



Cut out two Δ's GHI and JKL from coloured papers such that $\angle H = \angle K$; HI = KL and $\angle I = \angle L$



Cut out a pair of two right angled Δ's XYZ and LMN from coloured papers such that $\angle Y = \angle M = 90^o$; XZ = LN and YZ = MN

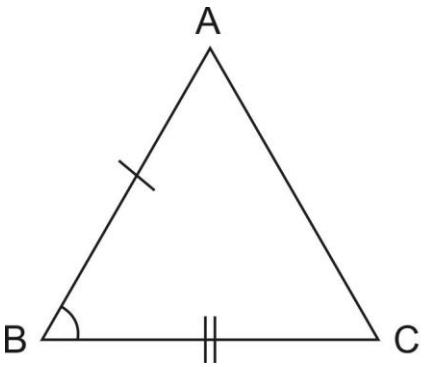


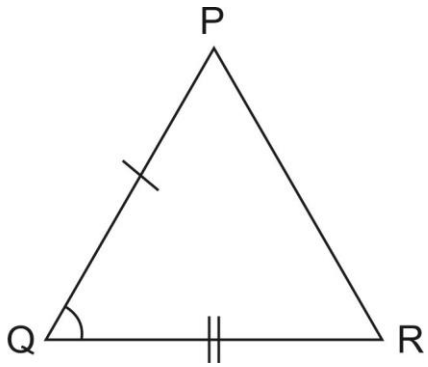
10. Observation :-

$\Delta ABC \cong \Delta DEF$ SSS

$\Delta GHI \cong \Delta JKL$ ASA

$\Delta XYZ \cong \Delta LMN$ RHS





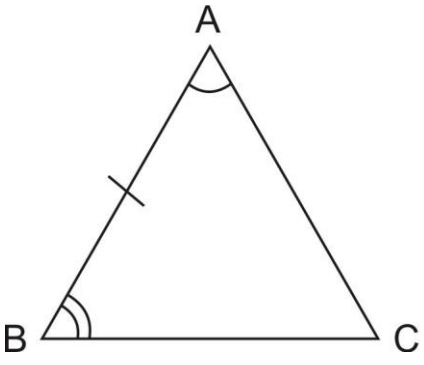
AB = PQ

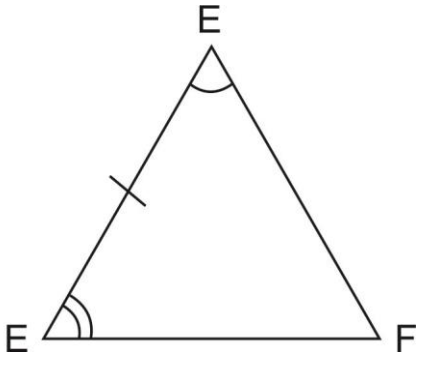
$\angle B = \angle Q$

BC = QR

$\Delta ABC \cong \Delta PQR$

ASA congruence rule : Two triangles are Congruent if two angles side of one one triangle are equal to two angles and the included side of other triangle.





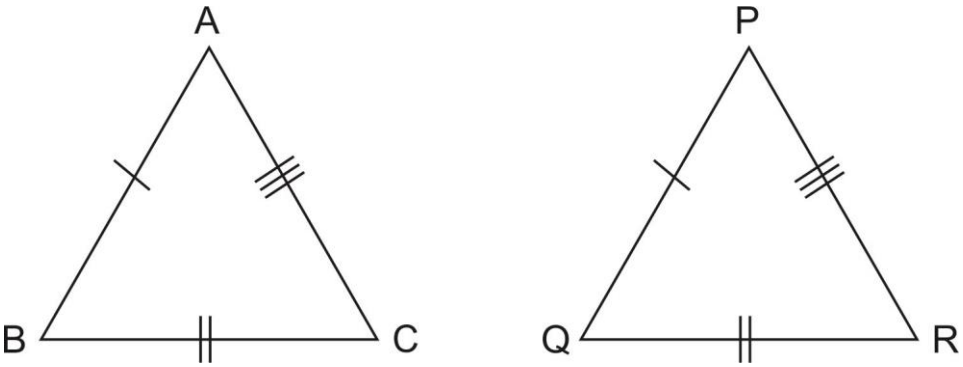
$\angle A = \angle D$

AB = DE

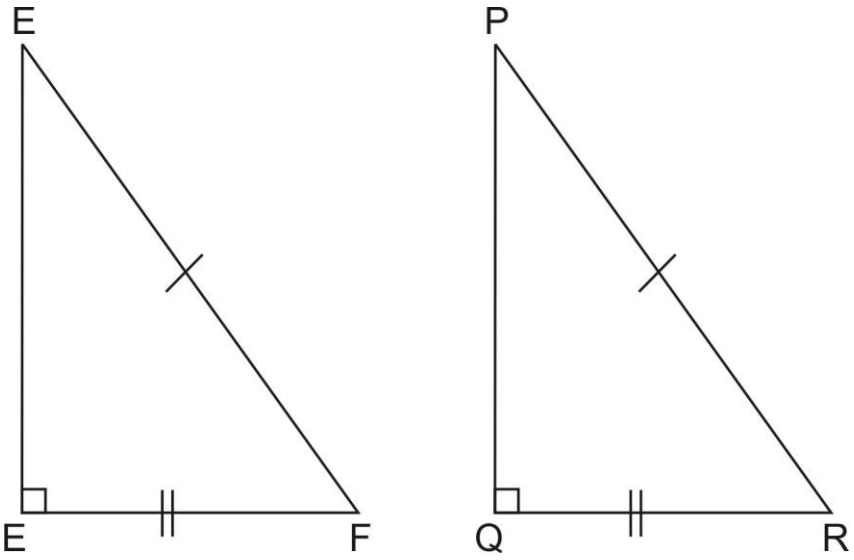
$\angle B = \angle E$

$\therefore \ \Delta ABC \cong \Delta DEF$

SSS congruence rule: If three sides of one triangle are equal to the three sides of another triangle then the two are congruent



RHS Congruence rule : If in two right triangles the hypotenuse and one side of one triangle is equal to hypotenuse and one side of the other triangle, then the two triangles are Congruence



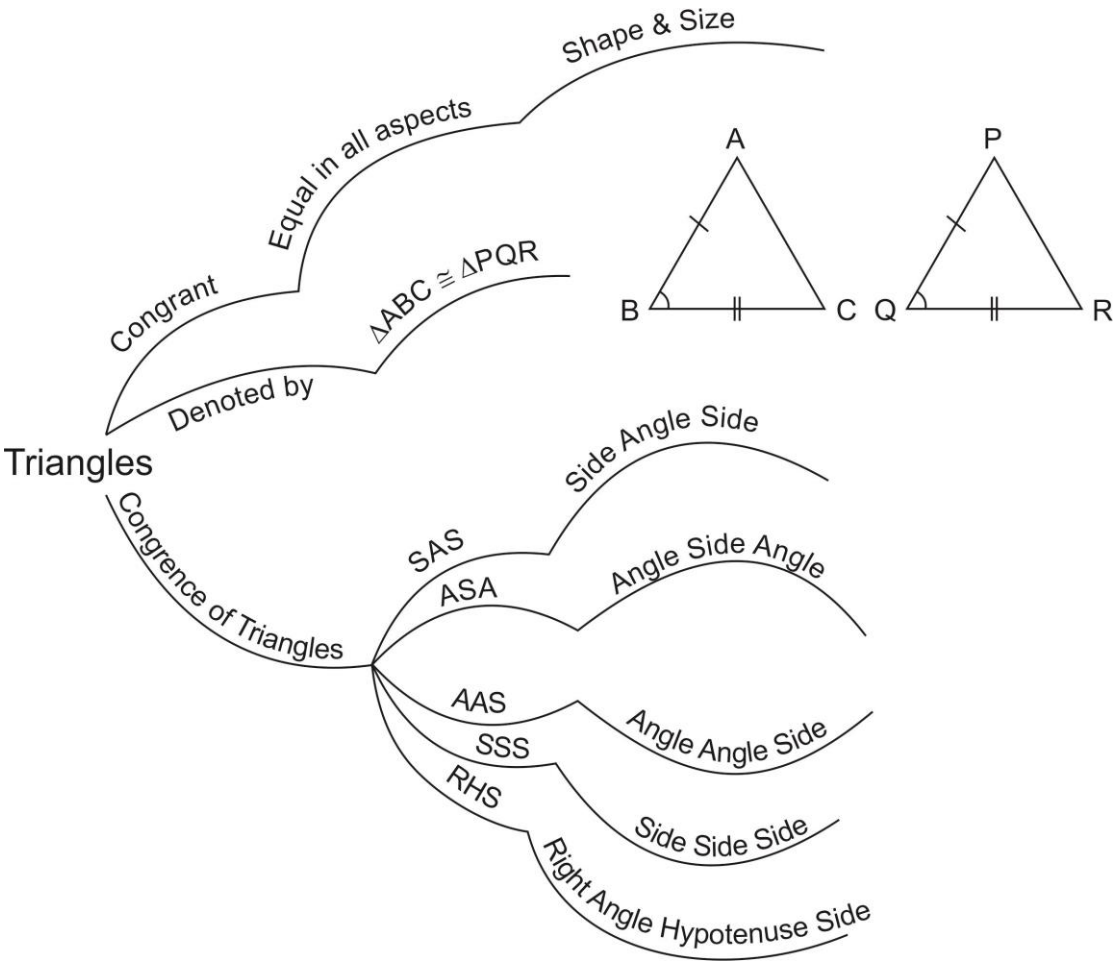
$\angle E = \angle Q$ (90º each)

DF = PR

EF = QR

$\Delta DEF \cong \Delta PQR$

11. Recapitulation:-



12. Assignment:-

Extra Questions for practice will be given to the students from the reference book.

Chapter : 8

TOPIC- QUADRILATERALS

1. PK Testing:

Students will be asked about a polygon, curve etc.

2. Vocabulary used:

Quadrilateral, Rectangle, Square, Rhombus, Diagonals.

3. Important spelling:

Quadrilateral, Rectangle, Parallelogram, Congruent, Diagonal.

4. Innovative methods used:

Students will be explained that the figure obtained by joining the mid points of consecutives sides of a quadrilateral is a Parallelogram by paper folding method.

1. Cut off a quadrilateral ABCD from a coloured piece of paper.

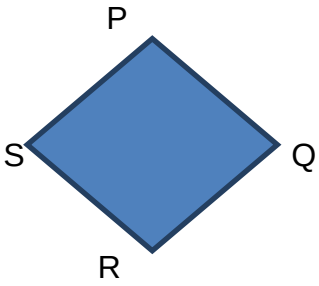
D C

2. Mark the points P, Q, R and S of sides AB, BC, CD & DA respectively by folding appropriately.

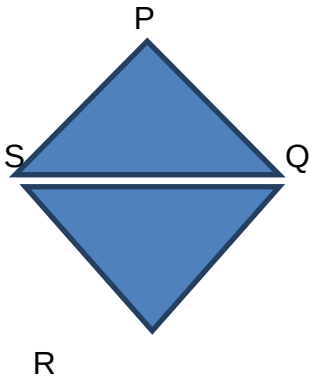
3. Join PQ, QR, RS& SP.

4. Cut off quadrilateral PQRS.

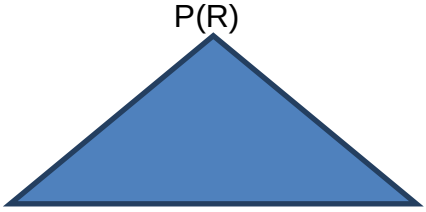
(a)



(b)



(C)



S(Q) Q(S)

5. Now, cut off the quadrilateral PQRS along the diagonal SQ into two triangles PSQ and SRQ.

6. Superimpose the triangle PSQ on triangle RQS such that PQ falls on SR.

This implies that the triangle PSQ superimpose the triangle RQS exactly. Thus SP=QR and RS= PQ. This shows that PQRS is a Parallelogram.

5. Procedure:

After PK testing, students will be explained a parallelogram, square, rectangle and rhombus. Their various properties will be discussed.

(A) A diagonal of a parallelogram divides it into two congruent triangle.

(B) In a parallelogram:-

(i) Opposite sides are equal.

(ii) Opposite angles are equal.

(iii) Diagonals bisect each other.

(C) A quadrilateral is a parallelogram if:-

(i) Opposite sides are equal.

(ii) Opposite angles are equal.

(iii) Diagonals bisect each other.

(iv) A pair of opposite sides is equal and parallel.

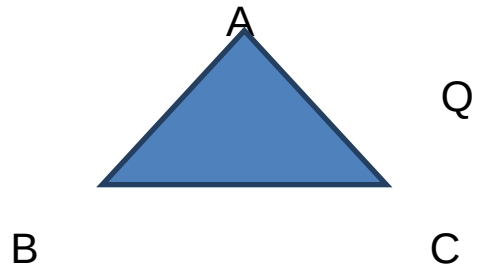
(D) Diagonals of a rectangle bisect each other and are equal & vice versa.

(E) Diagonals of a rhombus bisect each other at right angles and vice versa.

(F) Diagonals of a square bisect each other at right angles and are equal.

(G) Midpoint Theoram: The line joining the mid points of any two sides of a triangle is parallel to the third sides and is equal to half of it.

In triangle ABC, P and Q are the mid points of AB & AC respectively. Then PQ// BC and PQ=1/2 BC.



Converse of Midpoint Theorem

A line through the midpoint of side of a triangle parallel to another side bisects the third side.

The quadrilateral formed by joining the mid points of sides of a quadrilateral, in order, is a parallelogram.

Questions based on above theorem will be explained and will be discussed with the help of smart class.

6. Recapitulation:

Students will asked following questions.

(1) What is a quadrilateral ?.

(2) Define Parallelogram.

(3) Are the opposite sides of a Parallelogram equal.

(4) Each angle of a rectangle is of _____.

7. Assignment:

The following questions will be given as home assignment:-

Q1. Show that line joining the mid points of opposite sides of a quadrilateral bisect each other.

Q2. In trapezium ABCD, AB//CD and AD=BC.

Show that:

(i) Angle A = Angle B.

(ii) Angle C = Angle D

(iii). ▲ABC = ▲ BAD

(iv) Diagonal AC = Diagonal BD.

Q3. Show that diagonals of a rhombus are perpendicular to each other.

Class IX

Subject : Mathematics

Chapter : 10

Topic : Circles

13. Learning Objective :- To teach students about properties of circle

14. P.K. Testing :-

(iv) What is an arc

(v) What is a chord

(vi) Define various terms like radius, chord, diameter segment and sector etc.

15. Vocabulary :-

Chord, segment, cyclic, quadrilateral, concyclic points

16. Spellings :-

Chord, Concyclic

17. AIDS (Audio visual aids) :-

Access the videos relevant to the chapter ‘Circles’ from the library.

18. Supplemental Activities :- Students will be asked to do the following activities.

(xviii) Find out about taught and secant related to a circle and share findings with the class.

(xix) Find out why all celestial bodies (except asteroids) are spherical in shape.

19. Expected Outcomes (Learning) :-

After studying the lesson, students will be able to explain all the terms related to circle. They will also be able to prove various taeorems to circles.

20. Recap :

Assessment : Class Test, Extra sum from R.D. Sharma

Activity : Verify that angle at centre of a circle is double the angle at any point on the remaining part of circle.

Material required : Wooden board, green, nails, thread, cutter, glazed paper etc.

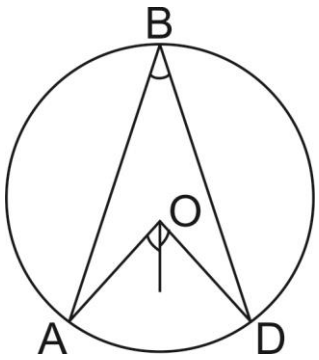
21. Procedure :-

(iv) Cut a circle of radius 10cm from card board and paste glaze paper on it.

(v) Mark centre O and angles ABD and AOD on the circle.

(vi) Cut two angles equal to angle ABD of same size.

(vii) Place both of those angle along the angle AOD.



(viii) Both these angles exactly cover the angle AOD.

(ix) It shows angle at the centre of circle is double the angle at any point on the remaining part of the circle.

22. Recap :-

(i) In a circle equal chords Subtend equal angles at the centre and vice versa.

(ii) The perpendicular from the centre of a circle.

(iii) To a chord bisects the chord.

(iv) Equal chords of a circle are equidistant from the centre and vice versa.

(v) Congruent arcs of a circle subtend equal angles at the centre.

(vi) The sum of either pair of opposite angles of a cyclic quadrilateral is 180°.

Class IX

Subject : Mathematics

Chapter : 11

TOPIC- CONSTRUCTIONS

1. PK Testing:

1. To construct angles of 30▫, 60▫, 90▫ 75▫, 105▫,
2. To construct their bisects..

2. Vocabulary used:

Base angle, Perpendicular bisector, Angle bisector & Perimeter.

3. Aids Used:

Smart class and Geometry box.

4. Procedure:

Various constructions with ruler and compass will be discussed :-

(i) To bisect a given angle.

(ii) To draw perpendicular bisector of a given line segment.

(iii) To construct an angle of 60▫ etc.

(iv) To construct a triangle given its base, a base angle and sum of other two sides.

(v) To construct a triangle given its base, a base angle and difference of other two angles.

(vi) To construct a triangle, given its perimeter & its two base angles.

5. Recapitulation:

The following questions will be discussed as assignment:-

(i) Draw a line segment AB of length of 6 cm. Draw line perpendicular to AB through A & B respectively. Are these lines parallel.

(ii) Draw a line segment PQ of length of 8 cm and divide it into 4 equal parts.

(iii) Construct an equilateral ▲ one of whose altitude is 5 cm.

6. Assignment:

The following questions will be given as home assignment:-

Q1. Is it possible to construct a ▲ PQR in which PQ=6cm, QR=6cm and PR= 12 cm?

Q2. Construct an equilateral ▲of side 6 cm.

Q3. Construct a ▲ PQR in which QR=7cm, ŁQ=70▫ and PQ+PR=12 cm. Justify your construction.

Q4. Construct a ▲ ABC in which ŁB=30▫ ,ŁC=90▫ and AB+BC+AC=12cm.

Subject : Mathematics

Chapter : 12

Topic : Heron's Formula

1. Learning Objective :-

To teach students above finding the area of triangles and quadrilaterals.

2. P.K. Testing :-

(ii) Define right angled triangle. Define an equilateral triangle.

(iii) What is area of a right angled triangle?

(iv) What is area of an equilateral triangle?

3. Vocabulary :-

Areas, perpendicular, scalene triangle.

4. spellings :-

Equilateral, scalene, Herons formula.

5. AIDS :-

Audio visual aids

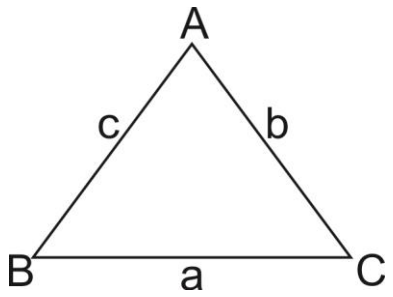
6. Procedure :-

Area of right triangle $\Delta = \frac{1}{2} \times \text{base} \times \text{height}$

Area of an equilateral triangle = $\frac{\sqrt{3}}{4} s^2$

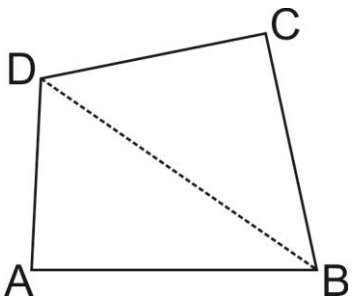
s = semi perimeter = $\frac{a+b+c}{2}$

or $s = \frac{p}{2}$



Area of $\Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$

Area of quadrilateral = Area of ΔABD + Area of ΔBCD



7. Recap

(i) Dimensions of all sides will be given and one can find area of triangle using Heron's formula.

(ii) In case ratio of all sides given, then find all sides first, hence find of Δ using Heron's formula.

8. Assessment :

Class test will be taken

9. Assignment :-

Practice Worksheet will be given to students.

10. Resources :-

Reference books : Systematic

Class IX

Subject : Mathematics

Chapter : 13

Topic : Surface area and Volumes

1. Learning Objective :-

Define the concepts of volume and surface areas of various solids

2. P.K. Testing :-

(ii) Perimeter and area of square and rectangle and circumference of circle.

3. Vocabulary :-

Curved surface area, total surface area capacity

4. spellings :-

Lateral, capacity, cuboids, hemisphere.

5. AIDS (Audio visual aids) :-

Smart Class, Geo Board.

6. Short Description :-

In this lesson, learners will calculate the surface areas and the volumes of different solids such as cubes, cuboids cylinders, cones and spheres. They will also derive the formulas for calculating the curved surface area, total surface area and volume of various solids.

7. Student's participation :-

Presentations on the theories / formulas related to volume.

8. Learning Outcome :

Learners should be able to calculate surface areas and volume of different solids such as cubes, cuboids, cylinders, cones and spheres.

9. Recap :-

(i) 3-D of rectangular cuboid : e.g. note book, pencil box etc.

(ii) 3-D of sphere cube : e.g. dice, chalk box etc.

(iii) 3-D of circle sphere $\rightarrow$ sphere into 2 equal parts i.e. hemisphere

(iv) All formulas of surface areas and volumes will be revised completely.

10. Assessment :-

(i) Class test

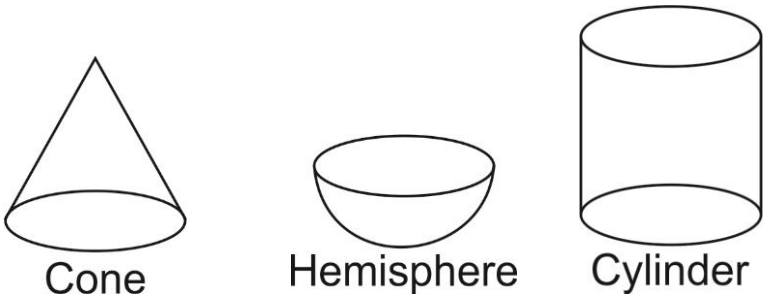
(ii) Extra sums from refreshers.

Activity : Verify volume relationship among right circular cone, a hemisphere and right circular cylinder of same height h and same radius r.

11. Material Rapid :-

Card Board, Scissors, Cutter, Gum, Plastic sheet, plastic ball, scale, geometry box.

12. Procedure :-



(i) Take a plastic sheet and cut it to get a right circular cone of radius 30cm and height 30cm.

(ii) Take a plastic ball of radius 30cm and cut this into two halves so as to get a hemisphere.

(iii) Similarly take a plastic sheet and cut it to get a right circular cylinder of radius 30cm and height 30cm.

(iv) Fill the cone with sand and pour it twice into hemisphere. Hemisphere is completely filled with sand.

(v) Fill the cone with sand and pour it twice into cylinder. Cylinder is completely filled with sand.

By verifying volume relationship among right circular cone, a hemisphere and right circular cylinder of same heights and same radius we found, it is given by 1 : 2 : 3.

Mathematically, we have

Volume of right circulars cone	:	volume of hemisphere	:	volume of circular cylinder.
$\frac{1}{3}\pi r^2 h$	:	$\frac{2}{3}\pi r^3$	:	$\pi r^2 h$

Putting r = 30 ; h = 30

$\frac{1}{3}\times\pi\times(30)^2\times 30$	:	$\frac{2}{3}\times\pi\times(30)^3$	:	$\pi\times(30)^2\times 30$
10	:	2	:	3
1	:	1	:	3

Class IX

Subject : Mathematics

Chapter : 14

Topic : Statistic

1. Learning Objective :-

To teach students about collection analysis and presentation of data

2. P.K. Testing :-

(i) Define data, range.

3. Vocabulary :-

Primary, secondary, collection,

4. Spellings :-

Representation, frequency, limits.

5. AIDS (Audio visual aids) :-

Smart Class, Daily life collection of data its analysis and presentation.

6. Short Description :-

In this lesson, learners will collect the data from daily life and then various terms like primary data and secondary data will be explained, students will be asked to find tally marks and draw frequency table and then bar graph. Students will be explained how to draw histogram.

7. Student's participation :-

Presentations of data.

8. Learning Outcome :

Learners will be able to collect the data and analyze the given situation.

9. Recap :-

(i) Drawing of bar graph.

(ii) Drawing of histogram.

10. Assessment :-

(iii) Class test

(iv) Extra sums from refreshers.

11. **Activity :** Collect the data of temperature of 5 different cities of India and represent it in the form of bar graph.

Class IX

Subject : Mathematics

Chapter : 15

Topic : Probability

1. Learning Objective :- To teach students probability. They will learn new terms such as experiment, trial, event and outcome.

2. P.K. Testing :-

(i) Question regarding data handling will be asked from students.

(ii) Discussion about weather forecast, playing games and tossing coins etc will be held.

3. Vocabulary :-

Experiments, trials

4. Spellings :-

Trials, Probability

5. AIDS (Audio visual aids) :-

Access the videos relevant to the chapter from Library resources.

Event : A event for an experiment is the collection of some outcomes of the expriments.

6. Procedure :-

Probability of an event

$$= \frac{\text{no. of trials in which event happened.}}{\text{total no. of trials}}$$

Probability lies between 0 and 1 i.e. $0 \leq P(E) \leq 1$

Probability of certain (sure) event = 1

Probability is always a positive value.

In case of a coin.

Total number of trials are H, T = 2

P (getting head) = $\frac{1}{2}$

In case of a die

Total no. of trials 1, 2, 3, 4, 5, 6 = 6

P (getting an odd no.) $= \frac{3}{6} = \frac{1}{2}$

7. Recap :-

$$P(E) = \frac{\text{no. of fovourable trials}}{\text{Total no. of trials}}$$

8. Activities :

Teacher will ask the students to perform the following activity.

Take a jar containing six blue marbles, five red marbles. If one marble is chosen at random from the Jar, Find out the probability of choosing a blue marbles, red marble and green marble.

9. Expected Outcome :-

After completing the lesson, students will be able to describe the concept of probability and experiment probability.

10. Assessment :-

Class Test and extra sums from references will be given.

11. Activity :-

Observe experimentally the difference between experimental and theoretical probability using a fair Die.

Prior Knowledge :-

Six different faces of a die

$$P(E) = \frac{\text{no. of fovourable trials}}{\text{Total no. of trials}}$$

Material Required :-

A white sheet, a die

12. Procedure :-

Throw a fair die (i) 6 times (ii) 20 times (iii) 50 times and note the number of times each face (1, 2, 3, 4, 5, 6) will come up.

Sr. No.	No. of Throws of a dice	1	2	3	4	5	6
I	6						
II	20						
III	50						

(ii) use each of rows 1, 11, 111 to calculate the fraction below

$$\frac{\text{no. of times 1 appears}}{n}$$

$$\frac{\text{no. of times 2 appears}}{n}$$

.....

and $$\frac{\text{no. of times 6 appears}}{n}$$

Here n = 6, 20, 50

Enter the results in table between

$\frac{\text{no. of outcomes}}{n}$		$\frac{\text{no. of 1's}}{n}$	$\frac{\text{no. of 2's}}{n}$	$\frac{\text{no. of 3's}}{n}$	$\frac{\text{no. of 4's}}{n}$	$\frac{\text{no. of 5's}}{n}$	$\frac{\text{no. of 6's}}{n}$
n = 6	$\frac{\text{no. of outcomes}}{6}$						
n = 20	$\frac{\text{no. of outcomes}}{20}$						
n = 50	$\frac{\text{no. of outcomes}}{50}$						

The theoretical probability for each of the outcomes 1, 2, 3, …….6 in a single throw of a die is $\frac{1}{6}$ compare the results obtained here with the theoretical probability of each of the outcomes.

Repeat the above experiment when a fair die is tossed 10, 30, 60 and 70 times.

Observations :- Students should observe the difference between theoretical and experimental probability.