**Class: VIII**

**Mathematics**

**Chapter-3/Topics/ Exponents and radicals**

**Exponent:** It represents as power of number (we multiply 2 by 5 times, we can express as2x2x2x2x2=25) 5 is the exponent.

**Zero exponent:** For any non-zero rational number a, we define a0=1.

**Negative integral exponent**: Let a be any non-zero rational number and n be a positive integer, then we define a-n=

**Laws of exponents** Let a and b any two rational numbers and let m and n be integers , then we have,

1. amxan=am+n ii) , a
2. iv)
3. , b v)

**Rational numbers as exponent**: If a any positive real number and m be an integer while n be a natural number, then ,

Where is called the Radicand. is called radical and n is called the index of radical(It is always positive integer), the sign is called the radical sign.

E.g. we can express the following radicals in exponential form, which is given below

i) = ii) =

**Positive rational number as exponent:**

**Negative rational number as exponent:**

**Chapter-6/Topics/Compound Interest**:

**Simple interest (SI):** Extra money on the original sum

**Formula:**  SI=, where P is the principal, R is the rate per annum and T is the time in year.

**Principal:** It is original money or sum by which we can earn extra money through simple interest or compound interest.

**Amount:** It is sum of principal and interest [Amount (A) =Principal (P) +Simple Interest (SI) or Compound Interest (CI)].

**Compound Interest**: After the certain specified period, the difference between amount at the end of the last period and original principal is called the compound interest

**Remarks:** 1. Principal is the same for conversion periods in simple interest (through whole year)

2. Principal changes conversion periods in compound interest (Principal is changes time to time)

3. Compound interest and simple interest is same for one year.

**Formula:** **When interest is compounded yearly**

 Amount A=P, Compound Interest (CI) =Amount-Principal=P ,

 Where P is the principal, R is the rate of interest per annum and n is the number of conversion periods (Years).

**When interest is compounded half yearly or semi-annually:**

Amount A= P

**When interest is compounded quarterly**

Amount A= P

**Growth:** Some quantities, such as population, weight, height of a human being increase over a period of time under normal conditions. The relative increase is called growth.

 **OR**

Increase in certain period quantities over a period of time is called growth.

**Net Growth = (Birth rate –Death rate)%**

**Case 1**: If the population growth is constant for all the given number of years, then population after n years= P `

**Case 2**: If the population growth variates for the given number of years.

 Let it be, say, r1% for the first year; r2% for the second year, r3% for the third year,

 Then population after 3 years= P

**Case3**: If the population decrease constantly for the given number of (n) years by R% then population after n years = P

**Case4**: Population before n years =

**Depreciation**: Relative decrease in the value of machine or a building or any other such article is called depreciation.

 If P is the value of machine at a certain time and R% Per annum is the constant rate of depreciation for n number of years, then the value of the article= P

**Chapter-8/Topics/Polynomials:**

**Polynomials :** An algebraic expression contains single variable, power of single variable is whole number (a number starting from 0 to infinite except fraction and decimal)

**OR A**n algebraic expression in which the exponents of the variable are non-negative integers is called a polynomial.

 **E.g.** 1=1x0, 2x2, 4y5+9y2, 6x+2x3 etc . are polynomials but x-1, = x1/2,, x+y+z are not polynomials.

**Degree:** Highest power of single variable in polynomial is called degree.

 **E.**g. x3+x2+x5+5 , here power of maximum variable is 5 , so degree is 5

**Zero polynomial :** it is not defined e.g. 0

**Constant polynomial :** Degree of polynomial is zero.

**E.**g. 1=1x0 here power of variable is 0 so degree is 0 basis of this definition we can say all real numbers are zero polynomial

**Linear polynomial :** Degree of polynomial is one

 **E.**g. x, x+2, y+3, etc…………

**Quadratic polynomial :** Degree of polynomial is 2

 **E.**g. 4x2+5x+6, x2+1, etc……………

**Cubic polynomial :** Degree of polynomial is 3

 **E.**g. x2+9x3+5, y3, z3+z2, etc………..

**Quadratic polynomial :** Degree of polynomial is 4

 **E.**g. x4+x3+x+2, z4, etc……

**Remarks:** we can define polynomial with help of degree.

**Standard form of polynomials :** When the terms of a polynomial are written in decreasing order of the powers of the variable or degree, it is called polynomial in the standard form.

 **E.**g. x4-4x3+5x2-x+1

**Division of a Polynomial by a Monomial:**  There are two methods for dividing a polynomial by a monomial

1. Divide each term of the polynomial by a monomial

E.g. Divide: (6x3+3x2-3 x) by 3x= =

 =

1. By factorizing the given polynomial which is to be divided by monomial in such a way that one of the factors is taken out as common and that factor is the same as the given monomial.

E.g. Divide: (6x3+3x2-3 x) by 3x ==

 =

**Division of polynomial by a binomial or polynomial** : There are two methods of division of a polynomial by a monomial.

1. Factor method: IF possible, factorise the dividend in such a way that one factor is common of divisor.

Factorisation of polynomial has two methods:

Firstly by using standard identities [(a+b)2=a2+b2+2ab ,

(a-b)2=a2+b2-2ab , (a2-b2)=(a-b)(a+b) ]

Secondly by using split into middle terms

Drawback of this method is dividing is only possible which have factors otherwise remain the same, we cannot break further to make answer in simple form.

1. Long division method: this method we can use when degree of dividend is greater than or equal to degree of divisor.

E.g. Divide (6-3x+6x2) by (-3+2x)

Solution: Step 1 :- Write the divisor(-3+2x) and dividend(6- 3x+6x2) in decreasing the degree of polynomials or in standard form.

Step 2:- Make the degree same by multiplying (-3+2x) by 3x then subtract dividend to multiplied the process continue till either remainder zero or remainder degree less than degree of divisor.



Here, divisor is not factor of dividend.

**For verification of answer : (Dividend=Divisor x Quotient +Remainder)**

**If a polynomial p(x) is divided by another polynomial q(x) and leaves remainder zero and gives the quotient r(x), then P(x)=q(x)r(x), thus q(x) is the factor of p(x).**

**Chapter-9/Topic/Linear Equations in one variable:**

**Definition**: A linear equation in one variable is an equation in which the highest power of the variable is one.

 The standard form of linear equation in one variable is ax+b=c, where a, example: x+3=5, 3y+9=5 etc

**Question**: Find the value of y in 3y+9=-6

**Answer:** Transposing 9 from LHS to RHS will become negative, i.e 3y=-6-9=-15

 Y=-5 (Transposing 3 from LHS to RHS it goes divide RHS)

**Equations of the Form , Where cx+d**

Question: Solve:

Do the cross multiplication on both sides, we get

 3(2x+3)=5(3x-1)15x-1

 6x-15x=-1-9( transposing 15x from RHS to LHS and 9 from LHS to RHS)

 -9x=-10( Transposing -9 from LHS to RHS)

Applications of Linear Equations:

Step I : Read the given problem carefully and note down what is given and what is required.

Step II: Represent the unknown quantity by any variable , such as x, y, z, p ,q etc.

Step III: Translate the statement of the given word problem step by step into a mathematical statement.

Step IV: Using the given conditions, formulate an equation.

Step V: Solve the equation for unknown quantity.

Step VI: After finding the solution, check whether the solution obtained, satisfies the equation or not.

**Chapter-11/Topics/Understanding Quadrilaterals**

Line: It has no end points( it will be straight)

Ray: It has only one end point (it will be straight)

Line segment: It has both end points (it is straight line)

Curve: A plane figure formed by joining a number of points without lifting a pencil from the paper and without retracing any portion of the drawing other than single point is called a curve.

Open Curve: The curve is open

Closed curve: The curve is closed

Simple closed curve: The curve which is closed not intersect itself e.g. Cirlce, rectangle , etc.

Closed curve but not simple: The curve intersect itself:

Polygons: It is simple closed figure which is made of line segment.

|  |  |  |  |
| --- | --- | --- | --- |
| S.N. | Number of sides | Shape of polygon | Name of the polygon |
| 1 | 3 |  | triangle |
| 2 | 4 |  | quadrilateral |
| 3 | 5 |  | pentagon |
| 4 | 6 |  | hexagon |
| 5 | 7 |  | heptagon |
| 6 | 8 |  | octagon |
| 7 | 9 |  | nonagon |
| 8 | 10 |  | decagon |
| 9 | n | ------------------------------------- | n-gon |

Regular polygon: A polygon whose all line segments as well as all interior angles are equal is called regular polygon

 E.g. Three sided regular polygon is equilateral triangle, four sided regular polygon is square, five sided regular polygon is regular pentagon, further regular polygon name is depend on the basis of side.

Adjacent sides: Any two sides with a common end point or vertex are called the adjacent sides of the polygon.

Adjacent vertices: The end points of the same side of a polygon are known as the adjacent vertices.

Diagonal: A diagonal is a line segment connecting two non-consecutive vertices of a polygon.

Interiors and Exteriors of a curve: A closed curved drawn on a plane of paper can be divided into

1. `The points lying inside the curve or the interior of the curve
2. The points lying on the curve or the boundary of the curve
3. The points lying outside the curve or the exterior of the curve

Convex Polygons: All interior angle is less than straight angle.

Concave polygons: One interior angle is greater than straight angle.

Quadrilaterals: It is simple closed figure which is made up four line segment. Sum of all interior angle is 3600. Six types of quadrilaterals we have.

1. Parallelogram 2. Rectangle 3. Rhombus 4. Square

5. Trapezium 6. Kite

 **Chapter-12 :-------**

Chapter-15/Topics/ Statistics and probability

Data: Collection of information is called Data.

Statistics: It is science of collecting classification, summarizing, analyzing and interpreting numerical facts.

Observations: Information in the form of numerical figure. E.g. (25, 28, 34, etc.)

Raw Data: Collection of all the observations is called raw data.

Examples: Weight of class VIII students, Height of class VIII students.

Range: The difference between the highest and lowest values of the observation in the given data is called its range.

Frequency: The number of times a particular observation occurs is called its frequency.

Representation of Data can be classified into two parts:

Data

Table

Graph

Frequency distribution table

\

Group frequency distribution table

Bar Graph

Double bar graph

 Histogram

Pie-chart

Frequency Table: A table showing the frequencies of various observations of a data is called frequency table.

|  |  |  |
| --- | --- | --- |
| S.N. | Marks | Number of students |
| 1 | 40 | 4 |
| 2 | 65 | 6 |
| 3 | 72 | 3 |
| 4 | 89 | 1 |
| 5 | 96 | 3 |

Example: Show the marks in mathematics out of 100 in frequency distribution table.

|  |  |  |
| --- | --- | --- |
| S.N. | Marks | Number of students |
| 1 | 0-20 | 1 |
| 2 | 20-40 | 6 |
| 3 | 40-60 | 7 |
| 4 | 60-80 | 6 |
| 5 | 80-100 | 5 |

Group frequency distribution table: A table showing the frequencies of various class intervals is called a frequency distribution table and the data in this form is called of grouped frequency distribution table.

Example: 0-20, 20-40, 40-60, 60-80, 80-100 are called class interval

Lower limit of first class interval is 0 and upper class interval is 20, similarly we can find lower limit and upper limit of any class interval.

Size: The difference between upper limit and lower limit of any class interval.

E.g. Class size of given class interval is [20-0=40-20=60-40=80-60=100-80=20].

Bar Graph: It is a pictorial representation of the numerical data by a number of rectangles of uniform width erected vertically from the same box line, with equal spacing between them.

Pie-Chart or Circle graph: A Circle graph shows the relationship between whole and its parts. The circle is divided into different sectors. Size of each sector is proportional to the information it represents.

Drawing a pie-Chart: The quantity of different fruits sold in fruit market in one is given in % as follows.

|  |  |
| --- | --- |
| Fruit | % of fruit of sold |
| AppleMangoBanana | 25%50%25% |

Let us represent this data in a pie chart. The total angle at the centre of a circle is 3600. The central angles of the sectors will be fraction of 3600. Let us now calculate the central angle of all the sectors.

|  |  |  |  |
| --- | --- | --- | --- |
| Fruit | % of fruit sold | Fractions | Fractions of 3600 |
| AppleMangoBanana | 25%50%25% |  |  =900 =1800 =900 |

****Step 1: Draw a circle with any radius.

 Mark the centre as O and radius

Step 2: Angle of sector for apples is 900.

 Draw angle AOB=900.

Step 3: Angle of sector for mangoes is 1800.

 Draw angle BOC =1800.

Step: Angle AOC= 900 which represents

 The angle of sector for bananas.

Experiment: It means an operation which can produce some well-defined outcomes(s).

Trial: When we perform an experiment, it is called a trial of the experiment.

Example: Tossing a coin is called trial of the experiment.

Event: An outcome of the trial is called an Event.

Example: Tossing a coin is called trail and the outcome either Head or Tail is called an event.

Example: Throwing a die is called trail and the outcomes getting 1, 2, 3, 4, 5, and 6 are event.

Probability: It is uncertain things, like most probably Ankit will stand firs in the annual examination.

Probability of an event=

The range of probability 0

Even Number: It is multiple of 2. [ 2, 4, 6, ……………………]

Odd Number: It is not a multiple of 2.[ 1, 3, 5, ………………]

Prime Number: It has only two factors one and itself. [2, 3, 5, 7, 11, ………….]

Composite Number: It has more than two factors. [4, 6, 8, 9……………..]

Questions: When a dies is thrown, list the outcomes of an event of getting.

1. A prime number
2. A composite number
3. A number less than 4
4. A number more than 4
5. Even number
6. Odd number

 **Chapter-16:----**