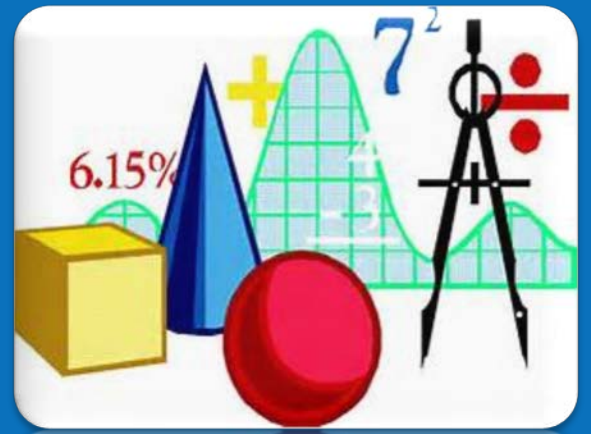


# Mathematics



**The Core concepts of Mathematics for Class VII are as follows:**

## Class VII

Number System

Ratio and Proportion

Algebra

Geometry

Mensuration

Data Handling

## Theme 1: Number System

In this theme the rules developed by children for addition and subtraction of integers will be extended to the formation of rules for their multiplication and division by using patterns and generalization.

Another important type of number called rational number will also be introduced in this class. This exposure will develop children's understanding about various kinds of numbers as a system and a structure. At this stage a relationship will also be established between fractions and rational numbers for which children will extend the rules used for performing operations on fractions to integers. This is also the time when children will be enabled to understand that fractions are not only representing part of a whole but also a number that operates on quantities. Extension of fractions and rational numbers is further done to decimal fractions. Once children understand that decimal notation of numbers is another convenient way of writing fractions with denominator as 10, 100, 1000 etc, they will be able to form rules for operating decimal fractions too. Children's exploration on properties of natural numbers through a play way method will help in learning exponential form of numbers, divisibility rules, LCM and HCF. The learning of Sets and their types and use in daily life is further extended in this class.

### Learning Outcomes:


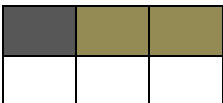
Children will be able to:

- multiply integers by using patterns and generalize the rules to multiply a positive integer by a negative integer, a negative integer by a positive integer and two negative integers;
- divide integers by using patterns;
- get a feel of necessity of rational numbers;
- perform operations on rational numbers (addition, subtraction, multiplication and division);
- understand and use fraction as an operator;
- find reciprocal of a fraction;
- multiply fractions by using patterns/paper folding/pictures and form general rules;
- divide fractions by using patterns/visualization/picture and forms rules;
- solve word problems involving mixed fractions and operations on them;
- represent rational number as a decimal and vice-versa;
- multiplication and division of decimal fractions;
- use exponential form;
- revise idea of sets;
- define equal, equivalent, and universal sets.

## Number System

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<ul style="list-style-type: none"> <li>➤ Multiplication and division of integers</li> <li>➤ Properties of operations on integers: Commutativity, associativity, existence of identity and inverse and distributivity (Only for discussion, no assessment).</li> <li>➤ Problem solving using operations on integers</li> <li>➤ Introduction to rational numbers (with examples only, representation on number line and word problems not required)</li> <li>➤ Decimal representation of rational numbers</li> <li>➤ Problem solving using operations on rational numbers and decimal fractions</li> <li>➤ Fraction as an operator</li> <li>➤ Reciprocal of a fraction</li> <li>➤ Multiplication and division of decimal fractions</li> <li>➤ Exponents only natural numbers. (Expressing any natural number in exponent form only, and also finding the value of given exponents without using any Laws. Only problems such as, <math>4^3</math>, <math>2^3</math>, <math>3^4</math>, <math>3^2 + 6^2</math> to be included.</li> <li>➤ Revision of idea of sets without solving any sums based on representation of sets, Roster form, tabular form, finite, infinite sets etc.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Revising previous concepts learnt by children.</li> <li>➤ Building on children's previous learning.</li> <li>➤ Involving children in discussion to find their own ways of multiplying integers using their understanding about the rules for multiplication and division of whole numbers</li> <li>➤ Providing enough time to children to use patterns in multiplying a negative integer by another integer as this may be a new idea. Up till now they have learnt that multiplication is repeated addition or an operator in case of fractions. Sufficient time should be given to children to appreciate why the product of two negative integers is positive.</li> <li>➤ Encouraging children to explore and use the concept of dividing a natural number by another by simply finding the number which when multiplies the divisor gives the dividend as product. So to find <math>-4 \div -2</math> we have to find the number which on multiplication with <math>-2</math> gives the result <math>-4</math>. Many children will be able to infer that the required number must be <math>+2</math>. Many such examples will help the child to make their own rule like <math>+ve \div -ve = -ve</math>, <math>-ve \div +ve = -ve</math> and <math>-ve \div -ve = +ve</math>.</li> <li>➤ Involving children in classification of numbers on the basis of their properties like even, odd, multiples and factors. These numbers can be used to classify numbers in to various categories</li> <li>➤ Introducing divisibility rules using patterns, and then different division problems could be discussed to show their use. For example, let children form multiplication tables of different numbers like 2, 3, 4, etc. and then from</li> </ul>	<ul style="list-style-type: none"> <li>➤ Shapes used in daily life (for demonstrating number system, algebra, geometry mensuration and data handling)</li> <li>➤ Geoboard with rubber bands (for demonstrating various shapes and Charts)</li> <li>➤ Brief life history of mathematicians with their contributions at elementary level.</li> <li>➤ Maths Kit</li> </ul>

## Number System

Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<p>➤ Equal, equivalent, universal sets</p>	<p>the multiplication facts ask them to identify the pattern like multiple of 3 has sum of its digits divisible by 3, multiple of 5 has either 5 or zero in its ones place etc.</p> <p>➤ Utilising children's knowledge about describing multiplication of fractions as operator 'of' and explain by paper folding, shading parts of whole etc. for example <math>\frac{1}{3} \times \frac{1}{2}</math> is one-third of one-half which can be shown as:</p> <div style="text-align: center;">     </div> <p>The double shaded region is one-sixth of the whole which shows that <math>\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}</math>.</p> <p>➤ Solving of sums by children and observing the pattern that in all cases the product of fractions can be obtained by multiplying their numerators and their denominators</p> <p>➤ Providing opportunities to children to observe and find through pictures that <math>\frac{1}{2} \div \frac{1}{4}</math> means the number of one-fourths in one-half. Simple visualization is required to find that one-half contains two one-fourths. Let children observe the patterns and find their own ways of dividing a fraction by another fraction.</p> <p>➤ Conducting discussion with children to observe and generalise that to divide a fraction by another fraction (non-zero) can be done by multiplying the dividend by reciprocal of the divisor.</p> <p>➤ Involving children in exploring their own ways of writing repeated</p>	

<b>Number System</b>		
<b>Key Concepts</b>	<b>Suggested Transactional Processes</b>	<b>Suggested Learning Resources</b>
	<p>multiplication in a short form as repeated addition is represented by multiplication. With discussion let the children reach the conclusion of writing repeated multiplication in exponent form.</p>	

**Life Skills:** Solving daily life problems

## Theme 2: Ratio and Proportion

This theme will focus on developing children's ability to solve higher problems on the use of ratio and proportion in daily life in this class. Children are enabled to use ratio, proportion and their properties appropriately in problem solving. The idea of percentage, unitary method, simple interest, time, work and speed are also introduced through simple daily life problems. Children will appreciate that this is the part of mathematics that they can use the most in their daily lives.

### Learning Outcomes:

Children will be able to:

- rewrite fractions and decimals into percentage and vice-versa;
- solve problems related to profit and loss (single transaction only);
- apply simple interest (time period in complete years) in daily life situations.

<b>Ratio and Proportion</b>		
<b>Key Concepts</b>	<b>Suggested Transactional Processes</b>	<b>Suggested Learning Resources</b>
<ul style="list-style-type: none"> <li>➤ Converting fractions and decimals into percentage and vice-versa.</li> <li>➤ Application to profit and loss: single transaction only. (Only Profit, Loss, Profit % and Loss %. Discount problems not required)</li> <li>➤ Application to simple interest (time period in complete years).</li> </ul>	<ul style="list-style-type: none"> <li>➤ Children know about many ways of comparing quantity. Utilise their experiences to conclude that ratio is another way of comparing quantities. Percentages and their applications are also in child's daily life experiences which can be used to form various formulae and solving problems using them.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Maths Kit</li> </ul>

**Life Skills:** Solving daily life problems

## Theme 3: Algebra

Children in class VI were exposed to and were enabled to understand that algebra is an extension and generalization of arithmetic. Letters for numbers are to be seen as a compact language to express situations in expressions. The basic idea of various terminologies that form the language to learn algebra is also to be communicated to children in a gradual manner. Children should get a feel that algebra is just extension of numbers and quantities. They should also gain fluency in mathematical language through operations on algebraic expressions and solving linear equations.

### Learning Outcomes:

Children will be able to:

- generate algebraic expressions involving one or two variables/unknowns;
- add and subtract algebraic expressions;
- express situations in simple linear equations and find solution of related problems.

<b>Algebra</b>		
<b>Key Concepts</b>	<b>Suggested Transactional Processes</b>	<b>Suggested Learning Resources</b>
<ul style="list-style-type: none"> <li>▷ Generate algebraic expressions</li> <li>▷ Performs simple operations (addition and subtraction) on algebraic expressions with integral coefficients only.</li> <li>▷ Simple linear equations in one variable (in contextual problems) with two operations. (Simple word problems with two operations is included)</li> </ul>	<ul style="list-style-type: none"> <li>▷ Revising previous concepts learnt by children.</li> <li>▷ Building on children's previous learning.</li> <li>▷ Use child's context and encourage them to generate algebraic expressions by proper choice of variable/unknown and operations.</li> <li>▷ Child's daily life experiences like adding/subtracting a group of 2 notebooks and 5 pencils to/from another group of 3 notebooks and 8 pencils etc. Let children form their own rule that like terms can only be added or subtracted.</li> </ul>	<ul style="list-style-type: none"> <li>▷ Notebooks, pencils, pens, etc.</li> <li>▷ Textbooks</li> </ul>

**Skills:** pursuing assumptions to logical conclusions

## Theme 4: Geometry

Children in this class will be enabled to perceive relationships between properties and figures. The children will develop the ability to give the minimum number of properties, eliminating redundancies and formulate meaningful definitions and understand inclusion relationships. Note that if a student is requiring to "know a definition" before attaining this level, it will be a memorized definition with little meaning to the student. Their concept definition is likely not to match their concept image.

### Learning Outcomes:

Children will be able to:

- ☑ identify pairs of angles like linear, supplementary, complementary, adjacent and vertically opposite and finds the one when other is given;
- ☑ verify angle sum and other properties of triangles and uses these properties to find unknown elements of a triangle;
- ☑ construct simple triangles when three out of six elements are given (like three sides, two sides and included angle, a side and two angles etc.).

<b>Geometry</b>		
Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
<ul style="list-style-type: none"> <li>➤ Pairs of angles (linear, supplementary, complementary, adjacent, vertically opposite)</li> </ul> <p>NOTE: Concept to be explained clearly but the level of difficulty should be reduced</p> <ul style="list-style-type: none"> <li>➤ <b>Properties of triangles:</b> <ul style="list-style-type: none"> <li>☛ Angle sum property</li> <li>☛ Exterior angle property</li> <li>☛ Construction of simple triangles. (SSS, SAS, ASA, RHS).</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>➤ Revising previous concepts learnt by children.</li> <li>➤ Building on children's previous learning</li> <li>➤ Using diagrams to help children in visualizing the relationship between various pairs of angles when a transversal cuts two lines (parallel and non-parallel), angles of triangle and relationship among its sides.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Maths Kit</li> <li>➤ Geoboard with rubber band</li> <li>➤ Geometry box</li> </ul>

**Skill:** Identify, visualise and quantify measures of shapes and objects



## Theme 5: Mensuration

This theme will focus on developing children's understanding and ability on measurement of area, volume and capacity. This begins with children finding rules/forming formulae for standard figures like cube, cuboid, etc. The major focus will be on finding the area of 2-D shapes. It is also expected that children will be able to learn to write measurement in smaller and larger units with conversion.

### Learning Outcomes:

Children will be able to:

- ☑ measure approximate area of simple regular and irregular closed shapes by using unit square grid sheet;
- ☑ form formulae to find area of the region enclosed in a rectangle and a square as a better way of counting the number of units squares that fill them completely.

<b>Mensuration</b>		
<b>Key Concepts</b>	<b>Suggested Transactional Processes</b>	<b>Suggested Learning Resources</b>
<ul style="list-style-type: none"> <li>➤ Revision of perimeter and Idea of Circumference of Circle</li> <li>➤ Area of a circle.</li> <li>➤ Concept of measurement using a basic unit area of a square, rectangle, triangle, circle, and combined figures (2 similar figures to be combined- 2 squares, 2 rectangles, 2 circles).</li> </ul>	<ul style="list-style-type: none"> <li>➤ Revising previous concepts learnt by children.</li> <li>➤ Building on children's previous learning</li> <li>➤ Involving children in activities targeted to measurement of region enclosed by closed figures on a plan surface and encouraging them to come to the conclusion that a unit is required.</li> <li>➤ Conducting activities related to measuring units squares within a figure drawn on a square grid and to compare the various regions.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Maths Kit</li> </ul>

## Theme 6: Data Handling

Finding a representative value for a given set of observations called data is a necessary requirement in most of the daily life situations, like one number for heights of the children in a class, number of children in a class when numbers of total children in all classes of the school is known etc. This theme aims at developing children's understanding about the meaning and use of averages like mode of simple data not having more than 15 observations.

### Learning Outcomes:

Children will be able to:

- ☑ find various representative values (mode) for simple data from daily life;

Data Handling		
Key Concepts	Suggested Transactional Processes	Suggested Learning Resources
▷ Mode of ungrouped data – understanding what they represent	<ul style="list-style-type: none"><li>▷ Revising previous concepts learnt by children.</li><li>▷ Building on children's previous learning</li><li>▷ Involving children in drawing inferences for future events from the existing data</li></ul>	▷ Maths Kit

**Integration:** Arts Education

**Life Skills:** Understanding and interpreting data, drawing inferences