

MATHEMATICS CURRICULUM

GRADES 6-8

Curriculum Aims

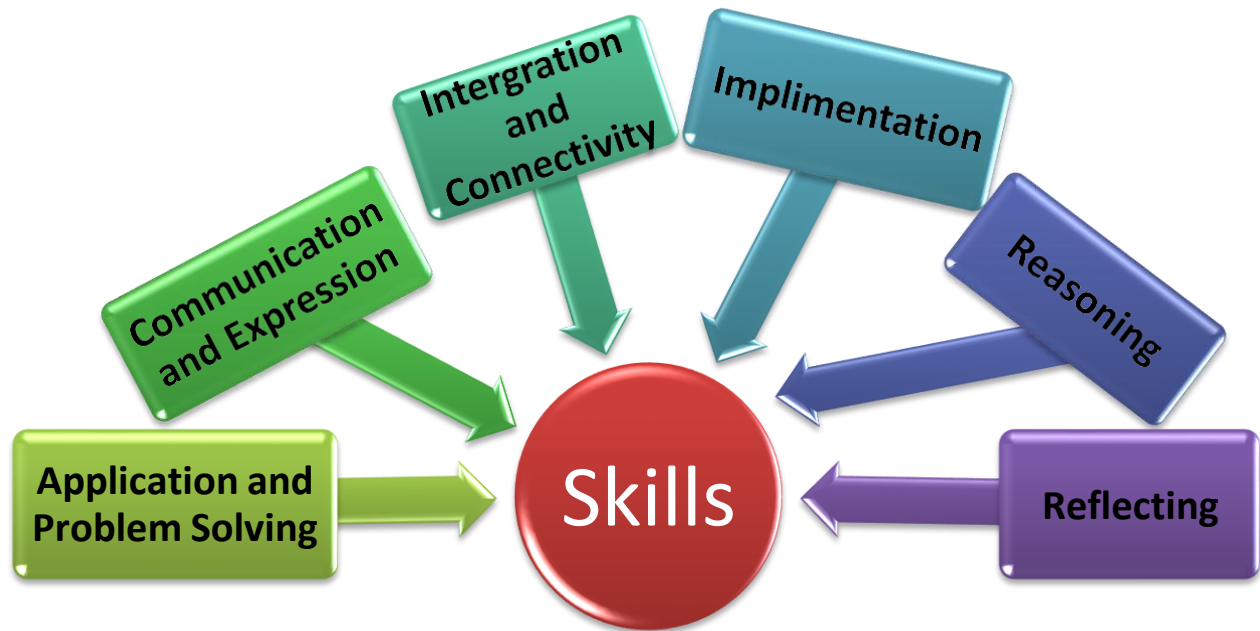
The learning of mathematics through an enquiry-based approach provides opportunities for the child to explore the nature of mathematics, to acquire the knowledge, concepts and skills required for everyday living, for use in other subject areas and to develop eco- friendly attitude & behavior.

The Importance of Mathematics

The learning of mathematics results in more than a mastery of basic skills. It equips students with a concise and powerful means of communication. Mathematical structures, operations, processes and language provide students with a framework and tools for reasoning, justifying conclusions and expressing ideas clearly. Through mathematical activities that are practical and relevant to their lives, students develop mathematical understanding, problem-solving skill and related technological skills that they can apply in their daily lives and eventually in the workplace.

Mathematics is a powerful learning tool. As students identify relationships between mathematical concepts and everyday situations and make connections between mathematics and other subjects, they develop the ability to use mathematics to extend and apply their knowledge in other curriculum areas including science, music, art and language.

Key Skills Developed



Application and Problem Solving

Problem solving is central to learning mathematics. By learning to solve problems and by learning through problem solving, students are given numerous opportunities to connect mathematical ideas and to develop conceptual understanding. Problem solving forms the basis of effective mathematics programs and should be the mainstay of mathematical instruction.

Communication and Expression

Communication is the process of expressing mathematical ideas and understanding orally, visually, and in writing, using numbers, symbols, pictures, graphs, diagrams, and words. Communication is an essential process in learning mathematics. Through communication, students are able to reflect upon and clarify their ideas, their understanding of mathematical relationships, and their mathematical arguments.

Integration and Connectivity

As students make connections, they begin to see that mathematics is more than a series of isolated skills and concepts, and that they can use their learning in one area of mathematics to understand another. Seeing the relationships among procedures and concepts also helps develop mathematical understanding. In addition, making connections between the mathematics they learn at school and its applications in their everyday lives not only helps students understand mathematics but also allows them to see how useful and relevant it is in the world beyond the classroom.

Implementation

Students need to develop the ability to select the appropriate electronic tools, manipulative, and computational strategies to perform particular mathematical tasks, to investigate mathematical ideas, and to solve problems.

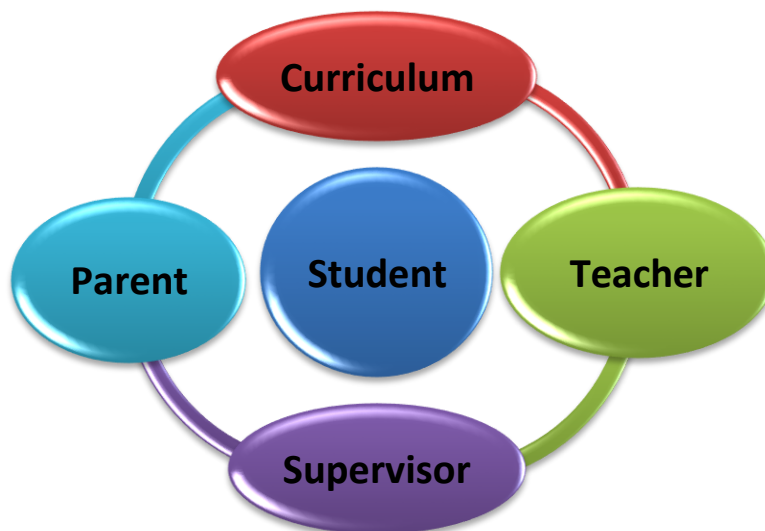
Reasoning

The reasoning process supports a deeper understanding of mathematics by enabling students to make sense of the mathematics they are learning. Students should be encouraged to reason from the evidence they find in their explorations and investigations.

Reflecting

Reflecting on the reasonableness of an answer by considering the original question or problem is another way in which students can improve their ability to make sense of problems. Reflecting on their own thinking and the thinking of others help students make important connections and internalize a deeper understanding of the mathematical concepts involved.

Roles and Responsibilities in Mathematical Education



Students. Students have many responsibilities with regard to their learning. Students who are willing to make the effort required and who are able to apply themselves will soon discover that there is a direct relationship between this effort and their achievement in mathematics. However, for some students who will find it more difficult to take responsibility for their learning because of special challenges they face the attention, patience, and encouragement of teachers and family can be extremely important factors for success. However, taking responsibility for their own progress and learning is an important part of education for all students. Students are also encouraged to pursue opportunities outside the classroom to extend and enrich their understanding of mathematics

Parents. Parents have an important role to play in supporting student learning. By becoming familiar with the curriculum, parents can find out what is being taught in each grade and what their child is expected to learn. This awareness will enhance parents' ability to discuss schoolwork with their child, to communicate with teachers, and to ask relevant questions about their child's progress. The mathematics

curriculum has the potential to stimulate interest in lifelong learning not only for students but also for their parents and all those with an interest in education.

Teachers. Teachers and students have complementary responsibilities. Teachers are responsible for developing appropriate instructional strategies to help students achieve the curriculum expectations, and for developing appropriate methods for assessing and evaluating student learning. Teachers bring enthusiasm and varied teaching and assessment approaches to the classroom, addressing different student needs and ensuring sound learning opportunities for every student.

Recognizing that students need a solid conceptual foundation in mathematics in order to further develop and apply their knowledge effectively, teachers endeavour to create a classroom environment that engages students' interest and helps them arrive at the understanding of mathematics that is critical to further learning. Opportunities to relate knowledge and skills to wider contexts will motivate students to learn and to become lifelong learners.

Supervisor. The supervisor works in partnership with teachers and parents to ensure that each student has access to the best possible educational experience. To support student learning, they should ensure that the curriculum is being properly implemented in all classrooms through the use of a variety of instructional approaches, and that appropriate resources are made available for teachers and students. To enhance teaching and student learning in mathematics, supervisors promote learning teams and work with teachers to facilitate teacher participation in professional development activities like PEP and CPD.

Provides Individual Differences

‘Each child is important and each capacity is respected’

Providing a differentiated curriculum is necessary to fulfil the learning needs of all groups of pupils. Appropriate activities are planned to suit the levels of students' ability. Teachers provide support for the low achievers. Support worksheets are given to those students who need improvement.

20% reduction in curriculum for all students with SEND and 50% reduction in curriculum for children with severe learning difficulties. Extra support worksheets are provided for students identified with special needs from Grade 5 -8. Groups are organized in a flexible way to give extra help to some children during the learning activities.

Teachers provide advanced level questions and opportunities for extended learning and research work to G and T within the class rooms. Ownex, Inter school competitions, Math week are platforms to Gifted and Talented students to show their abilities.

Cross-curricular learning:

Math as a core subject can be related to other subjects like Science, Social studies, English, Moral instruction and Art. A large number of scientific formulae are represented in the form of mathematical expressions, for which it is very necessary for the student to have sound mathematical basis. Numerical skills are applied in solving Science problems.

Language is the principal means of communication in every aspect of the learning process. In science, students use a range of language skills, they build subject specific vocabulary, interpret diagrams and charts, and read instructions relating to investigations and procedures.

Real Life Example:

Student learning is linked to daily life situations. Applications of theoretical material in real-life situations make content easier to understand, when it is demonstrated by real-life examples. Hands-on activity is an effective way to learn as students directly observe and learn.

Mental Mathematics:

Mental mathematics is a combination of cognitive strategies that enhance flexible thinking and number sense. It is calculating mentally without the use of external memory aids.

Problem Solving:

Learning through problem-solving should be the focus of mathematics at all grade levels. Students develop their own problem-solving strategies by listening to, discussing and trying different strategies. A problem-solving activity requires students to determine a way to get from what is known to

what is unknown. If students have already been given steps to solve the problem, it is not a problem, but practice. A true problem requires students to use prior learning in new ways and contexts. Problem solving requires and builds depth of conceptual understanding and student engagement. Problem solving is a powerful teaching tool that fosters multiple, creative and innovative solutions.

Creating an environment where students openly seek and engage in a variety of strategies for solving problems empowers students to explore alternatives and develops confident, cognitive mathematical risk takers.

Visualization:

The use of visualization in the study of mathematics provides students with opportunities to understand mathematical concepts and make connections among them. Spatial visualization enables students to describe the relationships among and between 3-D objects and 2-D shapes. Measurement visualization goes beyond the acquisition of specific measurement skills. Measurement sense includes the ability to determine when to measure, when to estimate and which estimation strategies to use.

Collaborative learning:

Collaborative learning refers to methodologies and environments in which learners engage in a common task in which each individual depends on and is accountable to each other. It involves use of small groups so that all students can maximize their learning and that of their peers. Collaborative learning activities can include collaborative writing, group projects, and other activities.

The benefits of collaborative learning include:

- Development of higher-level thinking, oral communication, self-management, and leadership skills.
- Increase in student retention, self-esteem, and responsibility.

Inquiry Based Learning:

Inquiry-based learning (IBL) can encourage students to discover, solve, explore, collaborate, and communicate. Also, IBL makes class more enjoyable for both teachers and students, and can bring students closer to the real experiences of mathematicians.

Digital learning / Innovative practices:

Students will be chosen for the Math Club “Math 360°” through an aptitude test and according to their enthusiasm in taking part in a variety of activities, including digital games that use math concepts, designing utilizing geometrical forms, entrepreneurial activities, and solving Rubik’s cubes.

Math quiz will be conducted during the Math Week to create an interest among the students to develop logical thinking, creative thinking, and higher order thinking skills.

Online practice test based on ASSET questions will be conducted through Microsoft forms to enhance the students’ problem-solving skills

Vision -‘Inspire students to think, design and innovate’

Mission -‘Provide opportunities for students to interact with latest technologies and tools through a multi-disciplinary approach to achieve global standard.’

The students develop the ability to:

- use technology productively
- use common software applications
- acquire the ability to access, evaluate and research information
- integrate ICT across disciplines
- carry on projects, assignments and research using tools of ICT

External Examinations

ASSET/CAT4/TIMSS

ASSET is an internationally administered program of assessments with tests appropriate for grades 6 to 8.

This test enables to evaluate the students in their reasoning, problem solving, logical and higher order thinking skills.

Children are given ample practice for the test. Modification of curriculum are made to fill in the gaps and ensure all topics/skills covered are aligned with TIMSS, CAT4 and ASSET assessments.

Instilling Values and Skills across Curriculum

GEMS Core Values

GEMS Core Values form the foundation of the GEMS educational programme. These Core Values are unique to **GEMS**, and are part of the planned curriculum, woven into the very fabric of school life.

- **Global Citizenship**
Empowering students with a global and local perspective.
- **Leading through Innovation**
Find the courage to challenge convention
- **Growing by Learning**
Developing each student's individuality and discovering their potential
- **Pursuing Excellence**
Developing skills for the future

Assessments - an integral part of teaching and learning

Assessment is an integral part of the teaching and learning process. It involves gathering information through various assessment techniques to grade students. Assessment provides information to the teacher about students' achievement in relation to the learning objectives.

With this information, the teacher makes decisions about what should be done to improve the teaching methods and enhance the learning of the students.

- Assessment provides feedback to **students**, allows them to understand their strengths and weakness. Through assessment, students can monitor their own performance and progress. It also points out to them in the direction they need to improve further.
- Assessment provides feedback to **teachers**, enables them to understand the strengths and weaknesses of their students. It provides information about students' achievement of the learning outcomes as well as the effectiveness of their teaching.
- Assessment provides feedback to **schools**. The information gathered facilitates the promotion of students from one level to the next. It also allows the schools to review the effectiveness of their instructional programme.
- Assessment provides feedback to **parents**, allows them to monitor their children's progress and achievement.

In addition to the written tests, teachers conduct performance-based

assessment using the following suggested modes:

- Inquiry based learning
- Research based project work
- Hands-on activities
- Group Discussions
- Extended learning
- Flipped Classroom
- Power point presentations

Range and Content



Number Sense

Algebra

Geometry

Data Handling

Constructions

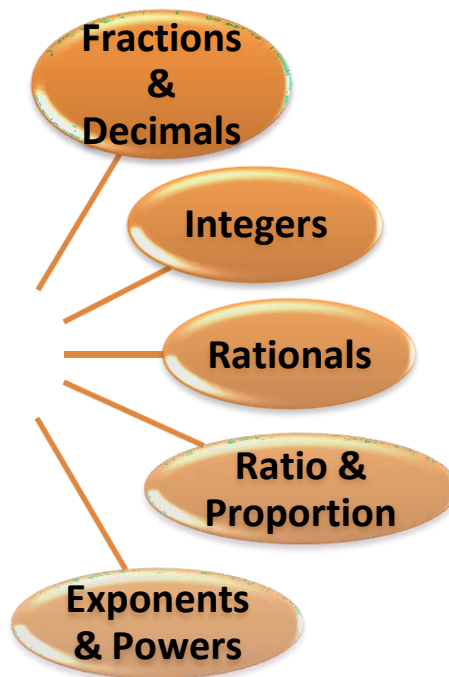
Symmetry & Shapes

ANNEXURE 1
SYLLABUS-MATH

Sl. no	<u>Chapters</u>	<u>Grade 6</u>
1	Knowing our numbers	9-digit numbers - Comparing, Ordering, writing in words and as numeral, conversion of Length, mass and weight to lower units. Word problems involving one or more basic operations with conversion
2	Whole Numbers	Whole Numbers - Number line, Addition, Subtraction and Multiplication, BODMAS Rule for simplification of whole numbers
3	Playing with Numbers	Finding HCF and LCM of given numbers, Solving word problems based on HCF and LCM Relationship Finding factors and multiples of a number. Divisibility rules for 2, 3,4, 5,6, 8, 9, 10 and 11
4	Basic Geometrical Ideas	Point, Types of lines, pair of lines (parallel and intersecting lines) types of angles (acute, right, obtuse, straight, reflex, complete)
5	Understanding elementary shapes	Triangles – types based on sides and angles Quadrilaterals – types and properties Polygons- with different number of sides 3- D shapes – faces, edges and vertices
6	Integers	Introduction, representation, absolute value and additive inverse Comparing, addition and subtraction of integers Word problems based on addition and subtraction
7	Fractions	Addition and subtraction of unlike fractions. Word problems based on addition and subtraction

8	Decimals	Multiplication and division of decimal by whole numbers and by decimal numbers. Plot a decimal number (two decimal places) between two consecutive whole numbers on a number line.
9	Data Handling	Drawing and Interpretation of bar graph
10	Mensuration	Find perimeter and area of square and rectangle. Finding other parameter if perimeter or area is given, Path problems
11	Algebra	Introduction of variables, generalization, framing expressions Solving equations on one variable Word problems on solving equations
12	Ratio and proportion	Concept of Ratio, proportion as equality of two ratios Unitary Method

GRADE 7: NUMBER SENSE



<p>Fractions:</p> <ul style="list-style-type: none">➤ Multiplication and division of fractions by whole numbers as well as fractions➤ Comparison of fractions➤ Application of concepts in real life	<p>Decimals:</p> <ul style="list-style-type: none">➤ Multiplication & division of decimals by 10, 100, 1000 etc➤ Multiplication and division of decimals by whole numbers as well as decimal numbers➤ Application of concepts in real life
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Integers

- Addition and Subtraction of integers
- Multiplication and Division of Integer
- Properties of integers with respect to all four operations
- Word problems based on addition,

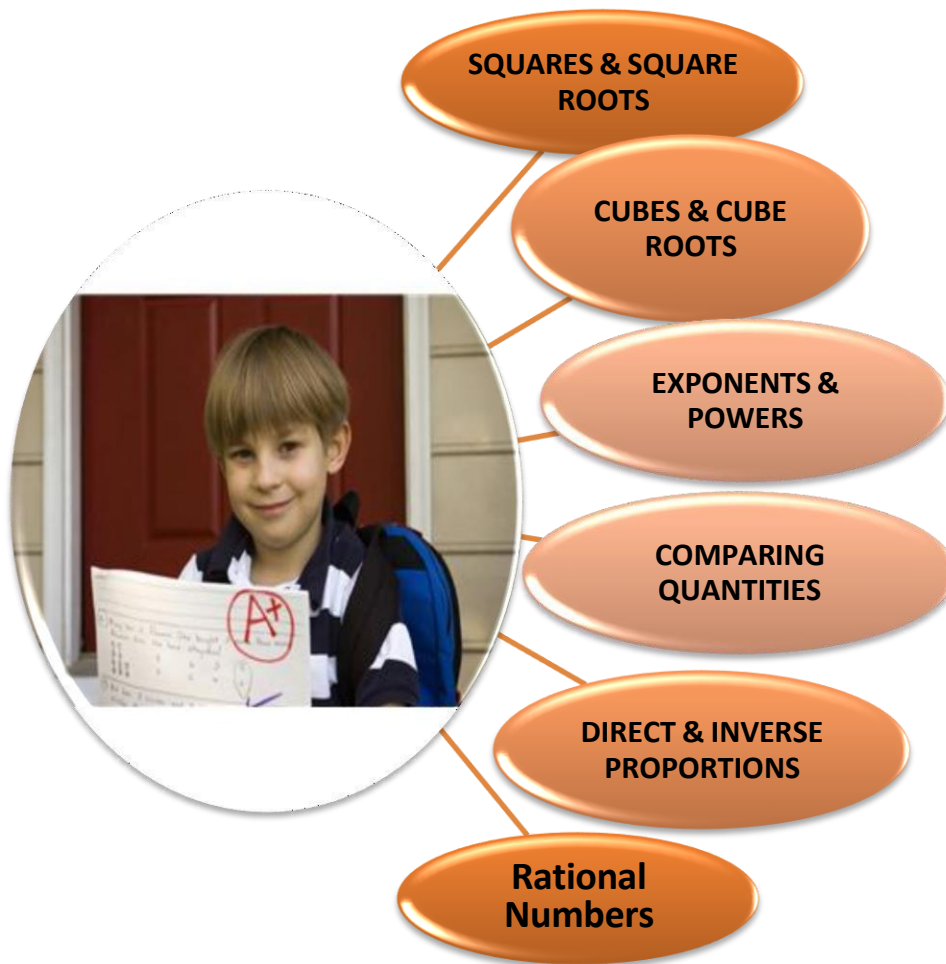
Rational Numbers

- Concept, need and meaning of rational numbers
- Equivalent rational numbers
- Standard Form of rational numbers
- Representation of rational numbers on a number line
- Comparison of rational

<p>subtraction and multiplication of integers</p>	<p>numbers</p> <ul style="list-style-type: none"> ➤ Addition, subtraction, multiplication and division of rational numbers ➤ Finding rational numbers between two given rational numbers ➤ Word problems with applications of all four operations
<p>Ratio & Proportion</p> <ul style="list-style-type: none"> ➤ Concept of ratio ➤ Equivalent ratios and proportion of numbers ➤ Unitary method ➤ Concept of percentage ➤ Conversion of percentage into fraction, decimal and ratio ➤ Conversion of fraction, decimal, ratio into percentage ➤ Finding 'how many' from give percentage and vice-versa ➤ Finding 'whole' when percentage is given ➤ Word problems based on the above ➤ Finding increase and decrease percentage ➤ Finding profit or loss percentage ➤ Finding SP or CP when P% or L% is given ➤ Finding Simple Interest, Amount, Principal, Rate of interest or Time when the remaining data is given 	<p>Exponents & Powers</p> <ul style="list-style-type: none"> ➤ Concept of exponents/powers, base and exponential form (positive powers only) ➤ Expressing given numbers in exponential form using prime factorization method ➤ Simplification using exponential forms ➤ Laws of exponents (positive powers only) <ul style="list-style-type: none"> ▪ Multiplying powers with same base ▪ Dividing powers with same base ▪ Multiplying powers with different base but same exponents ▪ Dividing powers with different base but same exponents ▪ Taking Power of power ▪ Numbers with exponent zero ➤ Simplifications applying laws.

Number Sense

GRADE 8



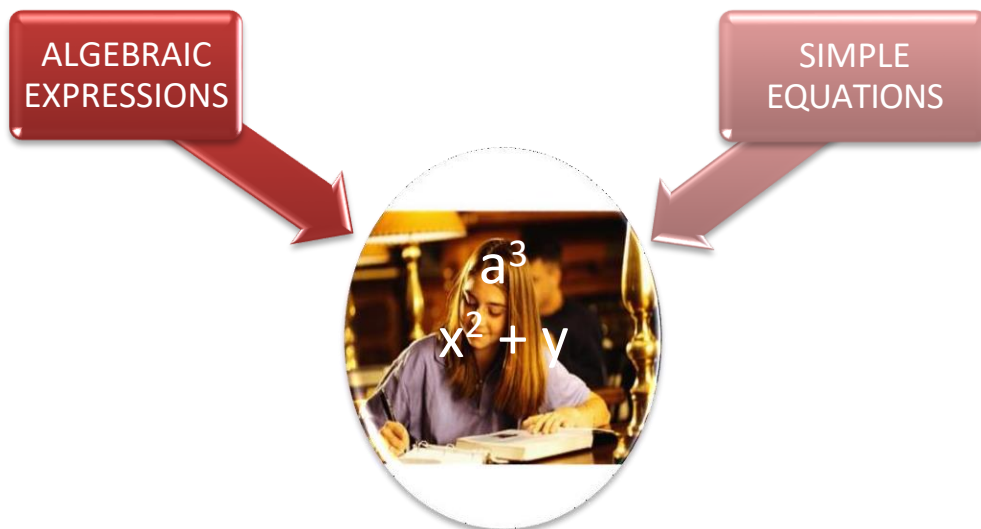
Squares & Square Roots

- The concept and symbols of squares and square roots
- Properties of square numbers and square roots
- Patterns in square numbers and Pythagorean triplets
- Finding square root using methods of Prime Factorisation and Division method
- Squares and Square roots of

	<p>decimals and fractions</p> <ul style="list-style-type: none"> ➤ Application of the above in word problems
<p>Cubes & Cube Roots</p> <ul style="list-style-type: none"> ➤ The concept and symbol of cubes and cube roots ➤ Properties of cube numbers and cube roots ➤ Patterns in cube numbers ➤ Finding cube root using method of Prime Factorisation ➤ Cubes and Cube roots of decimals and fractions ➤ Application of the above in word problems 	<p>Exponents & Powers</p> <ul style="list-style-type: none"> ➤ Laws of exponents (integral powers) <ul style="list-style-type: none"> ▪ Multiplying powers with same base ▪ Dividing powers with same base ▪ Multiplying powers with different base but same exponents ▪ Dividing powers with different base but same exponents ▪ Taking Power of power ▪ Numbers with exponent zero ➤ Simplifications applying laws of exponents. ➤ Expressing very large and very small numbers in Standard Form ➤ Comparing numbers using standard form
<p>Comparing Quantities</p> <ul style="list-style-type: none"> ➤ Advanced problems involving ratio and proportions ➤ Reverse problems on Increase and Decrease percentages ➤ Advance problems involving SP, CP, P% and L% ➤ Compound Interest ➤ Application of compound interest formula to calculate depreciated value and population 	<p>Direct & Inverse Proportions</p> <ul style="list-style-type: none"> ➤ Concept of direct and inverse proportions ➤ Connection to ratio, proportion and unitary method ➤ Word problems involving two components. <p>Rational Numbers</p> <ul style="list-style-type: none"> ➤ Properties of rational numbers ➤ Apply the suitable property to solve problems.

GRADE 7

ALGEBRA



Algebraic Expressions

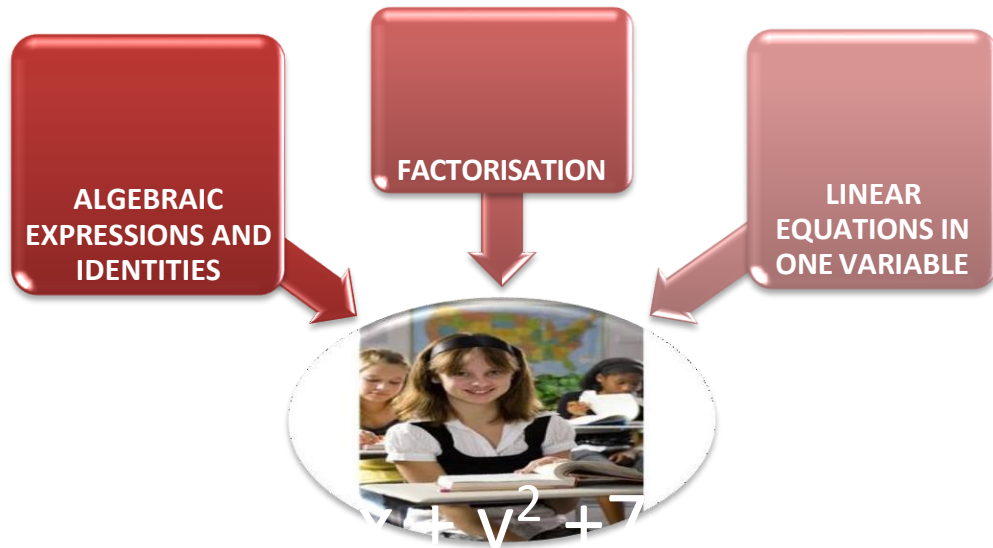
- Generate algebraic expressions
- Identify terms, coefficients
- Identify like and unlike terms
- Classify as monomials, binomials, trinomials
- Addition and subtraction of algebraic expressions with integral coefficients
- Value of an algebraic expression based on value of variable
- Simplification and evaluation

Simple Equations

- Generating simple equations from statements
- Solving an equation using method of transposition
- Verifying the given value as solution of the given equation

Algebra

GRADE 8



Algebraic Expressions and Identities

- Identification of coefficients, terms, factors
- Classification as monomial, binomial, trinomial, polynomials
- Addition and Subtraction of algebraic expressions
- Multiplication of algebraic expressions – direct and by applying identities
 - $(a + b)(a + b)$
 - $(a + b)(a - b)$
 - $(a - b)(a - b)$

Factorisation

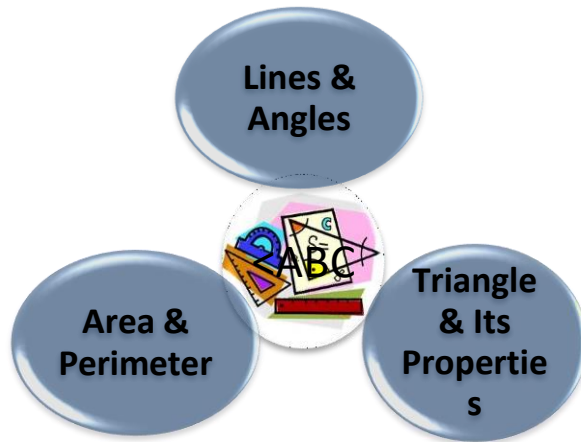
- Concept of factorisation of algebraic expressions
- Factorisation by methods of
 - Common Factors
 - Regrouping
 - Using identities

Linear Equations in one variable

- Solving linear equations using methods of expansion, LCM and/or cross multiplication
- Solving word problems by converting to linear equations.

Geometry

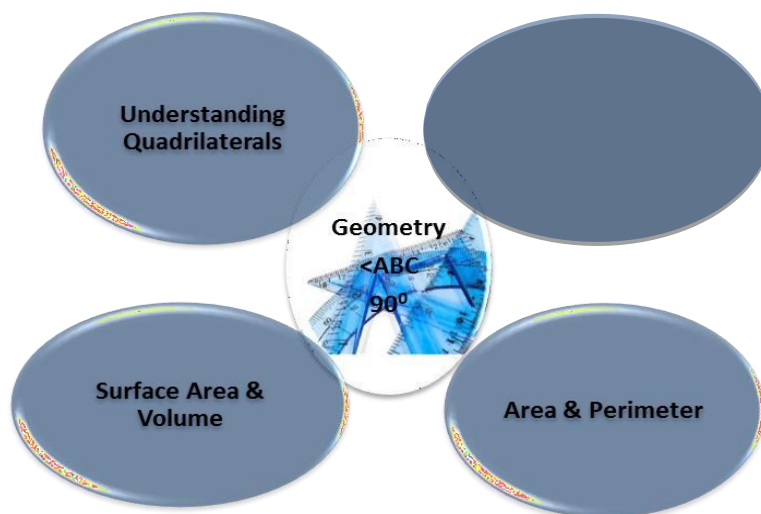
GRADE 7



Lines & Angles <ul style="list-style-type: none">➤ Properties of pairs of angles<ul style="list-style-type: none">▪ Complementary and supplementary angles▪ Adjacent angles & Linear Pair▪ Vertically Opposite angles➤ Parallel lines and properties of angles formed➤ Checking for parallel lines using properties of angles	Triangle & Its Properties <ul style="list-style-type: none">➤ Classification of triangles based on sides and angles➤ Median & Altitude of triangles➤ Properties of triangles<ul style="list-style-type: none">▪ Exterior angle property▪ Angle sum property▪ Isosceles triangle property▪ Triangle inequality property▪ Pythagoras theorem➤ Word problems based on all the above
Area & Perimeter <ul style="list-style-type: none">➤ Area and Perimeter of Plane figures<ul style="list-style-type: none">▪ Triangles▪ Parallelograms	<ul style="list-style-type: none">➤ Circles (concept of “ π ” being introduced)➤ Application of concept in word problems

GEOMETRY

GRADE-8



Understanding Quadrilaterals

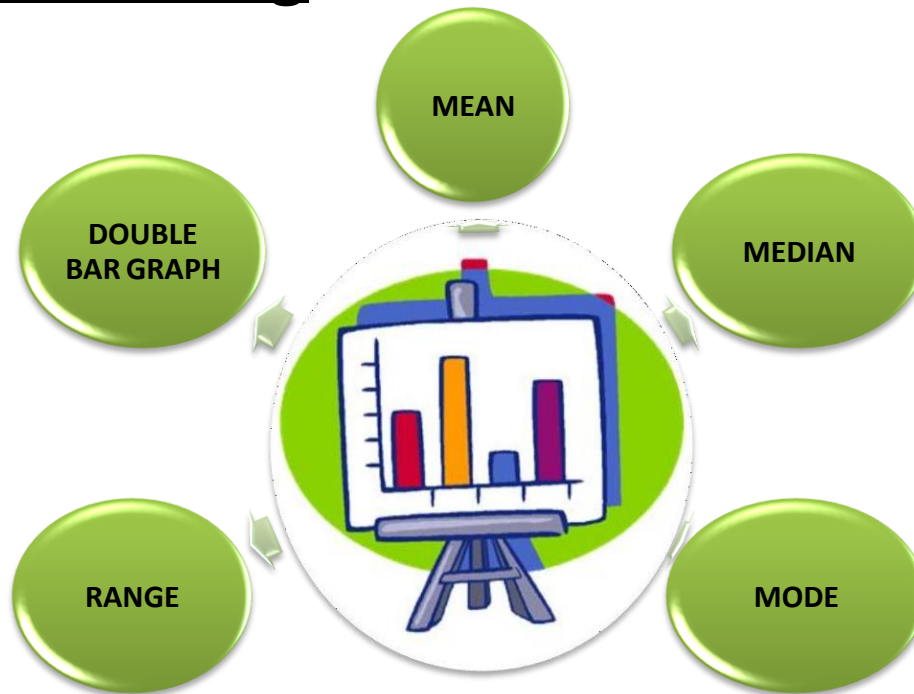
- Polygons – definition and classification
- Convex & Concave polygons; Regular & Irregular polygons
- Angle sum property of polygons with formula $(n - 2) \times 180$
- Exterior angle property of polygons
- Application of concept in word problems
- Exterior angle property of regular polygons
- Classification and properties of quadrilaterals:
 - Kite
 - Trapezium
 - Parallelogram
 - Rectangle
 - Rhombus
 - Square
- Application of the properties to find unknown angles/sides/diagonals (except kite)

Area & Perimeter

- Revisiting area and perimeter of square, rectangle, triangle, parallelogram, circle; with special attention to combination figures
- Area of plane figures:
 - Trapezium
 - Rhombus
 - General Quadrilateral
 - Polygon – by dividing it into areas with known formulae

GRADE 7

Data Handling

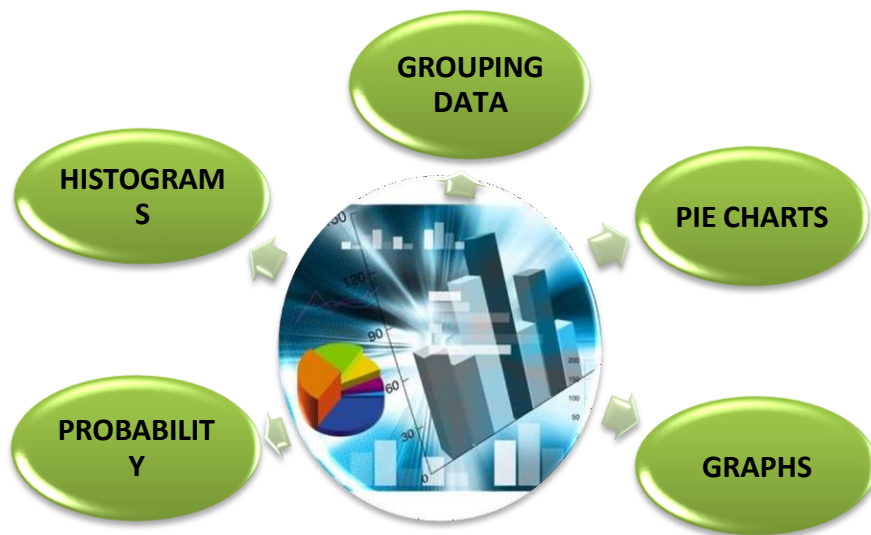


Data Handling

- The concept of data handling
 - Collection of data
 - Organisation of data
 - Representation of data
- Concepts and formulae for Arithmetic Mean, Median, Mode and Range of given data
- Application of the concepts in word problems
- Construction and interpretation of Double Bar Graph
- Basic concepts of probability

GRADE 8

Data Handling



Data Handling

- Preparation of Grouped Frequency Distribution table. Emphasis on concepts of:
 - Class Intervals
 - Class Limits – Upper class limit and Lower-class limit
 - Class Size
 - Class Mark
 - Tally Marks
 - Frequency
- Concept of Histograms
- Interpretation of Histograms
- Concept of Pie Charts
- Interpretation of Pie Charts
- Concept of Probability
- Finding Probability using formula for - Tossing a coin, Throwing a die, Picking up Balls from a bag

Introduction to graphs-Interpretation and plotting coordinate points.

GRADE 7
SYMMETRY & SHAPES

Symmetry

- Concept of symmetry
- Line Symmetry for Regular Polygons, Alphabets
- Concept of Rotational Symmetry
 - Centre of rotation
 - Angle of rotation
 - Order of rotation
- Figures/Polygons having both line and rotational symmetry

Visualising Solid Shapes

- Differentiating Plane and Solid figures (2-D and 3-D figures)
- Recalling Faces, Vertices, Edges of solids
- Drawing and identifying Nets for solids (atleast 2 each)
 - Cube
 - Cuboid
 - Cylinder
 - Cone
 - Tetrahedron
- Oblique and Isometric Sketches of solids
- Views of solids
 - Cross sectional view
 - Shadow view
 - Front, Side, Top View
- Faces, Vertices, Edges and Euler's formula

Assessments

Assessments For Learning(AFL)

In order to fulfill the objectives of AFL and to enable students to improve performance, teachers will use a variety of assessment tools during the course of their teaching. Tools such as

- Problem solving, Multiple choice questions (MCQ)
- Data handling and analysis
- Research projects and presentations
- Subject Enrichment activities.
- Self-Assessment
- Presentations including the use of Information Technology (IT)

The reason different methods are used:

- Learning in different subject areas and aspects of development isto be assessed
- Learners may respond better to one method as compared toanother
- Each method contributes in its own way to teacher’s understanding of learner’s learning

Periodic Assessment Scheme

- Share the learning outcomes and assessment expectations withstudents
- Use clearly defined criteria
- Use examples and exemplars
- Give specific feedback (*which will help to*) Incorporate students Self-Assessment
- Students keep a record of their progress
- Teachers keep records of students’ progress

Scholastic Area

The assessment structure and examination for classes VI to VIII are as follows:

Subjects	TERM-1 (100 marks) (1 st half of the session) 20 marks Periodic Assessment + 80 marks for Half Yearly Exam		TERM-2 (100 marks) (2 nd half of the session) 20 marks Periodic Assessment + 80 marks for Yearly Exam	
	PA 20 marks	Half Yearly Exam	PA 20 marks	Yearly Exam
Language -1 Language -2 Language -3 Mathematics Science Social Science Any other Subjects	<ul style="list-style-type: none"> Periodic Test 10 marks with syllabus covered till announcement of test dates by school Note Book Submission 5 marks at term-end Sub Enrichment 5 marks at term-end 	<ul style="list-style-type: none"> Written exam for 80 marks with syllabus covered till announcement of Half Yearly exam dates by school 	<ul style="list-style-type: none"> Periodic Test 10 marks with syllabus covered till announcement of test dates by school Note Book submission 5 marks at term-end Sub Enrichment 5 marks at term-end 	Written exam for 80 marks with syllabus coverage as below: Class VI: 10% of 1 st term covering significant topics + entire syllabus of 2 nd term Class VII: 20% of 1 st term covering significant topics + entire syllabus of 2 nd term Class VIII: 30% of 1 st term covering significant topics + entire syllabus of 2 nd term

Students in a mathematics class typically demonstrate diversity in the ways they learn best.

It is important, therefore, that students have opportunities to learn in a variety of ways –

individually, cooperatively, independently, with teacher direction, through hands-on experience and through examples followed by practice. In addition, mathematics requires students to learn concepts and procedures, acquire skills, and learn and apply mathematical processes.

These different areas of learning may involve different teaching and learning strategies. Therefore, the strategies teachers employ will vary according to both the object of the learning and the needs of the students

All learning, especially new learning, should be embedded in well- chosen contexts for learning

i.e. contexts that are broad enough to allow students to investigate initial understandings, identify and develop relevant supporting skills, and gain experience with varied and interesting applications of the new knowledge. Such rich contexts for learning open the door for students to see the “big ideas”, or key principles, of mathematics, such as pattern or relationship. This understanding of key principles will enable and encourage students to use mathematical reasoning throughout their lives.

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