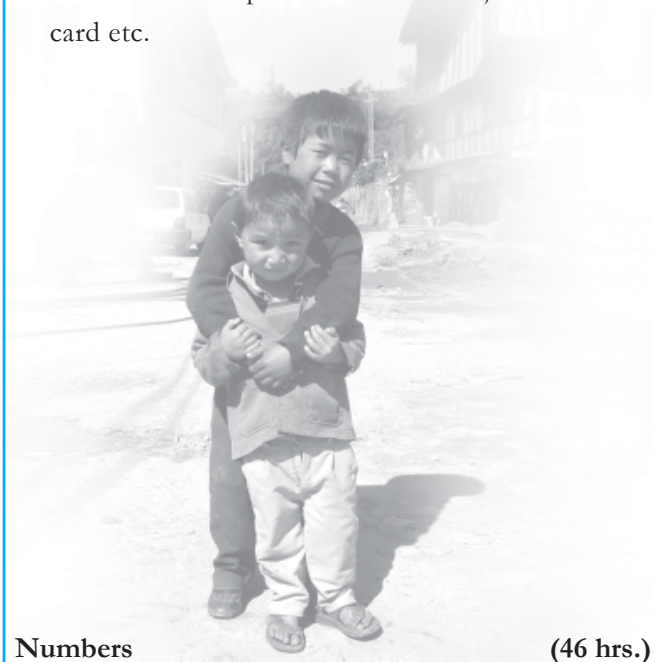
MATHEMATICS

MATHEMATICS CLASSES I – V

General Points for Textbook Writers

1. The following syllabus has been developed keeping the philosophy of the Yashpal Report and the National Focus Group for Teaching Learning Mathematics in view. Keeping in mind the reality of the number of hours that teaching actually takes place in the school, we have kept a thumb rule of 140 periods, of 30-40 minutes each, per year for mathematics. Within this the number of periods allotted to each area is given in the syllabus. However, this is just to give an **approximate idea** of the weightage to be given to a particular topic by writers and others who are transacting the syllabus. **This break-up of time should not be taken as an exact writ by teachers.**
2. We need to encourage the development of a culture of **learning outside the classroom**. If a topic is linked well with experiences, interesting exercises given then conceptual learning of math would continue beyond the 140 periods.
3. The syllabus has been developed in five very natural streams flowing from Class I to Class V, **which overlap** very often, not only with each other but also with themes developed in other subjects that are being learnt simultaneously.
4. While developing the study material, we expect the focus to be activities/exercises, built around children's real-life experiences and from areas across the curriculum. They need to be created in a manner that would meet more than one objective simultaneously, and cover more than one stream at the same time. Further, we must include **extensions to activities** as **part of the main course material**, and not as a supplement, for the learners who feel encouraged to do them. However, as for any activity or experience, the teachers would need to give enough leeway to children, or modify the activity, to suit their interests. In this context, it is important that **children's current local interests and enthusiasms be utilised to the maximum as opportunities for developing math concepts. Enough space, in various ways, must be given for this in the textbooks.**
5. **Mathematics is about** a **certain way of thinking and reasoning**. This should be reflected in the way the materials are written and other activities and exercises created. The teachers' training should reflect this also. Particular stress must be given to allow the child to **articulate her reasons** behind doing an exercise in a certain way, for example, why she is continuing a pattern in a particular way. Such interactive learning will require the teacher to plan for more time to be given for certain concepts in the classroom, and the textbooks would need to allow for this.

6. The **Class I and II books would be workbooks** with short notes for the teacher about suggestions for dealing with the particular topic. (In fact, such notes should probably be incorporated in all the primary books.) The Class I workbook and the other materials would be created with the view to consolidate the mathematical concepts and experiences that the child already has before she joins school, and to build on this background.
7. The language used in the books for Classes III to V should be what the child would normally use and would understand.
8. The sequencing of the concepts should not be linear, but spiral.
9. The book should not appear to be dry and should be attractive to children in various ways. The points that may influence this include the language, the nature of descriptions and examples, inclusion or lack of illustrations, inclusion of comic strips or cartoons to illustrate a point, inclusion of stories and other interesting texts for children.
10. While dealing with problems, the text books should have several situations with multiple correct solutions. Make the children aware that there can be several strategies for teaching a problem.
11. The material regarding patterns should be created in a way that would allow the child to observe patterns to generalise them, and to develop her own patterns.
12. The purpose is not that the children would learn known definitions and therefore never should we begin by definitions and explanations. Concepts and ideas generally should be arrived at from observing patterns, exploring them and then trying to define them in their own words. There should be no overt emphasis on remembering definitions in known standard forms in exactly the same words.
13. Problem posing is an important part of doing maths. Exercises that require children to formulate and create a variety of problems for their peers and others should be built in.

Class I	Class II
Geometry (10 hrs.) **SHAPES & SPATIAL UNDERSTANDING** • Develops and uses vocabulary of spatial relationship (Top, Bottom, On, Under, Inside, Outside, Above, Below, Near, Far, Before, After) **SOLIDS AROUND US** • Collects objects from the surroundings having different sizes and shapes like pebbles, boxes, balls, cones, pipes, etc. • Sorts, Classifies and describes the objects on the basis of shapes, and other observable properties. • Observes and describes the way shapes affect movements like rolling and sliding. • Sorts 2 - D shapes such as flat objects made of card etc.  **Numbers** (46 hrs.) **DEVELOPING A SENSE OF NUMBERNESS, COUNTING AND OPERATIONS OF NUMBERS 1 - 9 AND ZERO** • Observes object and makes collections of objects. • Arranges the collection of objects in order by – Matching and – One to one correspondence	**Geometry** (13 hrs.) **SHAPES & SPATIAL UNDERSTANDING** *3-D and 2-D Shapes* • Observes objects in the environment and gets a qualitative feel for their geometrical attributes. • Identifies the basic 3-D shapes such as cuboid, cylinder, cone, sphere by their names. • Traces the 2-D outlines of 3-D objects. • Observes and identifies these 2-D shapes. • Identifies 2-D shapes viz., rectangle, square, triangle, circle by their names. • Describes intuitively the properties of these 2-D shapes. • Identifies and makes straight lines by folding, straight edged objects, stretched strings and draws free hand and with a ruler. • Draws horizontal, vertical and slant lines (free hand). • Distinguishes between straight and curved lines. • Identifies objects by observing their shadows. **Numbers** (46 hrs.) • Reads and writes numerals for numbers up to ninety-nine. • Expands a number with respect to place values. • Counts and regroups objects into tens and ones. • Uses the concept of place value in the comparison of numbers.

Class III	Class IV	Class V
Geometry (16 hrs.) **SHAPES & SPATIAL UNDERSTANDING** • Creates shapes through paper folding, paper cutting. • Identifies 2-D shapes • Describes the various 2-D shapes by counting their sides, corners and diagonals. • Makes shapes on the dot-grid using straight lines and curves. • Creates shapes using tangram pieces. • Matches the properties of two 2-D shapes by observing their sides and corners (vertices). • Tiles a given region using a tile of a given shape. • Distinguishes between shapes that tile and that do not tile. • Intuitive idea of a map. Reads simple maps (not necessarily scaled) • Draws some 3D-objects.	**Geometry (16 hrs.)** **SHAPES & SPATIAL UNDERSTANDING** • Draws a circle free hand and with compass. • Identifies centre, radius and diameter of a circle. • Uses Tangrams to create different shapes. • Tiles geometrical shapes: using one or two shapes. • Chooses a tile among a given number of tiles that can tile a given region both intuitively and experimentally. • Explores intuitively the area and perimeter of simple shapes. • Makes 4-faced, 5-faced and 6-faced cubes from given nets especially designed for the same. • Explores intuitively the reflections through inkblots, paper cutting and paper folding. • Reads and draws 3-D objects, making use of the familiarity with the conventions used in this. • Draws intuitively the plan, elevation and side view of simple objects.	**Geometry (16 hrs.)** **SHAPES & SPATIAL UNDERSTANDING** • Gets the feel of perspective while drawing a 3-D object in 2-D. • Gets the feel of an angle through observation and paper folding. • Identifies right angles in the environment. • Classifies angles into right, acute and obtuse angles. • Represents right angle, acute angle and obtuse angle by drawing and tracing. • Explores intuitively rotations and reflections of familiar 2-D shapes. • Explores intuitively symmetry in familiar 3-D shapes. • Makes the shapes of cubes, cylinders and cones using nets especially designed for this purpose.
Numbers (42 hrs.) **NUMBER SEQUENCE UPTO 1000** • Reads and writes 3-digit numbers. • Expands a number w.r.t. place values. • Counts in different ways - starting from any number.	**Numbers (40 hrs.)** **NUMBERS AND OPERATIONS** • Writes multiplication facts. • Writes tables upto 10 × 10. • Multiplies two and three digit numbers using lattice algorithm and the standard (column) algorithm.	**Numbers (40 hrs.)** **NUMBERS AND OPERATIONS** • Finds place value in numbers beyond 1000. • Appreciates the role of place value in addition, subtraction and multiplication algorithms.

Class I	Class II
• Counts the number of objects in a collection. • Makes collection of objects corresponding to a specific number. • Recognises and speaks numbers from 1 to 9. • Uses numbers from 1 to 9 in counting and comparison. (Real objects and repeated events like clapping to be used for counting) • Reads and writes numerals from 1 to 9. • Adds and subtracts using real objects and pictures. • Adds and subtracts the numbers using symbols '+' and '-'. • Approaches zero through the subtraction pattern (such as 3 – 1 = 2, 3 – 2 = 1, 3 – 3 = 0). **NUMBERS FROM (10 - 20)** • Forms Number sequence from 10 to 20. • Counts objects using these numbers. • Groups objects into a group of 10s and single objects. • Develops the vocabulary of group of 'tens' and 'ones'. • Shows the group of tens and ones by drawing. • Counts the number of tens and ones in a given number. • Writes the numerals for eleven to nineteen. • Writes numerals for ten and twenty. • Compares numbers upto 20. **ADDITION AND SUBTRACTION (UPTO 20)** • Adds and subtracts numbers upto 20. **NUMBERS FROM 21 - 99** • Writes numerals for Twenty-one to Ninety nine. · Groups objects into tens and ones. • Draws representation for groups of ten and ones. • Groups a number orally into tens and ones.	• Counts in various ways: – Starting from any number. – Group counting etc. • Arranges numbers upto hundred in ascending and descending order. • Forms the greatest and the smallest two digit numbers with and without repetition of given digits. • Indicates and identifies the position of an object in a line. **ADDITION AND SUBTRACTION** • Adds and subtracts two digit numbers by drawing representations of tens and ones without and with regrouping. • Adds zero to a number and subtracts zero from a number. • Observes the commutative property of addition through patterns. • Solves addition, subtraction problems presented through pictures and verbal description. • Describes orally the situations that correspond to the given addition and subtraction facts. • Estimates the result of addition and subtraction and compares the result with another given number. **PREPARATION FOR MULTIPLICATION AND DIVISION** • Discussion of situations involving repeated addition and situations involving equal sharing. • Activities of making equal groups.

Class III	Class IV	Class V
• Compares numbers. • Forms greatest and smallest numbers using given digits. **ADDITION AND SUBTRACTION** • Adds and subtracts numbers by writing them vertically in the following two cases: – without regrouping. – with regrouping. • Uses the place value in standard algorithm of addition and subtraction. • Solves addition and subtraction problems in different situations presented through pictures and stories. • Frames problems for addition and subtraction facts. • Estimates the sum of, and difference between, two given numbers. **MULTIPLICATION** • Explains the meaning of multiplication (as repeated addition). • Identifies the sign of multiplication. • Constructs the multiplication tables of 2, 3, 4, 5 and 10 • Uses multiplication facts in situations. • Multiplies two digit numbers using standard algorithm and Lattice multiplication algorithm. **DIVISION** • Explains the meaning of division from context of equal grouping and sharing. • Relates division with multiplication. • Completes division facts: – by grouping – by using multiplication tables.	• Divides a given number by another number in various ways such as: – by drawing dots. – by grouping. – by using multiplication facts. – by repeated subtraction. • Applies the four operations to life situations. • Frames word problems. • Estimates sums, differences and products of given numbers.	• Uses informal and standard division algorithms. • Explains the meaning of factors and multiples.

Class I	Class II
MENTAL ARITHMETIC • Adds two single digit numbers mentally.	**MENTAL ARITHMETIC** • Adds and subtracts single digit numbers mentally. • Adds and subtracts multiples of ten mentally.
	
Money **(3 hrs.)** • Identifies common currency notes and coins. • Puts together small amounts of money.	**Money** **(3 hrs.)** • Identifies currency - notes and coins. • Puts together amounts of money not exceeding Rs 50/-. • Adds and subtracts small amounts of money mentally. • Transacts an amount using 3-4 notes.
Measurement **(13 hrs.)** **LENGTH** • Distinguishes between near, far, thin, thick, longer/taller, shorter, high, low. • Seriates objects by comparing their length.	**Measurement** **(13 hrs.)** **LENGTH** • Measures lengths & distances along short & long paths using uniform (non-standard) units, extends to longer lengths.

Class III	Class IV	Class V
MENTAL ARITHMETIC • Adds and subtracts single digit numbers and two digit numbers mentally. • Doubles two digit numbers mentally (result not exceeding two digits).	**MENTAL ARITHMETIC** • Adds and subtracts multiples of 10 and 100, mentally. • Completes multiplication facts by adding partial products, mentally (e.g. $7 \times 6 = 5 \times 6 + 2 \times 6$). **FRACTIONAL NUMBERS** • Identifies half, one fourth and three- fourths of a whole. • Identifies the symbols, $\frac{1}{2}, \frac{1}{4}, \frac{3}{4}$. • Explains the meaning of $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{3}{4}$. • Appreciates equivalence of $\frac{2}{4}$ and $\frac{1}{2}$; and of $\frac{2}{2}, \frac{3}{3}, \frac{4}{4}$ and 1.	**MENTAL ARITHMETIC** • Estimates sums, differences, products and quotients and verifies using approximation. **FRACTIONAL NUMBERS** • Finds the fractional part of a collection. • Compares fractions. • Identifies equivalent fractions. • Estimates the degree of closeness of a fraction to known fractions ($\frac{1}{2}, \frac{1}{4}, \frac{3}{4}$ etc.) • Uses decimal fractions in the context of units of length and money. • Expresses a given fraction in decimal notation and vice versa.
Money (5 hrs.) • Converts Rupee. to Paise using play money. • Adds and subtracts amounts using column addition, and subtraction without regrouping. • Makes rate charts and bills.	**Money** (5 hrs.) **MONEY** • Converts Rupees to Paise. • Adds and subtracts amounts using column addition and subtraction with regrouping. • Uses operations to find totals, change, multiple costs and unit cost. • Estimates roughly the totals and total cost.	**Money** (5 hrs.) • Applies the four operations in solving problems involving money.
Measurement (21 hrs.) **LENGTH** • Appreciates the need for a standard unit. • Measures length using appropriate	**Measurement** (21 hrs.) **LENGTH** • Relates metre with centimetre; • Converts metre into centimetres and vice versa.	**Measurement** (26 hrs.) **LENGTH** • Determines area and perimeter of simple geometrical figures. • Applies the four operations in

Class I	Class II
• Measures short lengths in terms of non-uniform units (in the context of games e.g. 'Gilli Danda' and 'marble-games'). • Estimates distance and length, and verifies using non-uniform units (e.g. hand span etc.) **WEIGHT** • Compares between heavy and light objects. **Time** • Distinguishes between events occurring in time using terms -earlier and later. • Gets the qualitative feel of long & short duration, of school days v/s holidays. • Narrates the sequence of events in a day.	**WEIGHT** • Compares two or more objects by their weight. • Appreciates the need for a simple balance. • Compares weights of given objects using simple balance. **CAPACITY (VOLUME)** • Compares and orders containers in terms of internal volume(capacity). • Orders given containers as per their capacities on the basis of perception & verifies by pouring out etc. **TIME** • Gets familiar with the days of the week and months of the year. • Gets a feel for sequence of seasons (varying locally). • Sequences the events occurring over longer periods in terms of dates/days.

Class III	Class IV	Class V
standard units of length by choosing between centimetres. and metres. • Estimates the length of given object in standard units and verifies by measuring. • Uses a ruler • Relates centimetre. and metre. **WEIGHT** • Weighs objects using non standard Units. • Appreciates the conservation of weight. **VOLUME** • Measures and compares the capacity of different containers in terms of non-standard units. • Appreciates the conservation of volume. **TIME** • Reads a calendar to find a particular day and date. • Reads the time correct to the hour. • Sequences the events chronologically.	• Solves problems involving length and distances. • Estimates length of an object and distance between two given locations. **WEIGHT** • Weighs objects using a balance and standard units. • Determines sums and differences of weights. • Estimates the weight of an object and verifies using a balance. **VOLUME** • Measures volumes of given liquid using containers marked with standard units. • Determines sums and differences of volumes. • Estimates the volume of a liquid contained in a vessel and verifies by measuring. **TIME** • Computes the number of weeks in a year. • Correlates the number of days in a year with the number of days in each month. • Justifies the reason for the need of a leap year. • Reads clock time to the nearest hours and minutes. • Expresses time, using the terms, 'a.m.' and 'p.m.' • Estimates the duration of familiar events. • Finds approximate time elapsed	solving problems involving length, weight and volume. • Relates commonly used larger and smaller units of length, weight and volume and converts one to the other. • Applies simple fractions to quantities. • Converts fractional larger unit into complete smaller units. • Appreciates volume of a solid body: intuitively and also by informal measurement. • Uses addition and subtraction in finding time intervals in simple cases.

Class I	Class II
Data Handling (6 hrs.) • Collects, represents and interprets simple data such as measuring the arm length or circumference of the head using a paper strip.	**Data Handling** (6 hrs.) • Collects data through measurement. • Represents the data followed by discussion (e.g. heights of children). • Collects and presents the data on birthdays. • Draws inferences from the data at the appropriate level.
Patterns (10 hrs.) • Describes sequences of simple patterns found in shapes in the surroundings and in numbers, e.g. stamping activity using fingers and thumb. • Completes a given sequence of simple patterns found in shapes in the surroundings and in numbers.	**Patterns** (10 hrs.) • Observes and extends patterns in sequence of shapes and numbers. • Searches for patterns in different ways of splitting a number. • Creates block patterns by stamping thumbprints, leaf prints, vegetable prints, etc. • Creates patterns of regular shapes by stamping.

Class III	Class IV	Class V
	by (to the nearest hour) forward counting. • Computes the number of days between two dates.	
Data Handling (6 hrs.) • Records data using tally marks. • Collects data and represents in terms of pictograph choosing appropriate scale and unit for display through pictographs. • Draws conclusions from the data by discussing with the teacher.	**Data Handling (6 hrs.)** • Collects data and represents in the form of bar graphs; • Draws Inferences by discussing with the teacher.	**Data Handling (6 hrs.)** • Collects two-dimensional quantitative data. represents the data in the form of a table. • Draws a bar graph or a pictograph to present a data.
Patterns (6 hrs.) • Identifies simple symmetrical shapes and patterns. • Makes patterns and designs from straight lines and other geometrical shapes. • Identifies patterns in the numerals for odd and even numbers and in adding odd and even numbers. • Partitions a number in different ways. • Identifies patterns in his surroundings • Identifies patterns in multiplication with, and dividing by 10s.	**Patterns (6 hrs.)** • Identifies patterns in multiplication and division: multiples of 9, • Casts out nines from a given number to check if it is a multiple of nine. • Multiplies and divides by 10s, 100s. • Identifies geometrical patterns based on symmetry.	**Patterns (6 hrs.)** • Identifies patterns in square numbers, triangular numbers. • Relates sequences of odd numbers between consecutive square numbers. • Makes border strip and tiling patterns.