

# A to Z Mathematics Series

## List of Concepts (I-VI)

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for Approximation

*The world of pre-number quantification*

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*Counting of unlike things*

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*Addition with carry on carry using column addition method*

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*Sum of first ‘n’ odd natural numbers*

*Pythagorean triplet*

*Patterns in square numbers*

3. Cube of Numbers

*Cubic numbers*

*Cube of rational numbers*

*To make perfect cube–by prime factorisation and multiplication*

*To make perfect cube – by prime factorisation and division*

*Sum of ‘n’ consecutive cubes*

*Difference between the squares of two consecutive triangular numbers*

4. Logarithms and Antilogarithms

*Definition of logarithm*

*Power rule*

*Quotient rule*

*Product rule*

*Antilog of numbers*

*Antilog law*

5. Ratios

*Idea of ratio*

*Simplest form of ratios*

*Comparison of ratios*

*Equivalent ratios – multiples of the given ratio*

6. Rate – A Special Kind of Ratio

*Idea of rate*

*Rate*

7. Unitary Relationship

*Idea of unitary ratio*

*Unitary ratio*

8. Percentage

*Idea of percentage*

*How do we convert ratios to percentage?*

*Difference between “what percentage of x is y?” and “what percentage is x of y?”*

*Conversion of decimal into percentage*

*Quantifying percentage*

*Conversion of percentage into fraction or decimal form*

# L for Long Form

*Mathematical expressions that expand*

## 1. Exponents and Numbers

*Writing and evaluating exponential form of numbers*

*Working with zeroth and negative exponents*

*Comparison of exponential numbers*

*Addition of exponents of same base*

*Multiplication of different bases with same exponents*

*Division of same bases with different exponents*

*Division of different bases with same exponents*

*Interpreting power of a power*

*Writing daily-life numbers as exponents*

*Real-life application of exponents*

## 2. Square of Numbers

*Square numbers*

*Numbers ending with digits 2, 3, 7, or 8 are non-perfect squares*

*Zeros at end of a perfect square*

*Square of even number is always an even number*

*Square of odd number is always an odd number*

*Square of numbers ending with 5*

*Difference between two consecutive squares*

## 9. Proportion

*Idea of proportion*

*Are the numbers in proportion?*

*Finding the missing term*

*Continued proportion*

*Mean proportion*

*Direct proportion*

*Inverse proportion*

## 10. Arithmetic Progression

*Finding missing term in AP*

*Characterising arithmetic progressions*

*Using the general term of arithmetic progression*

*How to assume terms in AP?*

*Sum of n terms of an AP*

*Applying the concept of arithmetic progression*

## 11. Geometric Progression

*Finding the term in geometric progression*

*Finding the geometric progression*

*Finding the sum of geometric progression*

*Finding the sum to infinity of the geometric progression*

*Applying the concept of geometric progression*

## 12. Harmonic Progression

*Finding the term in harmonic progression*

## 13. Algebraic Expressions

*Constants, variables/literals and expressions*

*Creating algebraic expressions*

*Finding values of algebraic expressions*

*Addition and subtraction of algebraic expressions*

*Multiplication of algebraic expressions*

*Division of algebraic expressions*

## 14. Algebraic Identities

*Identity :  $(a + b)(a - b) = a^2 - b^2$*

*Identity :  $(a + b)^2 = a^2 + 2ab + b^2$*

*Identity :  $(a - b)^2 = a^2 - 2ab + b^2$*

*Identity :  $a^3 + b^3 = (a + b)^3 - 3ab(a + b)$*

*Identity :  $a^3 - b^3 = (a - b)^3 + 3ab(a - b)$*

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

*Identity :  $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$*

*Factorising algebraic expressions*

## 15. Divisibility Test

*Utilising divisibility : By 2, 5, 10*

*Utilising divisibility : By 3, 6, 9*

*Utilising divisibility : By 4, 11*

# M

for Matter

*More about numbers, exploring factors, multiples*

## 16. Factors and Multiples of Numbers

*Idea of factors*

*Finding factors of numbers*

*Idea of multiples*

*Finding multiples of numbers*

## 17. Prime and Composite Numbers

*Defining prime and composite numbers*

*Twin prime and co-prime numbers*

*Prime triplets*

## 18. Fundamental Law/Theorem of Arithmetic

*Prime factorisation of numbers using division method*

*Prime factorisation of numbers using factor tree method*

## 19. Highest Common Factor (or Greatest Common Divisor) of Numbers

*Finding HCF using factors*

*Finding HCF using prime factorisation method*

*Finding HCF using division method*

*Finding HCF using Euclid's division lemma and algorithm*

*Application of HCF in real-life*

## 20. Least Common Multiple of Numbers

*Finding LCM by listing the multiples*

*Finding LCM using prime factorisation method*

*Finding LCM using division method*

*Application of LCM in real-life*

## 21. Applying Fundamental Theorem of Arithmetic

*Relationship between HCF and LCM*

## 22. Square Root of a Number

*Finding square root of a number using repeated subtraction method*

*Estimating square root of a number*

*Finding square root of a number using prime factorisation method*

*Finding square root of a number using long division method*

*Finding square root of fractions*

*Finding square root of decimal numbers*

### 23. Cube Root of a Number

*Finding cube root of a number using prime factorisation method*

*Estimating cube root of a number*

*Finding cube root of a negative and rational number*

### 24. The Order of Operation

*Using BODMAS rule to simplify the expressions*

## **N** for Negative Numbers

*The numbers we created*

### 25. Visualisation of Negative Numbers

*Visualising situations involving negative numbers*

*Visualising negative numbers on number lines*

### 26. Operations on Negative Numbers

*Addition of negative numbers*

*Subtraction of negative numbers*

*Multiplication of negative numbers*

*Division of negative numbers*

### 27. Commutative Property of Numbers

*Commutative law of addition*

*Commutative law of multiplication*

### 28. Associative Property of Numbers

*Associative law of addition*

*Associative law of multiplication*

### 29. Distributive Property of Numbers

*Distributive law of multiplication over addition*

*Distributive law of multiplication over subtraction*

### 30. Additive Identity or Zero Property

*Additive identity law of positive and negative numbers*

### 31. Multiplicative Identity Property

*Multiplicative identity law of positive and negative numbers*

### 32. Inverse Property

*Additive inverse property of positive and negative numbers*

*Multiplicative inverse property of positive and negative numbers*

### 33. Zero Property of Multiplication

*Zero property of multiplication of positive and negative numbers*

### 34. Closure Property of Numbers

*Closure property of addition of whole numbers and integers*

*Closure property of subtraction of integers*

*Closure property of multiplication of whole numbers and integers*

## **O** for Organising (data)

*Numericalising geometry, exploring coordinate systems, graphs*

### 35. Cartesian System: 1-Dimensional space

*Representing situations using integers*

*Plotting points in 1-dimensional space*

### 36. Cartesian System: 2-Dimensional space

*Abscissa, ordinates and quadrants*

*Plotting ordered pairs in quadrants*

### 37. Graph – A Cartesian Plane

*Dependent and independent variables in graph*

*Plotting points (or ordered pairs) to make graphs*

*Finding distance between two points*

*Defining and using section formula*

*Mid-point formula*

*Centroid of a triangle - application of section formula*

*Area of a triangle*

*Visualising collinearity of three points*

### 38. Application of Coordinate System – Statistical Graphs

*Collecting and organising data*

*Making pictograph of data*

*Making bar graph from data*

*Making histogram of data*

*Making pie charts of data*

### 39. Cumulative Frequency Distribution Tables and Curves

*Cumulative frequency table (ungrouped data)*

*Cumulative frequency table (grouped data)*

#### 40. Comparing Quantities

*Idea of profit and loss*

*Idea of discount*

*Idea of simple interest*

*Idea of compound interest*

#### 41. Triangle and its Properties

*Idea of different parts of a triangle*

*Classifying triangles on the basis of sides*

*Classifying triangles on the basis of angles*

*Idea of a median and altitude of a triangle*

*Angle sum property of a triangle*

*Exterior angle property of a triangle*

*Triangle inequality property*

*Pythagoras theorem*

#### 42. Congruency of Triangles

*Idea of congruency*

*Idea of SSS congruency*

*Idea of SAS congruency*

*Idea of ASA congruency*

*Idea of AAS congruency*

*Idea of RHS congruency*

#### 43. Understanding Quadrilaterals

*Idea of quadrilaterals*

*Idea of polygon's interior angles*

*Angle sum property of quadrilaterals*

*Exterior angles of quadrilaterals/polygons*

*Properties of parallelograms*

*Properties of rectangles*

*Properties of squares*

*Properties of rhombuses*

*Properties of kites and trapeziums*

#### 44. Mensuration

*Finding perimeter and area of a triangle*

*Finding perimeter and area of a rectangle*

*Finding perimeter and area of a square*

*Finding area of a parallelogram and rhombus*

*Finding circumference and area of a circle*

*Finding area between rectangles*

*Finding area enclosed by two concentric circles*

*Finding area of a trapezium*

*Finding area of a polygon*

*Finding volume of a cuboid*

*Finding volume of a cube*

*Finding volume of a cylinder*

*Finding volume of a sphere*

*Finding volume of a right circular cone*

*Finding surface area of a cuboid*

*Finding surface area of a cube*

*Finding surface area of a cylinder*

#### 45. Visualising Solid Shapes

*Diagnosing solid shapes*

*Drawing nets for building 3D shapes*

*Euler's relation for polyhedrons*

#### 46. Symmetry

*Idea of symmetry*

*Identifying lines of symmetry*

*Idea of reflection symmetry*

*Idea of rotational symmetry*

#### 47. Probability

*Idea of probability*

*Probability of throwing of dice*

*Probability of tossing coins*

More...