



# Syllabus

FOR GJMAT & GJMOC



## Preface

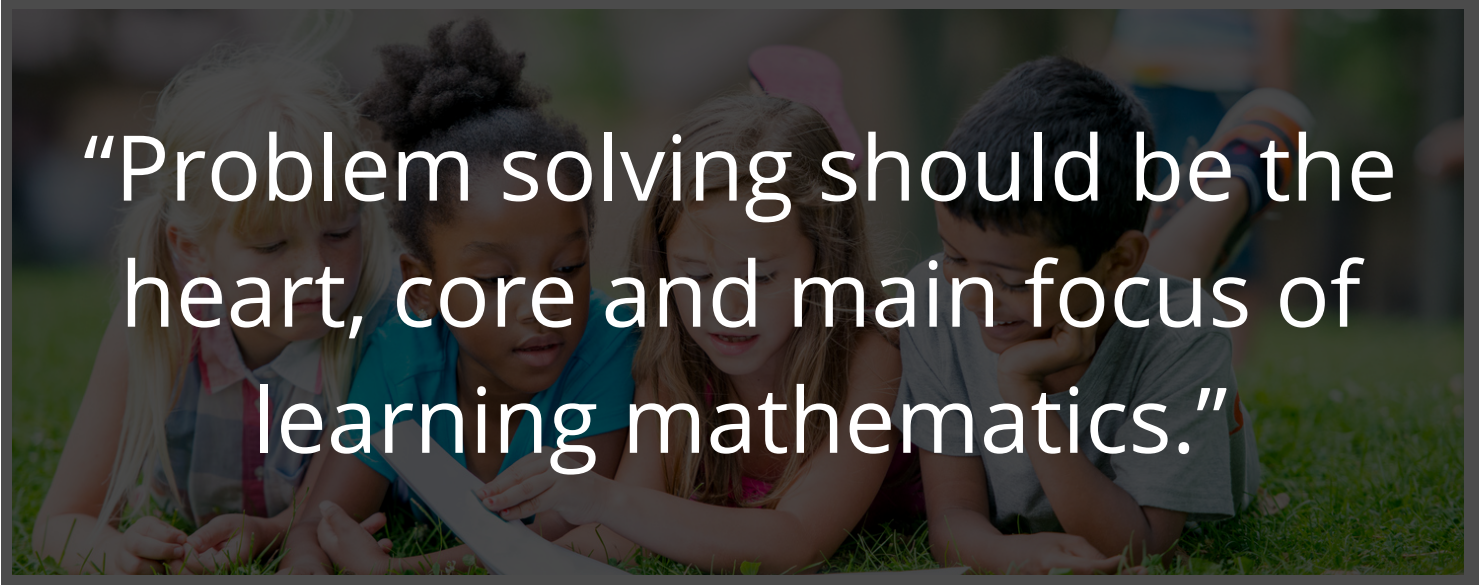
The mathematical concepts are divided below based on different streams of elementary mathematics. There is a detailed break-down of each of these streams into topics and concepts. The student is at least expected to be familiar with these to do well in GJMAT and GJMOC. Note that the competition will not only test their concept clarity, but also their application ability, problem solving skills and mindset; so many questions might require more than one topic's application for solving them.

The syllabus is categorized into 4 categories. However, the GJMAT and GJMOC question difficulty level will be different for the two grades given in each category

1. **Lower Primary – Grade 1 and 2** (Pages 3 - 4)
2. **Middle Primary – Grade 3 and 4** (Pages 5 - 6)
3. **Upper Primary – Grade 5 and 6** (Pages 7 - 8)
4. **Lower Secondary (Middle School) – Grade 7 and 8** (Pages 9 - 10)
5. **Competition Format** (Page 11)

For every grade level (category), one needs to be well versed with the previous grade's syllabus as well, since learning Mathematics is a sequentially linked progressive process.

GJMAT will have a mix of conceptual understanding, application ability and problem solving skills testing questions, whereas GJMOC will have all questions based on problem solving skills involving application of concepts.



“Problem solving should be the heart, core and main focus of learning mathematics.”

# Lower Primary (Grade 1 - 2)

## Number Sense and Arithmetic (Operations)

- Number system
- Counting
- Comparison, Sorting and arrangement of numbers
- Number patterns
- Type of Numbers – Natural, Whole, Integers, Odd/Even
- Addition and Subtraction – Properties, laws and smart methods
- Multiplication as repeated addition
- Division as size of equal shares or number of shares
- Understanding Part-Whole
- Basic understanding of fraction
- Multiples of numbers as skip counting
- Balancing simple equations using these operations
- Simple Cryptarithms using addition / subtraction
- Application in word problems

## Everyday Mathematics

- Measurements and units – Length, distance, mass, weight, capacity, temperature
- Time – Clocks, calendar, units of time, time zones and duration
- Money – Currencies, denominations, change and use in buying and selling
- Simple problems involving relational aspects (Times, difference, sum) and logic
- Simple problems related to Age
- Simple problems in Speed, distance and time
- Simple problems in Work and Time

## Geometry and Spatial Sense

- Spatial terms - far-near, inside-outside, above-below, left-right, etc.
- Point, line, segment, ray, straight line, curved line etc.
- 2D Shapes – polygons, circle
- Triangles, square, rectangle
- Calculation of perimeter of rectilinear figures
- Areas of polygons in grids without using any area formulae
- 3D Shapes – Prisms, Pyramids, Cones, cylinders, spheres etc.
- Understanding of vertices, edges and faces



## Combinatorics & Probability

- Elementary understanding of simple combinations
- Simple arrangements
- Formation of numbers under conditions
- Likelihood of an event like impossible, likely, unlikely, always
- Simple counting of shapes like triangles, squares etc.

## Logical Reasoning and Non-Routine Problem solving

- Patterns – growing, repeating and relational
- Balancing problems
- Queuing problems
- Interval problems
- Rabbit and chicken - solving by assumptions and replacement
- Excess and shortage problems
- IQ problems – like age, calendar and date
- Solving by comparison and replacement
- Working backwards
- Pigeonhole principle – worst case scenario
- Solving problems by using Heuristics methods – guess and check, draw a picture (visualization), making an organized list, making a similar simpler problem etc.

## Data Interpretation

- Understanding data
- Pictographs
- Tally Charts
- Bar Graphs

# Middle Primary (Grade 3 - 4)

\*\*\*\*\* Please ensure that you are familiar with all topics of Lower Primary as well. \*\*\*\*\*

## Number Theory and Arithmetic (Operations)

- Prime numbers and composite numbers
- Multiplication: Tables, multiples, multiplication algorithms and rules
- Lowest common multiples (L.C.M.) and Highest common factor (H.C.F.)
- Finding unit's (ones) place digit
- Square and Cube numbers
- Division – As multiplication by reciprocal, division algorithms, remainder
- Factors – Divisors
- Divisibility rules for divisions by 2,3,4,5,7,8,10,11
- Fractions – Numerator and denominator
- Comparison of fractions, types of fractions and simple operations on fractions
- Order of Operations – PEDMAS or BODMAS
- Understanding of Ratio and relation with fraction
- Gaussian addition method and addition of 1 to n counting numbers
- Understanding of avoidance of double counting and also basics of Venn diagram

## Everyday Mathematics

- Measurement – Length, distance, time, money, temperature, mass, volume etc.
- Speed, Distance and Time – Relative speed in catching up and encountering
- Work, Resources and Time
- Ratio and proportion - directly or inversely proportional scenarios
- Basic understanding of average as equal distribution
- Understanding of percentage as fraction with denominator 100
- Basic understanding of profit and loss
- Solving word problems using unitary method

## Data Interpretation

- Pie Charts
- Line Graphs
- Bar graphs
- Average as equal distribution, average problems

## Geometry and Spatial Sense

- Line of symmetry – rotation, reflection, flips etc.
- Properties, areas and perimeter of rectilinear figures, squares, rectangles
- 3D objects - Prisms, pyramids, cuboids, cubes - edges, faces and vertices
- Understanding of different viewing angles of 3D objects
- Understanding of ratio of areas when dividing a rectangle, square or triangle
- Sum of all angles in figures like triangle, quadrilateral
- Pythagorean triplets
- Triangle inequality theorem
- Understanding different triangles – scalene, isosceles and equilateral
- Area of a triangle in terms of height and base and area
- Understanding of parallel lines and perpendicular lines

## Logical Reasoning and Non-Routine Problem solving

- Periodic or Intervals related problems
- Solving growing, repeating and functional patterns
- Solving by assumption and replacement (chicken and rabbit) problems
- Excess and shortage problems
- Page number related problems
- Colouring of larger cubes made of smaller cubes
- Pigeonhole principle problems
- Remainder problems
- Number puzzles – Magic squares, Cryptarithms
- Using models or visualization for problem solving
- Age problems
- Logical reasoning and pattern problems

## Combinatorics and Probability

- Shortest Path Problems
- Number of rectangles in a grid
- Number of squares in a square grid
- Number of handshake problems – how many pairs?
- Number of rectangles encompassing a figure(s) within a grid
- Numbers formed by certain digits under conditions
- Number of ways to choose and arrange using logic and listing
- Multiplication and addition in counting of combinations
- Distribution problems – number of ways

# Upper Primary (Grade 5 - 6)

\*\*\*\*\* Please ensure that you are familiar with all topics of Lower and Middle Primary as well. \*\*\*\*\*

## Number Sense and Arithmetic (Operations)

- Numbers as product chains of primes, prime factors and factors
- Integers – Positive and negative
- Real numbers – Rational and irrational numbers
- Surds, square roots, cube roots
- Relation between fraction, percentage and decimal
- Exponents (indices) - Laws of exponents
- Numbers as difference of perfect squares
- Reciprocals
- Arithmetic and geometric series
- Solving of expressions with series of terms
- Simplification of fractions
- Decimals – place value, operations, recurring decimals
- Factorials and finding their terminal zeroes
- Finding L.C.M. and H.C.F. of numbers using prime factorization
- Number of factors and sum of factors of a number using prime factorization
- Remainder related problems using LCM / HCF
- Addition of squares of numbers and cubes of counting numbers
- Difference of squares of two numbers as the product of their sum and difference

## Everyday Mathematics

- Forming simple equations using one or two variables in word problems
- Profit and Loss
- Simple Interest
- Compound Interest
- Speed and distance problems – average speed, relative speed, use of ratio and proportion
- Work, resources and time problems
- Word problems using ratio and proportion, unitary method, percentage and fractions

## Data Interpretation

- Mean (average) Median Mode, Range.
- Average of averages and weightage averages and their difference
- Graphs and data

## Geometry and Spatial Sense

- Pythagorean Theorem - Right angled triangle and its properties
- Understanding similar and congruent shapes and how they are related
- Similarity and Congruence of triangles
- Parallel lines, transverse and different angles
- Areas of trapezium, parallelogram, rhombus
- Areas of equilateral triangle and other triangles using sides
- Area of circle, circular sections, relation between diameter, radius, circumference and area
- Internal and external angles of regular polygons
- No. of diagonals of polygons
- Parallel lines and relation of areas of triangles captures between them
- Angle chasing
- Finding surface areas and volumes of 3-D shapes like sphere, cylinder, cube, cuboid, cones

## Logical Reasoning and Non-Routine Problem solving

- Logic problems involving critical thinking
- Set Theory and Venn Diagrams
- Pattern identification and applying mathematical induction in problems
- Challenging pigeonhole problems
- Problems involving change in fractions, percentages due to exchange of quantities or addition or removal of quantities
- Optimum utilization of resources to save time problems

## Combinatorics and Probability

- Simple Combination and permutation problems
- Problems on staircase, shortest path
- Formation of numbers for different sums
- Problems on ways of laying tiles in a pathway
- Number of ways to pass a ball between people
- Sum of all digits of a number - to find all possible numbers
- Probability
- Understanding probability / likeliness of an event as a fraction / percentage
- Use of combination and permutations to find probability



# Lower Secondary (Middle School) (Grade 7 - 8)

\*\*\*\*\* Please ensure that you are familiar with all topics of Primary grades topics as well. \*\*\*\*\*

## Number Theory and Algebra

- Problems in number theory
- Absolute Value (Modulus)
- Base Number (other than 10) and base number arithmetic
- Modulo Arithmetic – Periodic remainder problems
- Linear Congruencies, System and equation of linear congruencies
- Algebraic methods of Arithmetic
- Euclidian Algorithm
- Exponents and Logarithms
- Imaginary numbers, Complex Numbers
- Series – Arithmetic, Geometric, Harmonic series
- Variables, terms, expressions, functions
- Systems of equations, linear equations with one-variable or multi-variable
- Solving equations with substitution or comparison
- Solving equations with Modulus
- Quadratic expression and equations - Factoring expressions and equations
- Divisibility rules with Algebra
- Introduction to Inequalities
- Graphing
- Polynomials, Binomials, Factor theorem

## Everyday Mathematics

- Word problems involving mensuration, time, money etc.
- Commercial math – fixed cost, variable cost, overhead cost, profit, loss, percentages
- Understanding of cost price, selling price, marked up price and discount
- Simple and compound Interest
- Speed and distance problems
- Work, resources and time problems
- Volumes, Area, displacement related problems
- Rate and average problems

## Data Interpretation

- Data tables, line plots, stem-leaf plots, bar graphs, histograms, frequency charts, line graphs
- Interpret charts to find mean, median, mode and range,
- Graphs of proportional relationship

## Geometry and Spatial Sense

- Circles and properties – Circle and angles, tangents, chords
- Circles and sections – semi circle, quarter circle, other sections and areas and circumference
- Triangles, Quadrilaterals and Polygons – Angles, congruencies, similarities, inequalities – Finding areas, lengths and diagonals, angles.
- Properties of parallelogram, rectangle, rhombus
- Areas of compound and over lapping shapes and figures.
- Concepts on angle bisectors, altitudes, side bisectors
- Introduction to Co-ordinate (Analytical) Geometry – Cartesian plane, Points or Co-ordinates, lengths, slopes, polar co-ordinates, equations of lines, finding intersecting points.
- 3-D Geometry – Curved surfaces, surface areas, volumes
- Introduction to Trigonometry
- Problem Solving Strategies in Geometry

## Logical Reasoning and Non-Routine Problem solving

- Counting and Set Theory – Principle of inclusion and exclusion
- Advanced Pigeonhole problems
- Word Problems involving system of equations, quadratic equations
- Challenging patterns and series related questions
- Problems involving mathematical induction
- Water's volume replacement problem
- Concentration of solutions related problems
- Challenging logical thinking and IQ problems

## Combinatorics and Probability

- Simple Combination and permutation problems
- Problems on staircase, shortest path
- Formation of numbers for different sums
- Problems on ways of laying tiles in a pathway
- Number of ways to pass a ball between people
- Sum of all digits of a number – to find all possible numbers
- Probability
- Understanding probability / likeliness of an event as a fraction / percentage
- Use of combination and permutations to find probability

# Contest Format



## Number of Questions: 25

- 3 Sections
  - Concept Understanding: 10 questions; 2 marks per question
  - Application Ability: 10 questions; 4 marks per question
  - Problem solving: 5 questions, 8 marks per question
- Total maximum possible marks: 100 .
- No negative marking
- Duration: 60 Minutes (1 hour)
- Question format: MCQs (Multiple choice single correct answer)
- Language of Question Paper: English



## No. of Questions: 25

- All questions will require critical thinking for problem solving and will carry 4 marks each.
- Total maximum possible marks: 100 .
- No negative marking
- Duration: 90 minutes (1 hour 30 minutes)
- Question Format: Open ended (only answer to be entered, working or solution is not required)
- Language of Question Paper: English

For more information visit  
**[www.globalolympiadsacademy.com](http://www.globalolympiadsacademy.com)**

*“Mathematics is an excellent vehicle, not a destination, to develop and improve the intellectual competencies or capabilities of our children.”*