MATHEMATICS CURRICULUM

Pre-Kindergarten (Pre-K)

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Numbers and Counting	Number Recognition: Recognize and name numbers 1-10.	- Identify numbers from 1 to 10 in various contexts. - Match numerals to their names.	- Play "Number Hunt" by finding numbers around the classroom. - Use flashcards for number identification games.	- Number flashcards. - *Numbers Everywhere* by McGraw-Hill.
	Counting: Count objects up to 10; practice counting aloud.	- Count objects accurately up to 10. - Count aloud with correct sequence.	- Count blocks, beads, or toys during play. - Sing counting songs like "Five Little Ducks."	- Counters (blocks, beads, small toys). - Counting rhymes and songs.
	One-to-One Correspondence: Match one object to one number when counting.	- Understand that each number represents one object. - Develop accurate counting skills.	- Use play dough to make "snacks" and count one for each teddy bear. - Count objects into egg cartons.	- Egg cartons for grouping. - Manipulatives like toy animals or beads.
	Number Order: Understand the order of numbers 1-10.	- Arrange numbers in the correct sequence. - Recognize the concept of before and after in numbers.	- Use number cards to create a number line. - Play sequencing games like "What Comes Next?"	- Number cards. - Printable number sequencing puzzles.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Shapes and Patterns	Basic Shapes: Identify common shapes (circle, square, triangle, rectangle).	- Recognize and name basic shapes in the environment.	- Go on a "shape hunt" to find objects of different shapes. - Use shape stencils for tracing and naming shapes.	- Shape stencils. - *Shape Hunt* by Fisher-Price.
	Shape Sorting: Sort objects by shape.	- Group objects based on their shape. - Develop classification skills.	- Sort buttons, blocks, or toys by shape. - Use sorting trays or bowls for categorized grouping.	- Sorting trays or bowls. - Shape-sorting worksheets.
	Patterns: Recognize and create simple patterns.	- Identify repeating patterns (e.g., AB patterns). - Create simple patterns using colors or shapes.	- Make bead necklaces with repeating patterns. - Use colored blocks to create patterns.	- Pattern blocks. - Printable pattern worksheets.
Measurement and Comparison	Size: Understand concepts of big/small, tall/short.	- Compare objects by size. - Use language to describe size differences.	- Sort toys into "big" and "small" bins. - Use stuffed animals to compare "tall" and "short."	- Size-sorting worksheets. - Manipulatives like toys or blocks of different sizes.
	Length: Compare lengths of objects (longer/shorter).	- Compare two objects by length. - Use language to describe length.	- Compare ribbons or paper strips by length. - Line up pencils or crayons from shortest to longest.	- Ribbons or strings. - Printable length comparison activities.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
	Weight: Introduce the concept of heavy or light using objects.	- Identify objects as heavy or light. - Begin to understand weight differences.	- Compare the weight of a book and a stuffed toy. - Use a balance scale to explore weight differences.	- Balance scales. - Objects of varying weights (blocks, toys, books).
Spatial Awareness	Position Words: Learn terms like above, below, besides, in front of, and behind.	- Use positional words to describe object locations. - Follow instructions using positional language.	- Play "Simon Says" with positional commands (e.g., "Put your hand above your head."). - Sort objects by position.	- Positional word flashcards. - *Where Is Bear?* by Eric Carle.
	Directions: Follow simple directions using position words.	- Understand and act on directions using position words. - Develop listening and comprehension skills.	- Use toy cars and a map to follow directional commands. - Play games like "Hide the Object" with positional hints.	- Toy cars and maps. - Printable positional word worksheets.

Kindergarten 1 (KG 1)

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Numbers and Counting	Counting: Count objects up to 20 and beyond.	- Count up to 20 objects accurately. - Count aloud past 20 with guidance.	- Count toys, blocks, or counters during play. - Use songs like "Count to 20."	- Counting charts. - Manipulatives (blocks, beads).
	Number Recognition: Recognize and write numbers 1-20.	- Identify and write numbers from 1 to 20. - Match numbers to quantities.	- Use flashcards for number recognition. - Trace and write numbers in a workbook.	- Printable number worksheets. - Number flashcards.
	Basic Addition: Simple addition with objects.	- Use objects to add numbers up to 10. - Solve simple addition problems visually.	- Add toy animals to see how many are in total. - Draw pictures to represent addition problems.	- Counters or toys. - *Beginning Addition for Kids* by McGraw-Hill.
	Number Line: Using a number line to understand "before" and "after."	- Identify numbers before and after on a number line. - Use a number line to add and subtract.	- Use a physical number line to jump forward and backward. - Solve problems like "What comes before 8?"	- Number line charts or printable number lines.
Shapes and Patterns	Advanced Shapes: Recognize and name oval, diamond, and star shapes.	- Identify and name shapes like oval, diamond, and star. - Match shapes to real-world objects.	- Find and name shapes in everyday items (e.g., kites, eggs). - Draw and decorate advanced shapes.	- Shape flashcards. - Printable shape worksheets.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
	Pattern Recognition: Extend and create complex patterns.	- Recognize patterns like AAB, ABB. - Create new patterns using objects, colors, or shapes.	- Use colored blocks to create patterns. - Complete worksheets that extend given patterns.	- Pattern blocks. - Pattern worksheets and manipulatives.
Measurement and Comparison	Length and Height: Measure objects using non-standard units.	- Compare and measure objects using blocks, hands, or paper clips. - Understand concepts of taller/shorter.	- Measure classroom items with blocks. - Compare the height of books by stacking them.	- Non-standard measurement tools. - Measuring activity cards.
	Volume: Concepts of more/less using containers.	- Compare volumes of liquids or solids in different containers. - Understand "more" and "less."	- Use cups to pour water or sand into containers and compare volumes. - Sort containers by how much they hold.	- Measuring cups and buckets. - Sand or water for volume experiments.
Spatial Awareness	Directional Language: Use directional words like left, right, up, and down.	- Understand and use directional language to describe positions and movements.	- Play games like "Simon Says" with directional commands. - Follow treasure maps using directional words.	- Directional flashcards. - Printable maps for directional activities.

Kindergarten 2 (KG 2)

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Numbers and Counting	Counting: Count objects up to 50 and beyond.	- Accurately count up to 50 objects. - Count aloud beyond 50 with guidance.	- Count classroom objects like crayons or blocks. - Use counting songs and games like "Count the Stars."	- Counting charts. - Manipulatives (blocks, beads).
	Number Sequences: Count by 2s, 5s, and 10s up to 50.	- Skip count by 2s, 5s, and 10s up to 50. - Recognize patterns in skip counting.	- Create hopscotch grids for skip counting. - Use number lines to practice skip counting visually.	- Number line charts. - Printable skip-counting worksheets.
	Basic Subtraction: Simple subtraction using objects.	- Subtract numbers within 20 using manipulatives. - Solve subtraction problems visually or with objects.	- Use toys or counters to "take away" objects and count what remains. - Solve subtraction puzzles or worksheets.	- Counters or cubes. - Subtraction worksheets.
	Number Comparison: Compare numbers (greater than, less than, equal to).	- Compare numbers using >, <, and = symbols. - Understand numerical relationships.	- Play "Which is Greater?" games with number cards. - Use a number line to visualize comparisons.	- Printable number cards. - Greater-than and less-than activity sheets.
Shapes and Patterns	3D Shapes: Introduction to cube, sphere, cylinder.	- Recognize and name 3D shapes. - Match 3D shapes to real-world objects.	- Sort household items into cube, sphere, and cylinder groups.	- 3D shape models (cubes, spheres, cylinders).

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
			- Build 3D shapes using clay or blocks.	- Printable 3D shape worksheets.
	Complex Patterns: Recognize and create patterns like ABC and AABB.	- Extend and create complex patterns using shapes, colors, or objects.	- Create bead necklaces or patterns with blocks. - Solve pattern completion worksheets.	- Pattern blocks. - Printable pattern activity sheets.
	Symmetry: Explore basic symmetry with shapes and objects.	- Recognize and draw lines of symmetry. - Explore symmetry in objects and drawings.	- Fold paper shapes to find lines of symmetry. - Create symmetrical art using mirrors or drawing.	- Mirrors for symmetry activities. - Symmetry worksheets.
Measurement and Comparison	Estimation: Estimate quantities and sizes.	- Make reasonable guesses about quantities and lengths. - Develop a sense of approximation.	- Guess how many blocks are in a jar, then count to verify. - Estimate and compare lengths of classroom objects.	- Estimation jars. - Printable estimation activities.
	Time: Concepts of morning, afternoon, evening; read clocks to the hour.	- Differentiate between times of day. - Read analog and digital clocks to the hour.	- Sort daily activities into morning, afternoon, and evening categories. - Practice setting clocks to specific hours.	- Clock models (analog and digital). - Printable time-sorting cards.
Spatial Awareness	Positional Concepts: Reinforce position with complex tasks.	- Use terms like above, below, beside, and in front in tasks.	- Arrange toys based on verbal instructions (e.g., "Put the block beside the book."). - Solve positional puzzles.	- Positional flashcards. - Interactive positional games.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
		- Place objects accurately based on directions.		
	Directions and Mapping: Create simple maps using positional language.	- Use positional terms to describe directions on a map. - Create simple maps with landmarks.	- Draw a map of the classroom and mark locations of key objects. - Follow a treasure map to find hidden items.	- Printable map templates. - Interactive mapping games or puzzles.

GRADE 1

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Numbers	Counting: Count in steps of 2, 3, 5, and 10 up to 100.	- Count forward and backward in steps of 2, 3, 5, and 10. - Recognize patterns in skip counting.	- Count objects in groups (e.g., candies in boxes). - Play skip-counting games like "number hopscotch."	- Number charts. - Skip-counting flashcards.
	Place Value: Understanding place value for numbers up to 100.	- Break numbers into tens and ones. - Compare and order numbers up to 100.	- Use base-10 blocks to build numbers. - Solve puzzles that involve ordering numbers from smallest to largest.	- Place value charts. - Base-10 blocks or online manipulatives.
	Addition and Subtraction: Adding and subtracting two-digit numbers with regrouping.	- Add and subtract numbers with and without regrouping. - Solve word problems involving these operations.	- Use counters to solve addition problems with regrouping. - Solve story problems involving change or subtraction.	- Worksheets on two-digit addition and subtraction. - Counters for hands-on practice.
Fractions	Introduction: Introducing thirds and three-quarters using visual models like pie charts.	- Recognize and identify thirds and three-quarters. - Use visual aids to understand fractional parts.	- Divide a pizza or paper circles into thirds and quarters. - Color parts of pie charts to represent fractions.	- Fraction pie charts. - Printable fraction circles.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Measurement	Money: Identifying coins and notes and solving simple money problems.	- Recognize and count coins and notes. - Solve word problems involving simple transactions.	- Set up a mock store for students to practice making purchases and giving change. - Count mixed coins to match amounts.	- Play money sets. - Real or replica coins and notes.
	Length, Mass, and Volume: Comparing and ordering objects by size, weight, and capacity.	- Use appropriate units to measure and compare length, weight, and volume. - Solve real-world problems.	- Measure classroom objects using rulers or measuring tapes. - Compare the capacities of different containers.	- Measuring tools (rulers, scales, measuring cups). - Sorting worksheets for measurements.
Time	Telling Time: Reading clocks to the nearest 5 minutes and understanding a.m. and p.m.	- Read analog and digital clocks. - Understand and apply the concept of a.m. and p.m.	- Create daily schedules, labeling activities with a.m. or p.m. - Play time-matching games using clock faces.	- Clock models. - Worksheets on telling time to the nearest 5 minutes.
Geometry	Properties of Shapes: Identifying properties of 2D and 3D shapes.	- Recognize and describe 2D shapes (e.g., sides, vertices). - Identify 3D shapes and their properties (e.g., edges, faces).	- Build 3D shapes using blocks or paper templates. - Draw and label 2D shapes with correct properties.	- Shape sorting games. - 3D shape models (e.g., cubes, cones).
	Symmetry: Identifying lines of symmetry in simple shapes.	- Recognize and draw lines of symmetry in regular 2D shapes.	- Fold paper shapes to find lines of symmetry. - Create symmetrical designs	- Mirrors for symmetry activities. - Printable symmetrical shape templates.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
		- Understand reflective symmetry.	using mirrors or drawing tools.	
Problem-Solving	Word Problems: Solving word problems with multiplication, division, and repeated addition.	- Solve word problems using arrays or repeated addition. - Begin understanding division as grouping.	- Solve problems involving groups of objects (e.g., sharing candies equally). - Use arrays to solve multiplication problems.	- Word problem worksheets. - Array grids for multiplication visualization.

GRADE 2

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Numbers	Counting: Count in steps of 2, 3, 5, and 10 up to 100.	- Count forward and backward in steps of 2, 3, 5, and 10. - Recognize patterns in skip counting.	- Count objects in groups (e.g., candies in boxes). - Play skip-counting games like "number hopscotch."	- Number charts. - Skip-counting flashcards.
	Place Value: Understanding place value for numbers up to 100.	- Break numbers into tens and ones. - Compare and order numbers up to 100.	- Use base-10 blocks to build numbers. - Solve puzzles that involve ordering numbers from smallest to largest.	- Place value charts. - Base-10 blocks or online manipulatives.
	Addition and Subtraction: Adding and subtracting two-digit numbers with regrouping.	- Add and subtract numbers with and without regrouping. - Solve word problems involving these operations.	- Use counters to solve addition problems with regrouping. - Solve story problems involving change or subtraction.	- Worksheets on two-digit addition and subtraction. - Counters for hands-on practice.
Fractions	Introduction: Introducing thirds and three-quarters using visual models like pie charts.	- Recognize and identify thirds and three-quarters. - Use visual aids to understand fractional parts.	- Divide a pizza or paper circles into thirds and quarters. - Color parts of pie charts to represent fractions.	- Fraction pie charts. - Printable fraction circles.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Measurement	Money: Identifying coins and notes and solving simple money problems.	- Recognize and count coins and notes. - Solve word problems involving simple transactions.	- Set up a mock store for students to practice making purchases and giving change. - Count mixed coins to match amounts.	- Play money sets. - Real or replica coins and notes.
	Length, Mass, and Volume: Comparing and ordering objects by size, weight, and capacity.	- Use appropriate units to measure and compare length, weight, and volume. - Solve real-world problems.	- Measure classroom objects using rulers or measuring tapes. - Compare the capacities of different containers.	- Measuring tools (rulers, scales, measuring cups). - Sorting worksheets for measurements.
Time	Telling Time: Reading clocks to the nearest 5 minutes and understanding a.m. and p.m.	- Read analog and digital clocks. - Understand and apply the concept of a.m. and p.m.	- Create daily schedules, labeling activities with a.m. or p.m. - Play time-matching games using clock faces.	- Clock models. - Worksheets on telling time to the nearest 5 minutes.
Geometry	Properties of Shapes: Identifying properties of 2D and 3D shapes.	- Recognize and describe 2D shapes (e.g., sides, vertices). - Identify 3D shapes and their properties (e.g., edges, faces).	- Build 3D shapes using blocks or paper templates. - Draw and label 2D shapes with correct properties.	- Shape sorting games. - 3D shape models (e.g., cubes, cones).
	Symmetry: Identifying lines of symmetry in simple shapes.	- Recognize and draw lines of symmetry in regular 2D shapes.	- Fold paper shapes to find lines of symmetry. - Create symmetrical designs	- Mirrors for symmetry activities. - Printable symmetrical shape templates.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
		- Understand reflective symmetry.	using mirrors or drawing tools.	
Problem-Solving	Word Problems: Solving word problems with multiplication, division, and repeated addition.	- Solve word problems using arrays or repeated addition. - Begin understanding division as grouping.	- Solve problems involving groups of objects (e.g., sharing candies equally). - Use arrays to solve multiplication problems.	- Word problem worksheets. - Array grids for multiplication visualization.

GRADE 3

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Numbers	Place Value: Understanding place value up to 1,000.	- Read, write, and compare numbers up to 1,000. - Understand the value of each digit in a three-digit number.	- Build numbers using base-10 blocks. - Play place value games where students arrange digits to meet criteria.	- Place value charts. - *Number Sense for Grade 3* by McGraw-Hill.
	Addition and Subtraction: Adding and subtracting three-digit numbers using column methods.	- Solve addition and subtraction problems involving three-digit numbers. - Use regrouping effectively.	- Solve word problems involving three-digit addition and subtraction. - Create number riddles for classmates.	- Column method worksheets. - Online addition/subtraction tools.
	Multiplication and Division: Learning times tables and division as the inverse of multiplication.	- Memorize multiplication facts for 2, 3, 4, 5, 8, and 10 tables. - Relate division to multiplication.	- Solve puzzles involving multiplication and division. - Use manipulatives to visualize division as grouping.	- Times tables charts. - Flashcards for multiplication practice.
Fractions	Comparing Fractions: Fractions with the same denominator.	- Compare and order fractions with the same denominator. - Use visual aids to represent fractions.	- Use fraction bars to compare sizes visually. - Solve puzzles involving fraction comparisons.	- Fraction manipulatives. - Worksheets for comparing fractions.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
	Adding and Subtracting Fractions: Fractions with the same denominator.	- Add and subtract fractions with like denominators within one whole.	- Use fraction circles to visualize addition and subtraction. - Solve recipes requiring fractional adjustments.	- *Mastering Fractions* by Pearson Education. - Fraction addition worksheets.
Measurement	Perimeter: Measuring simple shapes using standard units.	- Measure and calculate the perimeter of rectangles and other simple shapes.	- Measure objects in the classroom and calculate their perimeters. - Design a garden plan with specific perimeters.	- Rulers and measuring tapes. - GeoGebra for visualizing shapes.
	Volume and Capacity: Understanding volume and capacity in liters and milliliters.	- Measure and compare capacities using standard units. - Estimate and measure volumes of containers.	- Measure water in containers using measuring jugs. - Compare capacities of various classroom objects.	- Measuring jugs and containers. - Worksheets for capacity problems.
Time	Telling Time: Reading clocks to the nearest minute and solving elapsed time problems.	- Read analog and digital clocks. - Calculate elapsed time in real-world contexts.	- Create a daily schedule using time intervals. - Solve puzzles involving time differences between events.	- Analog clock models. - Time-related problem sets.
Geometry	Angles: Identifying right angles and understanding turns.	- Recognize and identify right angles. - Understand that two right angles make a half-turn.	- Use a right-angle tester to find right angles in the classroom.	- Protractors. - Worksheets on identifying and measuring angles.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
			- Solve puzzles involving turns and angles.	
Problem-Solving	Multiplication and Division: Applying operations to solve real-world problems.	- Solve multi-step problems involving multiplication and division.	- Plan a school event budget using multiplication for costs and division for sharing items. - Solve group-sharing scenarios.	- Real-world math challenges. - Multiplication and division word problems.

GRADE 4

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Numbers	Place Value: Understanding place value up to 10,000.	- Read, write, and compare numbers up to 10,000. - Use place value to perform arithmetic operations.	- Create number puzzles where students arrange digits to meet specific criteria. - Build numbers using base-10 blocks.	- *Mathematics for Grade 4* by McGraw-Hill. - Place value charts and manipulatives.
	Addition and Subtraction: Advanced operations with four-digit numbers.	- Add and subtract four-digit numbers accurately. - Solve word problems involving these operations.	- Solve real-world problems, such as calculating total costs or remaining balances. - Play competitive addition games.	- Online addition and subtraction tools. - Worksheets for four-digit arithmetic.
	Multiplication and Division: Mastery of up to 12 times tables.	- Multiply and divide numbers up to 12 times tables. - Solve word problems involving multiplication and division.	- Solve problems like sharing costs equally among friends. - Use flashcards to master times tables.	- Times tables apps and games. - *Mastering Multiplication and Division* by Pearson.
Fractions and Decimals	Adding and Subtracting Fractions: Fractions with the same denominator.	- Add and subtract fractions with like denominators. - Simplify results when possible.	- Use fraction strips to visualize addition and subtraction. - Solve recipe problems requiring fractional adjustments.	- Fraction manipulatives. - *Fractions Made Easy* by Larson.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
	Decimals: Recognize and write decimal equivalents for tenths and hundredths.	- Understand place value in decimals. - Convert fractions like 1/10 and 1/100 to decimals.	- Represent decimals on number lines. - Solve money problems using decimal notation.	- Decimal place value charts. - Interactive number line tools.
Measurement	Area and Perimeter: Calculating for rectangles and compound shapes.	- Derive formulas for area and perimeter. - Apply these to solve real-world problems.	- Calculate the perimeter of a schoolyard or area of a classroom. - Create designs with given area and perimeter.	- Geometry toolkits. - Worksheets for compound shapes.
	Unit Conversion: Converting between common units (e.g., cm to m, g to kg).	- Understand and perform basic unit conversions. - Solve problems involving conversions.	- Measure classroom objects and convert between units. - Plan a shopping list with weights converted to kilograms.	- Metric conversion charts. - Hands-on measurement tools (rulers, scales).
Time	24-Hour Clock: Reading and solving time problems.	- Tell time using the 24-hour clock. - Solve time interval problems involving schedules and durations.	- Plan a daily schedule using a 24-hour clock. - Calculate time intervals for train or bus timetables.	- Digital and analog clocks. - Time-related problem sets.
Geometry	Symmetry: Lines of symmetry in shapes.	- Identify and draw lines of symmetry in regular and irregular shapes. - Explore rotational symmetry.	- Use mirrors to identify symmetry in objects. - Create symmetrical art pieces by folding and cutting paper.	- Symmetry worksheets. - Art supplies for creating symmetrical designs.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
	Angles: Identifying acute, obtuse, and right angles.	- Classify angles as acute, obtuse, or right. - Understand basic properties of angles.	- Use a protractor to measure angles in classroom objects. - Solve puzzles involving angle types and sums.	- Geometry protractors. - Worksheets on classifying angles.
Problem-Solving	Multi-Step Problems: Complex problems with all four operations.	- Solve multi-step problems combining addition, subtraction, multiplication, and division.	- Plan a party budget, calculating costs, taxes, and discounts. - Solve word problems involving multiple operations.	- Real-world math challenges. - *Problem-Solving Strategies for Grade 4* by Gottfried.
	Introduction to Algebra: Solving simple algebraic equations.	- Simplify and solve one-step equations with a variable. - Translate word problems into algebraic equations.	- Solve puzzles where students guess a "mystery number" based on equations. - Model equations using counters.	- *Introduction to Algebra* by Fisher. - Algebra tiles for hands-on learning.

GRADE 5

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Numbers	Place Value: Understanding place value up to 1,000,000.	- Read and write numbers up to 1,000,000. - Understand the value of each digit in large numbers.	- Create a place value chart for large numbers. - Solve puzzles involving rearranged digits in large numbers.	- *Math in Focus: Singapore Math* by Houghton Mifflin. - Place value worksheets.
	Rounding: Rounding numbers to the nearest 10, 100, and 1,000.	- Round numbers accurately to different place values. - Apply rounding in real-world scenarios.	- Round prices to estimate total shopping costs. - Create a rounding "number line" for visualizing estimates.	- Rounding practice worksheets. - Interactive number line tools.
	Prime Numbers: Recognizing prime numbers up to 100 and understanding prime factors.	- Identify prime numbers and their properties. - Factorize numbers into primes.	- Create a prime number sieve (e.g., Eratosthenes' sieve). - Solve problems involving prime factors and GCF.	- Prime number charts. - Khan Academy modules on prime numbers.
	Multiplication and Division: Advanced multi-digit operations.	- Multiply and divide multi-digit numbers efficiently. - Solve real-world problems involving these operations.	- Calculate costs for multiple items in a shopping scenario. - Divide large quantities into smaller groups.	- Long division problem sets. - Online multiplication tools.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Fractions, Decimals, and Percentages	Conversion: Converting between fractions, decimals, and percentages.	- Convert fractions to decimals and percentages, and vice versa.	- Solve problems comparing prices with discounts using percentages. - Represent fractions visually and as decimals.	- Fraction-decimal conversion guides. - Visual fraction models.
	Comparing Fractions: Ordering fractions with different denominators.	- Find common denominators to compare fractions. - Order fractions in ascending or descending order.	- Use fraction strips to compare sizes visually. - Solve word problems involving fraction comparisons.	- Fraction comparison worksheets. - Fraction strip manipulatives.
	Adding and Subtracting Fractions: Adding and subtracting with different denominators.	- Add and subtract fractions using common denominators. - Solve mixed number problems.	- Solve recipe problems requiring fraction addition. - Simplify fractions after operations.	- Online fraction calculators. - *Mastering Fractions* by Pearson Education.
Measurement	Area and Volume: Calculating the area of triangles, parallelograms, and volume of cubes/cuboids.	- Use formulas to find area and volume. - Solve real-world problems involving measurement.	- Calculate the area of floor plans. - Measure and calculate the volume of a classroom object.	- Geometry toolkits. - Measurement practice problems.
	Unit Conversion: Metric and imperial conversions.	- Convert between metric and imperial units (e.g.,	- Convert a recipe's measurements from metric	- Metric-imperial conversion charts.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
		inches to cm). - Solve real-world conversion problems.	to imperial. - Measure objects and convert units.	- Worksheets on unit conversion.
Geometry	Angles: Measuring angles using a protractor.	- Identify and measure angles accurately. - Understand types of angles (acute, obtuse, etc.).	- Measure angles in a polygon using a protractor. - Create a "guess the angle" game with peers.	- Protractor sets. - GeoGebra angle-measuring tools.
	Properties of Polygons: Recognizing and describing polygons.	- Classify polygons as regular or irregular. - Identify sides, angles, and symmetry.	- Draw and label different polygons. - Explore symmetry in nature or architecture.	- Geometry construction sets. - Polygon classification worksheets.
	Reflection and Translation: Simple transformations on a grid.	- Reflect and translate shapes on a coordinate plane. - Analyze properties of transformations.	- Design patterns using reflection and translation. - Solve puzzles with shapes on a grid.	- Interactive graphing tools. - Transformation worksheets.
Problem-Solving	Complex Problems: Multi-step problems involving fractions, decimals, and percentages.	- Solve real-life problems using multiple operations. - Develop critical thinking and reasoning skills.	- Plan a budget for a school project. - Solve shopping discounts and tax problems.	- Real-world problem-solving worksheets. - Project-based learning modules.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
	Introduction to Algebra: Simple algebraic equations and expressions.	- Simplify algebraic expressions. - Solve one-step equations.	- Solve puzzles requiring algebraic reasoning. - Translate word problems into algebraic equations.	- *Pre-Algebra Essentials* by Fisher. - Worksheets on beginner algebra.

GRADE 6

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Numbers	Large Numbers: Understanding and working with numbers up to 10 million.	- Read, write, and compare numbers up to 10 million. - Apply place value concepts to large numbers.	- Compare populations of different countries. - Create a number puzzle involving large numbers.	- *Mathematics for Grade 6* by McGraw-Hill. - Worksheets on large number comparisons.
	Prime, Square, and Cube Numbers: Identifying and using these numbers.	- Recognize and generate prime, square, and cube numbers. - Solve problems involving these numbers.	- Identify prime numbers in a given range. - Create a "prime factorization tree."	- Prime number charts. - Online factorization tools.
	Advanced Multiplication and Division: Multi-digit operations.	- Perform multi-digit multiplication and long division. - Solve real-world problems involving these operations.	- Calculate the cost of multiple items in a shopping scenario. - Divide large quantities among groups.	- Khan Academy modules on multiplication and division. - *Mental Math Strategies* guides.
Fractions, Decimals, and Percentages	Advanced Operations: Multiplication and division with fractions.	- Multiply and divide fractions and mixed numbers. - Solve real-world problems involving fractions.	- Solve recipes requiring fractional measurements. - Share portions of items among groups using fractions.	- Fraction problem-solving worksheets. - Online fraction calculators.
	Ratio and Proportion: Understanding and solving related problems.	- Solve problems involving ratios and proportions.	- Create scale drawings of objects. - Use ratios to compare ingredients in recipes.	- Interactive ratio tools. - *Understanding Ratios* by Pearson Education.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
		- Apply ratios to real-world contexts.		
Measurement	Area, Volume, and Surface Area: Calculating for complex shapes, including cylinders and prisms.	- Derive and use formulas for area, volume, and surface area. - Solve real-world measurement problems.	- Calculate the volume of a water tank. - Design packaging for an item with specified dimensions.	- Measurement kits. - *Geometry and Measurement* by Larson.
Geometry	Advanced Properties of Shapes: Describing properties of complex shapes, including circles.	- Identify and describe properties of 2D and 3D shapes. - Solve problems involving circles and polygons.	- Measure angles and dimensions of polygons. - Explore properties of circles using compasses.	- Geometry toolkits (rulers, compasses). - Worksheets on shape properties.
	Coordinates: Plotting in all four quadrants.	- Plot points in all four quadrants. - Solve problems involving coordinate geometry.	- Create a map of a city grid using coordinates. - Solve puzzles involving points in the coordinate plane.	- Graph paper and coordinate plotting tools. - *Coordinate Geometry for Kids* by Gottfried.
	Geometric Figures: Constructing bisected angles and perpendicular lines.	- Use tools to construct geometric figures. - Apply constructions to solve problems.	- Construct bisected angles and verify with measurements. - Design patterns using perpendicular lines.	- Compass and protractor kits. - GeoGebra for geometric constructions.
Problem-Solving	Algebra: Solving algebraic expressions and equations.	- Simplify expressions and solve one-step and two-step equations. - Apply equations to real-world scenarios.	- Solve word problems requiring algebraic reasoning. - Create equations from everyday contexts, like budgets.	- Worksheets on basic algebra. - *Algebra for Beginners* by Fisher.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
	Real-Life Problems: Applying mathematical concepts to multi-step problems.	- Solve complex real-world problems involving multiple operations. - Apply critical thinking strategies.	- Plan a school event budget, incorporating cost analysis and optimization. - Design a layout for a garden.	- Real-world math problem sets. - Problem-solving guides.

GRADE 7

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Numbers and Operations	Integers: Operations with positive and negative numbers, order of operations.	- Perform addition, subtraction, multiplication, and division with integers. - Apply order of operations with integers.	- Solve temperature changes involving negative numbers. - Create number line diagrams to visualize operations.	- *Math in Focus: Singapore Math* by Houghton Mifflin. - Worksheets on integer operations.
	Rational Numbers: Operations with fractions, decimals, and percentages.	- Simplify and perform arithmetic operations on fractions. - Convert between fractions, decimals, and percentages.	- Compare unit prices in a shopping scenario. - Calculate percentage discounts during sales.	- Khan Academy modules on rational numbers. - Online fraction calculators.
	Ratios and Proportions: Solving problems involving ratios, rates, and proportions.	- Understand and solve ratio and proportion problems. - Apply proportions to real-world scenarios.	- Scale recipes using proportions. - Solve problems involving speed, distance, and time.	- Ratio problem-solving guides. - Worksheets on rates and proportions.
	Exponents: Introduction to powers, square roots, and cube roots.	- Calculate powers and roots. - Understand the relationship between squares, square roots, and cubes.	- Explore area and volume relationships using square and cube roots. - Solve exponential growth problems.	- *Understanding Exponents* by McGraw-Hill. - Worksheets on basic powers and roots.
Algebra	Expressions: Simplifying algebraic expressions and combining like terms.	- Simplify expressions by combining like terms and	- Create and simplify expressions for calculating costs. - Match simplified	- Desmos Algebra Starter Kit.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
		applying the distributive property.	expressions to word problems.	- *Pre-Algebra Essentials* by Fisher.
	Equations: Solving one-step and two-step linear equations.	- Solve equations with variables on one side. - Apply equations to solve real-world problems.	- Solve problems involving missing values in budgets. - Create and solve equations from story problems.	- Worksheets on solving linear equations. - Algebra equation solvers.
	Inequalities: Introduction to inequalities and solving simple inequalities.	- Represent and solve inequalities on a number line. - Apply inequalities to real-world situations.	- Solve problems involving maximum or minimum constraints. - Graph simple inequalities on a number line.	- Interactive inequality graphing tools. - Worksheets on inequalities.
	Patterns: Identifying and extending arithmetic and geometric sequences.	- Identify patterns and write rules for sequences. - Differentiate between arithmetic and geometric sequences.	- Explore number patterns in tiling or art. - Predict future values in a given sequence.	- Pattern-recognition worksheets. - Online sequence generators.
Geometry	Angles: Understanding complementary, supplementary, and vertical angles.	- Measure and calculate angles. - Solve problems involving angle relationships.	- Create geometric art using complementary and supplementary angles. - Solve puzzles involving angle measures.	- GeoGebra geometry tools. - Protractors and angle-measure worksheets.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
	Triangles: Properties of triangles, including Pythagoras' theorem.	- Classify triangles by angles and sides. - Apply Pythagoras' theorem to right triangles.	- Solve problems involving distances in triangles. - Model real-world problems with right triangles.	- *Introduction to Geometry* by Moise. - Pythagoras theorem worksheets.
	Perimeter, Area, and Volume: Calculating perimeter, area, and volume of shapes.	- Derive and use formulas for 2D and 3D shapes. - Solve real-world problems involving space and design.	- Calculate material costs for building projects. - Design a container with specific volume constraints.	- Measurement tools and resources. - Geometry problem-solving guides.
Statistics and Probability	Data Representation: Bar charts, histograms, and pie charts.	- Create and interpret bar charts, histograms, and pie charts. - Analyze data for trends and insights.	- Collect and graph data on daily habits. - Analyze survey results using pie charts and histograms.	- Google Sheets or Excel for chart creation. - *Statistics Made Simple* by Gottfried.
	Measures of Central Tendency: Mean, median, mode, and range.	- Calculate and interpret measures of central tendency. - Use data to solve real-world problems.	- Analyze class test scores to find mean, median, and mode. - Compare different data sets using range.	- Statistical analysis worksheets. - Data visualization tools.
	Probability: Basic probability concepts and experiments.	- Calculate probabilities for simple events. - Understand the concept of likelihood.	- Conduct probability experiments with dice or coins. - Solve word problems involving probabilities.	- *Probability Basics* by Larson. - Probability games and worksheets.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Problem-Solving	Mathematical Reasoning: Solving multi-step word problems.	- Apply multiple mathematical concepts to solve complex problems. - Develop strategies for efficient problem-solving.	- Design a small business plan using percentages, equations, and area. - Solve puzzles involving geometry and algebra.	- Real-world scenario worksheets. - Problem-solving challenges from Math Olympiad resources.

GRADE 8

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Numbers and Operations	Rational and Irrational Numbers: Understanding and identifying rational and irrational numbers.	- Differentiate between rational and irrational numbers. - Approximate irrational numbers on the number line.	- Classify numbers as rational or irrational. - Approximate $\sqrt{2}$ or π to place on a number line.	- Worksheets on classifying numbers. - *Understanding Rational Numbers* by Bennett.
	Exponents and Radicals: Simplifying expressions with exponents and radicals.	- Apply the laws of exponents. - Simplify expressions with square and cube roots.	- Simplify radical expressions. - Solve real-world problems involving exponential growth.	- Khan Academy modules on exponents. - *Mathematics for Middle School* by Larson.
	Percentages: Advanced percentage problems, including percentage change and compound interest.	- Solve real-world problems involving percentage increase/decrease. - Calculate compound interest.	- Analyze price changes during sales. - Use compound interest formulas to explore savings growth.	- Financial literacy guides. - Worksheets on compound interest problems.
Algebra	Linear Equations: Solving multi-step linear equations.	- Solve equations with variables on both sides. - Apply equations to real-world problems.	- Solve equations involving measurements of length or cost. - Graph solutions on the coordinate plane.	- Desmos graphing tools. - *Algebra Essentials* by Fisher.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
	Systems of Equations: Solving systems of equations graphically and algebraically.	- Solve systems of linear equations. - Analyze real-world scenarios using systems of equations.	- Model cost comparisons using systems of equations. - Graph solutions to identify points of intersection.	- Graph paper and graphing software. - Worksheets on systems of equations.
	Polynomials: Adding, subtracting, and multiplying polynomials.	- Perform basic operations with polynomials. - Identify degree and terms of polynomials.	- Solve area problems involving polynomial expressions. - Multiply binomials to model geometric relationships.	- Online polynomial calculators. - *Beginning Algebra* by Aufmann et al.
Geometry	Transformations: Translations, rotations, reflections, and dilations.	- Perform transformations on the coordinate plane. - Analyze congruence and similarity after transformations.	- Design a tessellation using reflections and rotations. - Create dilations to explore scaling effects.	- GeoGebra transformation tools. - Interactive graphing platforms.
	Circles: Calculating circumference, area, and understanding circle theorems.	- Apply formulas for circumference and area of circles. - Explore relationships among angles and arcs.	- Solve problems involving wheels and circular objects. - Analyze sector areas and arc lengths.	- *Geometry for Middle School* by Rhoad. - Circle theorem worksheets.
	Surface Area and Volume: Calculating surface area and volume of cylinders, cones, and spheres.	- Derive and apply formulas for 3D shapes. - Solve real-world problems	- Calculate paint needed to cover cylindrical tanks. - Explore	- Real-life measurement tools. - *Introduction to*

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
		involving volume and surface area.	volume-to-surface-area ratios in design.	*Geometry* by McGraw-Hill.
Statistics and Probability	Data Analysis: Introduction to scatter plots, correlation, and basic interpretation.	- Interpret scatter plots. - Understand and analyze trends and correlations.	- Create scatter plots for real-world data, such as temperatures and rainfall. - Analyze correlation coefficients.	- Excel or Google Sheets for plotting data. - Statistical problem-solving guides.
	Probability: Compound probability and independent/dependent events.	- Calculate probabilities of compound events. - Differentiate between independent and dependent events.	- Solve problems involving dice rolls and card games. - Design probability experiments with spinners or coins.	- Probability games. - *Probability Basics for Students* by Gottfried.
Problem-Solving	Multi-Step Problems: Solving real-world problems involving multiple mathematical concepts.	- Break down and solve complex word problems. - Apply algebra, geometry, and statistics to real situations.	- Design a budget incorporating percentages and linear equations. - Solve real-world design problems using geometry.	- Real-world problem scenarios. - Multi-step problem worksheets.

GRADE 9

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Numbers and Operations	Advanced Exponents and Radicals: Higher-order exponents and complex radical expressions.	- Simplify expressions with higher-order exponents. - Perform operations with radicals, including rationalizing denominators.	- Solve real-world problems involving radical expressions. - Explore powers of ten and their applications in physics.	- Khan Academy modules on exponents and radicals. - *Algebra 1* by McGraw-Hill.
	Scientific Notation: Operations with scientific notation.	- Convert between standard and scientific notation. - Perform operations (addition, subtraction, multiplication, division) with scientific notation.	- Solve problems involving astronomical distances or molecular scales. - Perform calculations with very large or small numbers.	- NASA educational resources. - Worksheets on scientific notation.
Algebra	Quadratic Equations: Solving by factoring, completing the square, and quadratic formula.	- Solve quadratic equations using multiple methods. - Analyze the roots of quadratic equations graphically and algebraically.	- Solve projectile motion problems. - Explore quadratic roots using graphing calculators.	- Desmos graphing calculator. - *Algebra: Structure and Method* by Dolciani et al.
	Functions: Introduction to functions and function notation.	- Understand the concept of a function. - Evaluate and graph functions using function notation.	- Create and analyze input-output tables. - Graph simple functions and transformations.	- Interactive function plotting tools. - Worksheets on evaluating functions.
	Linear Functions: Graphing, slope-intercept, and point-slope forms.	- Graph linear equations and find slopes. - Interpret slope-intercept and	- Solve problems involving speed and distance. - Analyze trends in linear	- *Algebra 1* by Larson. - Practice problems for slope and intercepts.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
		point-slope forms in real-world contexts.	data, such as temperature changes.	
Geometry	Advanced Geometric Concepts: Congruence, similarity, and constructions.	- Prove congruence and similarity of triangles. - Use geometric tools to construct shapes and solve problems.	- Use compasses and protractors for geometric constructions. - Solve map scale problems.	- GeoGebra geometry tools. - *Geometry for Enjoyment and Challenge* by Rhoad et al.
	Trigonometry: Trigonometric ratios (sine, cosine, tangent) and solving right triangles.	- Understand and use trigonometric ratios. - Solve right triangles in real-world contexts.	- Calculate heights of objects using trigonometry. - Solve navigation and angle of elevation problems.	- Trigonometry tables. - *Practical Trigonometry* by Jones.
	Coordinate Geometry: Distance formula, midpoint formula, and equations of lines.	- Derive and apply the distance and midpoint formulas. - Write equations of lines in various forms.	- Solve problems involving the shortest path between two points. - Analyze geometric shapes on the coordinate plane.	- *Geometry* by Pearson Education. - Online coordinate geometry tools.
Statistics and Probability	Descriptive Statistics: Standard deviation, variance, and data distributions.	- Calculate and interpret measures of spread (variance, standard deviation). - Analyze patterns in data distributions.	- Analyze class test scores and compare variances. - Create and interpret histograms and box plots.	- Excel or Google Sheets for data analysis. - *Statistics for High School* by Gottfried.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
	Probability: Probability distributions and expected value.	- Calculate probabilities for simple and compound events. - Determine expected values in real-world contexts.	- Analyze outcomes in games of chance. - Solve real-world problems like expected profit in business scenarios.	- Probability simulators. - *Introduction to Probability and Statistics* by Walpole.
Problem-Solving	Real-World Applications: Applying algebra, geometry, and probability concepts.	- Solve interdisciplinary problems using algebra, geometry, and probability.	- Design a cost-effective fence using algebra and geometry. - Optimize routes using coordinate geometry.	- Case studies in real-world problem-solving. - Worksheets with complex multi-step problems.

GRADE 10

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Numbers and Operations	Complex Numbers: Introduction and basic operations.	- Understand the concept of imaginary numbers. - Perform operations (addition, subtraction, multiplication, division) on complex numbers.	- Plot complex numbers on the complex plane. - Solve quadratic equations with non-real roots.	- *Algebra and Trigonometry* by Sullivan. - Graphing tools for the complex plane.
	Sequences and Series: Arithmetic and geometric sequences and series.	- Derive and use formulas for nth terms and sums. - Identify and analyze arithmetic and geometric patterns.	- Solve real-world problems, such as calculating loan payments or predicting population growth.	- Khan Academy sequences tutorials. - Worksheets on arithmetic and geometric sequences.
Algebra	Polynomials: Division, synthetic division, and the factor theorem.	- Divide polynomials using long and synthetic methods. - Apply the factor theorem to solve polynomial equations.	- Simplify polynomial expressions and verify results with synthetic division. - Solve problems using the factor theorem.	- *Precalculus* by Larson. - Polynomial division worksheets.
	Rational Expressions: Simplification and operations.	- Simplify rational expressions. - Perform addition, subtraction, multiplication, and division of rational expressions.	- Solve real-world problems involving rates (e.g., work problems). - Create and simplify complex rational equations.	- Algebra problem-solving guides. - Online rational expression solvers.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
	Quadratic Functions: Graphing, vertex form, and transformations.	- Graph and analyze quadratic functions. - Understand transformations (shifting, reflecting, and stretching).	- Graph quadratic equations using vertex form. - Analyze projectile motion problems using quadratic functions.	- Graphing calculators. - *Functions Modeling Change* by Connally et al.
Geometry	Advanced Trigonometry: Sine and cosine rules; radian measure.	- Solve triangles using the sine and cosine rules. - Convert between degrees and radians.	- Calculate distances between points on a map. - Solve navigation problems involving bearings.	- GeoGebra. - *Trigonometry* by Lial, Hornsby, Schneider.
	Circles and Conics: Properties of circles, parabolas, ellipses, and hyperbolas.	- Derive equations of conic sections. - Graph and analyze their properties.	- Explore satellite orbits using ellipses. - Solve problems involving parabolic trajectories.	- Desmos graphing tool. - Geometry problem sets.
	Proofs: Formal geometric proofs.	- Write and analyze formal proofs involving angles, lines, triangles, and circles.	- Prove properties of isosceles triangles. - Develop proofs for circle theorems (e.g., angles subtended by chords).	- *Geometry: A High School Course* by Moise and Downs. - Interactive geometry software.
Statistics and Probability	Inferential Statistics: Sampling methods, estimation, and hypothesis testing.	- Understand sampling techniques. - Perform basic hypothesis testing and interval estimations.	- Design a simple survey and analyze the results using hypothesis testing. - Create confidence intervals for data.	- SPSS tutorials. - *Statistics for Beginners* by Gottfried.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
	Probability: Conditional probability, permutations, and combinations.	- Solve probability problems involving conditions. - Use permutations and combinations in problem-solving.	- Analyze outcomes in card games or dice rolls. - Solve real-world scenarios using permutations and combinations.	- *Probability and Statistics for Engineers and Scientists* by Walpole. - Probability simulators.
Problem-Solving	Abstract Problems: Applying algebraic and geometric concepts.	- Solve complex problems requiring the integration of algebra and geometry.	- Model and solve optimization problems (e.g., maximizing areas or minimizing costs). - Analyze physics-based problems using algebra and geometry.	- Case studies from physics and engineering. - Problem-solving contests (e.g., Math Olympiads).

GRADE 11

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Numbers and Operations	Logarithms: Introduction, properties, and applications.	- Understand the concept of logarithms as inverses of exponentials. - Solve equations involving logarithms.	- Solve compound interest problems using logarithmic functions. - Graph and analyze logarithmic functions.	- *Precalculus Mathematics in a Nutshell* by George Simmons. - Desmos graphing tools.
	Sequences and Series: Infinite series, convergence, and the binomial theorem.	- Explore convergence of infinite series. - Expand expressions using the binomial theorem.	- Test convergence of series using formulas. - Solve practical problems using the binomial theorem.	- Khan Academy modules on series and sequences. - Binomial expansion worksheets.
Algebra	Exponential Functions: Growth, decay, and equations.	- Solve real-world problems involving exponential growth and decay. - Graph exponential functions.	- Model population growth and radioactive decay problems. - Graph transformations of exponential functions.	- Graphing calculators. - *Algebra and Trigonometry* by Sullivan.
	Advanced Functions: Inverse and composite functions; transformations.	- Understand and construct inverse and composite functions. - Apply transformations to function graphs.	- Explore transformations of quadratic and cubic functions. - Analyze real-world problems using composite functions.	- Wolfram Alpha for visualizing transformations. - Inverse function practice sheets.
	Polynomial Functions: Higher-degree polynomials, end behavior, and roots.	- Analyze the behavior of polynomial functions.	- Explore the effects of coefficients on graph shapes.	- *Functions Modeling Change* by Connally et al.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
		- Solve polynomial equations.	- Identify roots and turning points of polynomials.	- Polynomial graphing software.
Geometry	Vectors: Introduction, operations, and applications.	- Perform operations on vectors. - Solve geometric problems using vectors.	- Model motion in physics using vector concepts. - Solve problems involving vector magnitudes and directions.	- GeoGebra for vector visualizations. - *Vector Analysis* by Spiegel.
	Trigonometry: Identities, equations, and applications.	- Prove and apply trigonometric identities. - Solve equations involving trigonometric functions.	- Derive and verify identities like $\sin^2\theta + \cos^2\theta = 1$. - Solve problems involving heights and distances.	- *Trigonometry* by Lial, Hornsby, Schneider. - Online trigonometric solvers.
	Analytical Geometry: Conic sections and graphing techniques.	- Graph and analyze parabolas, ellipses, and hyperbolas. - Solve geometric problems involving conics.	- Model satellite orbits using ellipses. - Explore real-world applications of parabolic reflectors.	- Graphing software for conics. - *Geometry and the Imagination* by Hilbert.
Statistics and Probability	Probability Distributions: Binomial, normal, and key distributions.	- Understand and calculate probabilities for distributions. - Analyze the properties of normal curves.	- Conduct experiments to create histograms and fit probability distributions. - Solve real-world probability problems.	- SPSS or R for statistical analysis. - *Introduction to Probability* by Blitzstein.
	Data Analysis: Regression analysis and correlation.	- Analyze data sets for patterns and correlations.	- Analyze relationships in real-world data sets.	- Excel or Google Sheets for regression.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
		- Perform simple linear regression.	- Use regression to predict outcomes.	- Regression tutorials from Khan Academy.
Problem-Solving	Real-World Scenarios: Complex, interdisciplinary problems.	- Apply mathematical concepts to solve real-world problems.	- Optimize travel routes using vectors and geometry. - Analyze financial data using exponential and logarithmic models.	- Case studies from economics, engineering, and science. - Problem-solving worksheets.

GRADE 12

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
Numbers and Operations	Advanced Calculus: Limits, derivatives, integrals, and applications.	- Understand and evaluate limits. - Differentiate and integrate functions. - Apply calculus to real-world problems.	- Derive the velocity of an object from position-time equations. - Calculate areas using definite integrals.	- *Calculus: Early Transcendentals* by James Stewart. - Khan Academy calculus tutorials.
	Complex Numbers: Advanced operations, De Moivre's theorem, and applications.	- Perform complex number operations. - Solve polynomial equations using De Moivre's theorem.	- Visualize roots of unity on the complex plane. - Solve electrical circuit problems using complex numbers.	- Graphing software like GeoGebra. - *Complex Numbers and Applications* by P. Westwood.
Algebra	Logarithmic and Exponential Functions: Analysis and applications.	- Solve equations involving logarithms and exponentials. - Model exponential growth and decay.	- Model population growth and radioactive decay. - Explore the behavior of exponential functions in finance.	- Desmos graphing calculator. - *Algebra and Trigonometry* by Sullivan.
	Systems of Non-Linear Equations: Methods for solving systems with complex variables.	- Solve systems of equations using substitution, elimination, and graphical methods.	- Model economic supply-demand equilibrium using non-linear equations.	- Wolfram Alpha. - Advanced algebra problem sets.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
	Matrices and Determinants: Introduction and applications.	- Perform matrix operations and use determinants to solve systems of equations.	- Use matrices to encode and decode messages. - Model network flows or economic input-output problems.	- MATLAB software. - *Linear Algebra and Its Applications* by David Lay.
	Sequences and Series: Taylor and Maclaurin series.	- Expand functions using Taylor and Maclaurin series. - Analyze convergence of series.	- Approximate π using Taylor series. - Explore error bounds in polynomial approximations.	- Interactive tools like Wolfram Demonstrations Project. - Taylor/Maclaurin examples.
Geometry	Advanced Vectors: Applications in three-dimensional space.	- Represent vectors in 3D. - Solve geometric problems using vector operations.	- Model aircraft trajectory using vectors. - Analyze forces acting on a structure in 3D.	- *Vector Analysis* by Spiegel. - Engineering simulations for vectors.
	Trigonometry: Polar coordinates and parametric equations.	- Convert between Cartesian and polar forms. - Graph parametric equations and solve related problems.	- Create art using polar graphs (e.g., spirals, roses). - Analyze motion paths defined by parametric equations.	- Graphing calculators. - Online polar graph generators.
	Calculus in Geometry: Solving problems involving curves and areas.	- Use calculus to find areas, lengths, and volumes of geometric shapes.	- Solve problems on areas between curves. - Use integrals to calculate	- *Geometry with Calculus* by Hilbert and Cohn-Vossen.

Area of Study	Topics	Learning Objectives	Sample Activities	Sample Resources
			volume of revolved solids (e.g., wine glasses).	- Real-world shape problems.
Statistics and Probability	Advanced Inferential Statistics: Hypothesis testing and confidence intervals.	- Construct and interpret confidence intervals. - Conduct hypothesis tests for different distributions.	- Test hypotheses using data from experiments. - Evaluate public health data for statistical significance.	- Statistical software like SPSS. - *Introduction to the Practice of Statistics* by Moore.
	Probability Theory: Distributions, stochastic processes, and Markov chains.	- Analyze probability distributions (normal, binomial, etc.). - Solve problems involving Markov chains.	- Model customer behavior using Markov processes. - Simulate dice rolls to understand probability distributions.	- Probability theory guides. - *Stochastic Processes* by Sheldon Ross.
Problem-Solving	Complex Applications: Advanced applications in real-world scenarios.	- Apply mathematical concepts to interdisciplinary problems.	- Model energy consumption in renewable systems. - Optimize routes in logistics using matrix and vector operations.	- Case studies from engineering and economics. - Project-based learning tools.