Pre K-Kindergarten
Students will be able to:

- Sort and classify objects by color, shape, size, number, and other properties.
- Count by fives and tens at least up to 50.

1. ***Identify, reproduce, describe, extend and create color, rhythmic, shape, number, and letter repeating patterns with simple attributes.*** *(K.P.1, K.P.2, K.P.3)*

- Sort and identify basic 2-dimensional shapes such as but not limited to circle, square, triangle, rectangle, oval/ellipse, hexagon, and trapezoid.
- Describe attributes by naming number of sides and corners.
- Reproduce, draw 2-dimensional shapes.

2. ***Sort, describe, name, reproduce, and draw 2-dimensional shapes.*** *(K.G.1)*

- Sort and identify basic 3-dimensional shapes such as but not limited to sphere, cone, cylinder, cube prism.
- Describe attributes by naming number of sides and corners.
- Recognize 3-dimensional shapes when viewed from different angles.

3. ***Sort, describe, name, reproduce, and draw 3-dimensional shapes.*** *(K.G.2, K.G.3)*

- Rote count by ones to at least 20 (Pre-K), 100 (K).
- Count using 1 to 1 correspondence.
- Match quantities up to at least 10 with numerals and words.
- Identify and describe a set.
- Relate a numeral to the number of objects in a set.
- Compare sets to 10 using concrete objects and match numerals to sets.
- Order numbers 0-10.
- Demonstrate the joining and separating of sets.

4. ***Use concrete objects to solve addition and subtraction problems to 10.*** *(K.N.2, K.N.4, K.N.7, K.P.4)*

- Explore size, shape and visual attributes of coins.
- Recognize penny, nickel, and dime.
- Count pennies up to 20.

5. ***Identify coins by name.*** *(K.N.6)*

Pre K-Kindergarten (Continued)

- Identify positions of objects in sequences (e.g., first, second) up to fifth.
- Identify positions of objects in space (e.g., beside, inside, next to, close to, above, below, apart) to describe and compare their relative positions.

6. Use appropriate language to describe position of objects. *(K.N.3, K.G.4)*

- Use non-standard units to measure length, area, weight and capacity.
- Make and use estimates of measurements from every day experiences.
- Use comparative language (e.g., longer taller, shorter, same length; heavier, lighter, same weight; holds more, holds less, holds the same amount).

7. Recognize and compare the attributes of length, volume, capacity, and weight. *(K.M.1, K.M.2, K.M.3)*

- Collect and organize data.
- Compare data from simple graphs (e.g., largest, smallest, most often).
- Solve simple problems based on data from tables.

8. Collect and organize data in lists, tables, and simple graphs. *(K.D.1)*

Grade 1
Students will be able to:

- Know addition and subtraction facts (addends to 10) and use them to solve problems.
- Discuss and use the inverse relationship between addition and subtraction.
- Use models to calculate whole number sums through 99.
- Identify mathematical symbols (+, -, =).

1. ***Use addition and subtraction to solve story problems.*** *(2.N.8, 2.N.9, 2.N.10, 2.N.11, 2.N.12)*

- Count by ones to one hundred.
- Identify different patterns on hundreds chart.
- Continue simple numeric and geometric patterns.

2. ***Skip count by 2's, 5's, 10's to 50.*** *(2.P.3, 2.P.4)*

- Sort 2-and 3-dimensional shapes by attribute.
- Identify shapes that have been turned, flipped, slid, and enlarged.
- Recognize congruent shapes.

3. ***Identify and name 2-and 3-dimensional shapes.*** *(2.G.1, 2.G.4)*

- Recognize and identify the value of penny, nickel, dime, quarter, and half-dollar.
- Identify the value of $1, $5, $10, and $20 bills.
- Recognize money symbols (¢ and $).

4. ***Identify the value of coins.*** *(2.N.6)*

- Identify parts of the day (morning, afternoon, evening).
- Identify parts of the analog clock and know its purpose.
- Tell time to the hour.
- Identify days of the week.
- Identify months of the year.
- Use a calendar to identify dates.

5. ***Name, order, and distinguish periods of time (days, weeks, months).*** *(2.M.1, 2.M.2)*

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Grade 1 (Continued)

- Match simple data to lists, tables, or graphs.
- Interpret data using tally charts.
- Read and interpret data from a picture graph.
- Solve simple problems based on data from pictographs and bar graphs

6. Organize, classify, represent, and interpret data using tables, charts, etc. *(2.D.2, 2.D.3, 2.D.4)*

- Estimate and measure with inches.
- Estimate and measure with feet.
- Estimate and measure with centimeters.

7. Measure and compare common objects using non-standard and standard units. *(2.M.3, 2.M.4, 2.M.5, 2.M.6)*

Grade 2
Students will be able to:

- Demonstrate an understanding of place value.
- Add multiple 1-digit numbers.
- Add 2-digit number with no regrouping.
- Subtract two 1-digit numbers.
- Subtract a 2-digit number from a 2-digit number with no regrouping.
- Use a variety of words to explain addition and subtraction.

1. ***Add 2 and 3-digit numbers and subtract 2-digit numbers.*** *(2.N.1, 2.N.7, 2.N.9, 2.N.10)*

- Match equal coin amounts (i.e. 5 pennies = 1 nickel, 2 nickels =1 dime, etc.).
- Find the value of a collection of like coins.
- Find different ways to represent an amount of money.
- Identify the value of paper money ($1, $5, $10, $20).

2. ***Identify the value of a collection of coins and bills to $5.00.*** *(2.N.6)*

- Recognize number patterns.
- Analyze patterns to identify rules.
- Extend number, geometric, and other repeating patterns.

3. ***Describe and create number patterns.*** *(2.N.2, 2.P.1, 2.P.2, 2.P.3)*

- Solve basic-facts open sentences (3 + □ = 10).
- Solve simple open sentences with missing operation symbols (3 __ 7 = 10).

4. ***Construct and solve open sentences that have variables.*** *(2.P.5)*

- Identify figures that are the same size and shape (congruent).
- Create new shapes by putting different shapes together and taking them apart.
- Analyze position of shapes (inside, outside, between).

5. ***Predict the results of putting shapes together and taking them apart.*** *(2.G.1, 2.G.2, 2.G.3, 2.G.6)*

- Compare length and width of objects (shorter, longer, wider, narrower).
- Select and correctly use the appropriate measurement tools (ruler, thermometer).
- Make and use estimates of measurement, e.g. centimeter and inch.

6. ***Measure and compare common objects using English and metric systems.*** *(2.M.3, 2.M.4, 2.M.5, 2.M.6)*

Grade 2 (Continued)

- Tell time to the nearest hour.
- Tell time to the nearest half-hour.

7. Tell time to quarter-hour intervals on analog and digital clocks using a.m. and p.m. *(2.M.2)*

- Use surveys and observations to gather data.
- Read and interpret data from graphs.
- Organize data using tallies, charts, tables, bar graphs, pictographs, and Venn Diagrams.

8. Draw conclusions and make educated guesses based on information gained from data. *(2.D.1, 2.D.2, 2.D.3, 2.D.4)*

Grade 3
Students will be able to:

- Add multi-digit numbers with regrouping.
- Subtract a 2-digit number from a 2-digit number with regrouping.
- Subtract 3 or 4-digit numbers with regrouping.

1. ***Solve real-world whole number problems involving addition and subtraction.*** *(3.N.8, 3.N.10)*

- Understand situations that entail multiplication, such as equal groupings and repeated addition.
- Use concrete materials to investigate situations that lead to multiplication and division.
- Select, use, and explain various meanings and models of multiplication.
- Understand 'doubling' as equivalent to multiplying by 2.
- Understand multiplying by 1 (identity property e.g., 1x7=7, 1x1000=1000).
- Understand multiplying by 0 e.g., 7x0=0, 1000x 0 = 0.

2. ***Know multiplication facts through 10 x 10.*** *(3.N.7, 3.N.9, 3.N.13)*

- Use basic facts to solve related problems e.g., 3x5 is related to 3x50.
- Multiply a 2-digit by a 1-digit number with no regrouping.

3. ***Multiply up to 2-digit by 1-digit number accurately and efficiently.*** *(3.N.6)*

- Round whole numbers through 1,000 to the nearest 10, 100, or 1,000.
- Compute with dollars and cents.
- Use rounding to estimate answers to real-world problems.

4. ***Estimate quantities, measures, amounts of money to judge the reasonableness of computations.*** *(3.N.11, 3.N.12)*

- Identify equal parts using models.
- Identify one-half from a group or set.
- Identify fractional parts from a group or set (halves, fourths, thirds, tenths).
- Write a fraction from a visual representation.
- Order fractions using visual representation.
- Read and write the word names for fractions and mixed numbers between 0 and 1.

5. ***Identify and represent fractions between 0 and 1 with denominators through 10 as parts of wholes and parts of groups.*** *(3.N.3, 3.N.4)*

Grade 3 (Continued)

- Determine which symbol (<, >, =) is appropriate for a given number sentence.
- Use the commutative (10 + x = x + 10) and identity properties.
- Solve simple open sentences using diagrams and models.

6. ***Determine the value of a variable (through 10) in simple equations involving addition, subtraction, or multiplication.*** *(3.N.7, 3.P.2, 3.P.3, 3.P.4)*

- Identify and name various 2- and 3-dimensional shapes.
- Classify 2-dimensional figures by number of sides and number of vertices.
- Classify 3-dimensional figures by number of faces.
- Identify angles as acute, right, or obtuse.

7. ***Compare and analyze attributes and other features of two-dimensional and 3-dimensional shapes.*** *(3.G.1, 3.G.7)*

- Identify points on a line.
- Identify and draw parallel lines, perpendicular lines, and other intersecting lines
- Identify lines of symmetry.
- Determine and name locations on a labeled grid or coordinate system (map or graph).

8. ***Use ordered pairs of whole numbers and/or letters to locate and identify points on a grid.*** *(3.G.4, 3.G.5, 3.G.6)*

- Identify the value of a collection of coins and bills.
- Carry out simple unit conversions (cents to dollars).

9. ***Determine the value of a combination of coins and bills and write the monetary amounts using the dollar sign ($) and decimal notation (.05.)*** *(3.M.2)*

- Measure length with customary measures to the inch mark.
- Measure length with metric measures to the centimeter mark.
- Know the approximate weight of familiar objects.
- Estimate and find area and perimeter of a rectangle, using diagrams and grids, or by measuring.
- Carry out simple conversions hours to minutes, yards to feet or inches, etc.
- Identify time to the minute and compute elapsed time less than one hour.
- Identify the number of hours in a day, minutes in an hour.
- Read Fahrenheit thermometers to the nearest degree.

10. ***Select and use the appropriate tools and unit of measurement using both English and Metric systems to estimate, measure and solve problems.*** *(3.M.1, 3.M.2, 3.M.3, 3.M.4, 3.M.5)*

Grade 3 (Continued)

- Using observations, measurements, surveys, or experiments to collect data.
- Read and interprets data from graphs, tables, and charts.
- Solve problems using graphs, dual bar graphs, Venn Diagrams, charts, and tables.

11. Collect, organize, draw conclusions and identify appropriate ways to display data sets (in the form of tables, line plots, pictographs, tallies or bar graphs). *(3.D.1, 3.D.2, 3.D.3)*

- Make an organized list (using words, symbols or pictures) of possible outcomes.
- Recognize that missing or duplicating choices affect the number of possible outcomes (i.e., vanilla/chocolate, chocolate/vanilla).

12. List and count the number of possible combinations of objects from two sets. *(3.D.4)*

Grade 4
Students will be able to:

- Add and subtract up to 5-digit numbers.
- Know multiplication facts through 12x12 with related division facts.
- Multiply up to 3-digits by 2-digits.
- Divide up to a 3-digit whole number with a single-digit divisor with or without remainders and interpret any remainders.

1. ***Select and use appropriate operations (+, -, x, ÷) to solve problems including those involving money.*** *(4.N.7, 4.N.8, 4.N.11, 4.N.12)*

- Round whole numbers through 100,000 to the nearest 10, 100, 1,000 and 10,000.
- Represent, order, and compare large numbers (to at least 100,000) using various forms, including expanded notation.
- Select, use, and explain the associative property.
- Add/Subtract decimals to the hundredths place.

2. ***Estimate the results of whole number computations up to 3-digits whole numbers and amounts of money up to $1,000.00 to judge the reasonableness of the answer.*** *(4.N.2, 4.N.6, 4.N.9, 4.N.10)*

- Use a number line to identify a fractional point.
- Compare equivalent fractions using visual representations.
- Compare numeric and visual representation of equivalent fractions.
- Use models to add/subtract fractions.
- Read, name, and write decimals between 0 and 1 up to the hundredths.
- Compare and order decimals through the hundredths.
- Identify and generate equivalent forms of common decimals.

3. ***Select, use, and explain models of common fractions and mixed numbers (1/2, 1/3, 1/4, 1/5, 1/8, 1/10, 1/12, and 1 ½), find equivalent fractions, mixed numbers, and decimals, and order fractions*** *(4.N.4, 4.N.5)*

- Solve simple open sentences with missing operation symbols.
- Use symbols and letters (e.g., , △x) to represent unknowns in equations.
- Use basic operations to write and solve algebraic expressions.

4. ***Determine the value of 1 or 2 variables in equations involving addition, subtraction, multiplication, and division.*** *(4.P.2, 4.P.3, 4.P.4)*

Grade 4 (Continued)

- Solve open sentences using diagrams and models (e.g., balances).
- Complete a simple function table.
- Complete a simple function table according to a rule.

5. Determine how change in one variable relates to a change in a second variable, e.g., input, output tables. *(4.P.5, 4.P.6)*

- Identifies figures that are the same size and shape (congruent).
- Identifies figures that are similar.
- Recognizes reflections (flips), rotations (turns), translations (slides) of figures.

6. Determine whether two shapes are congruent by using reflections, rotations, and translations. *(4.G.1, 4.G.3, 4.G.7, 4.G.8)*

- Estimate and find area and perimeter of a rectangle, triangle, or irregular shape using diagrams, models, and grids or by measuring.
- Use appropriate metric and English units and tools to estimate, measure, and solve problems involving length, area, volume, weight, time, angle size, and temperature.

7. Demonstrate an understanding of such attributes as length, area, weight, and volume, and select the appropriate type of unit for measuring each attribute. *(4.M.1, 4.M.2, 4.M.4, 4.M.5)*

- Match representations of a data set such as lists, tables, or graphs (including circle graphs) with the actual set of data.
- Identify appropriate ways to display data.

8. Construct, draw conclusions, and make predictions from various representations of data sets. *(4.D.3)*

- List and count the number of possible combinations of objects from two sets.
- Classify outcomes as certain, likely, unlikely, or impossible by designing and conducting experiments using concrete objects such as counters, number cubes, spinners, or coins.

9. Represent the possible outcomes for a simple probability situation. *(4.D.4, 4.D.5, 4.D.6)*

Grade 5
Students will be able to:

- Identify the numeral and written name for whole numbers through the millions place.
- Identify the place value and value of each digit in whole numbers through the Millions.
- Write whole numbers in standard form using place value terms and vice versa to the millions place.
- Identify the numeral, place value and value of each digit to the tenths.
- Identify the numeral, place value and written name for decimals to the Hundredths.

1. ***Identify place value from thousandths through millions and demonstrate an understanding of the powers of ten.*** *(5.N.1, 5.N.2, 5.N.3)*

- Add/subtract numbers with 5-digits or more, with regrouping.
- Multiply a 2, 3, or 4-digit number by a 2 or 3-digit number.
- Divide a 4 digit number by a 1or 2 digit number.
- Model whole number multiplication and division algorithms (e.g., uses physical materials to show 4 groups of 3 objects).
- Add/subtract fractions with like denominators.
- Add/subtract fractions with like denominators, with simplifying or converting to a mixed number.
- Add/subtract fractions with unlike denominators, without simplifying (e.g., halves, quarters, fifths and tenths).
- Multiply a fraction by a whole number.
- Add/subtract decimals through the hundred-thousandths place.
- Express a simple fraction as a decimal.

2. ***Demonstrate computational fluency with whole numbers, decimals, fractions, and mixed numbers with like and unlike denominators.*** *(5.N.4)*

- Compare and order whole numbers using the symbols <, >, or = through the billions.
- Order whole numbers and compare fractions greater than or less than a given fraction using visual representations.
- Compare fractions on a number line.
- Compare and order fractions and mixed numbers using symbols.
- Order decimals on a number line.

3. ***Compare and order whole numbers, positive fractions, positive mixed numbers, and decimals.*** *(5.N.5, 5.N.6, 5.N.7)*

Grade 5 (Continued)

- Simplify equivalent fractions using visual representations.
- Express "1" in many different ways (e.g., 3/3, 4/4).
- Express improper fractions as whole numbers (e.g., 4/2=2) or mixed numbers.
- Express a simple fraction as a decimal or percent.
- Write a benchmark percent as a fraction or decimal and vice versa.
- Determine simple equivalent fractions using scale factors.

4. Express common equivalent fractions and mixed numbers, decimals and percents. *(5.N.7)*

- Identify numbers as prime or composite.
- Determine factors of whole numbers.
- Complete a factor tree for a number (prime factorization).
- Determine multiples of a whole number.
- Determine common multiples of two whole numbers.
- Apply rules of divisibility.

5. Identify and understand prime and composite numbers, common multiples, and factors. *(5.N.8)*

- Solve 1-step open sentences with missing addends.
- Solve 2-step open sentences with missing addends.
- Solve simple open sentences with missing factors.
- Solve simple open sentences with basic-facts calculations on both ides of the sentence.
- Solve 2-step open sentences with missing operation symbols.
- Replace variables with given values and evaluate.

6. Use properties of equality to solve problems with whole numbers. *(5.N.12, 5.P.2, 5.P.3)*

- Solve simple open sentences using models.
- Write the missing number in a proportion.
- Solve complex open sentences using models (concrete and pictorial).
- Complete a simple function table or function machine.

7. Solve problems using proportional relationships using models, tables, and/or graphs. *(5.P.4, 5.P.5)*

Grade 5 (Continued)

- Identify and name a polygon, parallelogram, pentagon, hexagon, and octagon.
- Sort 2-D shapes and objects according to their attributes (sides and angles).
- Identify and name a cube, rectangular solid, cylinder, sphere, prism, cone and pyramid.
- Sort 3-D shapes according to their attributes.
- Classify cubes by their properties (e.g., edges with equal lengths, faces with equal areas and congruent shapes, right angle corners).
- Classify cylinders by their properties (e.g., base shape, lateral surface shape, vertices).

8. Compare and contrast 3 dimensional shapes based on their properties such as edges and faces. *(5.G.1, 5.G.2, 5.G.3)*

- Classify and identify equilateral, isosceles and scalene triangles.
- Classify and identify acute, obtuse and right triangles.
- Identify and name a rhombus.
- Classify and identify quadrilaterals by sides and angles.

9. Classify and identify types of triangles and quadrilaterals. *(5.G.1)*

- Determine and name locations on a labeled grid or coordinate system (e.g., map or graph).
- Graph ordered pairs in the 1^{st} quadrant.

10. Use ordered pairs of whole numbers to graph, locate, and identify points in all quadrants. *(5.G.4)*

- Determine the perimeter of a figure on a grid or where all sides are labeled.
- Determine the perimeter of a figure on a grid or where some sides are labeled.
- Solve simple problems involving the perimeter of squares, rectangles or triangles.
- Determine the area of a figure by counting square units.
- Identify situations where it is appropriate to calculate area.
- Determine the area of shapes with partial square units.
- Solve simple problems comparing area and perimeter.
- Determine the process for calculating perimeter.
- Find the perimeter/area of a polygon.

11. Apply formulas to the solution of problems involving perimeter and area. *(5.M.1, 5.M.3, 5.M.4)*

Grade 5 (Continued)

- Estimate the measure of acute, right, and obtuse angles using benchmark angles of 45 and 90 degrees as referents.
- Select and use appropriate tools for measuring angles.
- Identify, measure, describe, classify and draw acute angles.
- Identify, measure, describe, classify and draw obtuse angles.
- Identify, measure, describe, classify and draw right angles.
- Identify, measure, describe, classify and draw straight angles.

12. Identify, measure, describe, classify and draw various angles. *(5.M.2)*

- Recognize the interior angle relationships of triangles.

13. Find the sum of the measures of the interior angles in triangles with and without measuring. *(5.M.5)*

- Determine the middle value (median) from a simple set of data.
- Determine the average (mean) of a simple set of data.
- Determine the mode of a set of data.
- Estimate the mean from a set of data.
- Solve simple problems involving mean.
- Explain rationale for determining the mean, median, or mode of a set of data.
- Determine the range of a set of data.
- Determine the maximum and minimum of a set of data.

14. Given a set of data, find the median, mean, mode, maximum, minimum, and range. *(5.D.1)*

- Organize data to create simple bar and circle graphs and line plots.
- Draw conclusions from data.
- Read and interpret tables.
- Solve problems using line graphs, bar graphs and circle graphs.

15. Construct, interpret and label line plots, line graphs, bar graphs, and circle graphs. *(5.D.2)*

- Investigate probability of "more likely" or "less likely" using spinners, dart boards, dice, and with objects hidden in containers.
- Calculate the probability of outcomes of simple experiments.
- Determine the possible outcomes for a simple probability experiment using a frequency table.
- Determine probability from real-world situations.
- Compare the outcome of experiments to actual data.
- Use the results of probability experiments or events to predict future events.

16. Predict and test the probability of outcomes of simple experiments. *(5.D.3)*

Grade 6
Students will be able to:

- Identify the place value of each digit within whole numbers through the billions.
- Identify the numeral, place value and written name for decimals to the thousandths.
- Identifies place value from thousandths through millions and demonstrate an understanding of the corresponding powers of ten.

1. Apply understanding of place value from hundred-thousandths through billions. *(6.N.2)*

- Know multiplication facts of a number times itself (number squared).
- Write a power as a product of multiplied numbers and vice versa (e.g., $2^4 = 2x2x2x2$).
- Use powers/exponents to represent 10, 100, 1000, 10,000, and 100,000.
- Calculate the value of a power (e.g., $2^3 = 8$).

2. Demonstrate an understanding of positive integer exponents. *(6.N.1)*

- Find and compare fractions on a number line.
- Find and compare decimals on a number line.
- Find and compare integers on a number line.
- Compare and order Rational numbers on a number line.

3. Order and compare Rational numbers. *(6.N.3, 6.N.4, 6.N.5, 6.N.6, 6.N.7)*

- Identify and understand prime, relatively prime, and composite numbers, common multiples, and factors.
- Write composite numbers as a product of primes.
- Determine greatest common factor of two numbers.
- Determine least common multiple of two numbers.
- Apply rules of divisibility.

4. Apply number theory concepts to the solution of problems*. (6.N.8, 6.N.12)*

- Understand that multiplication/division is performed in order from left to right before addition/subtraction in order from left to right.
- Understand that if grouping symbols are present, begin by simplifying within the grouping symbols.
- Understand that if powers are present, powers are simplified after grouping symbols.

5. Apply the Order of Operations. *(6.N.11, 6.N.13, 6.N.14, 6.N.15)*

Grade 6 (Continued)

- Analyze and describe symbolic, arithmetic and geometric patterns and progressions.
- Determine rules for extending patterns and progressions.
- Express tabular functions in comparative terms i.e. increasing or decreasing.
- Analyze or create patterns, sequences or functions from a rule.
- Create or analyze input-output tables.

6. ***Identify and analyze properties of linear functions.*** *(6.P.1)*

- Evaluate expressions.
- Graph or interpret points represented by ordered pairs.
- Use the properties of equality to solve problems.
- Solve linear equations using models, tables, graphs and paper and pencil methods.

7. ***Solve problems to include the coordinate system.*** *(6.P.2, 6.P.3, 6.P.5, 6.P.6, 6.G.4)*

- Compare and contrast 3-dimensional shapes especially pyramids and prisms based on their properties.
- Identify, describe and classify angles, triangles and quadrilaterals.
- Construct and estimate angle measures.
- Identify and describe circles and the relationship of the radius, diameter, circumference, area and Pi.
- Develop and explain the concept of Pi.
- Apply formulas to the solution of problems involving perimeter, area, surface area, and volume.

8. ***Find areas and perimeters (circumference) of circles, triangles, and parallelograms and volumes and surface areas of rectangular prisms.*** *(6.G.1, 6.G.2, 6.G.3, 6.M.1, 6.M.2, 6.M.5, 6.M.6)*

- Find the sum of the interior angles of a triangle with and without measuring.
- Understand triangulation i.e. dividing polygons into triangles using diagonals.

9. ***Find the sum of the interior and exterior angles of simple polygons.*** *(6.M.7)*

- Determine if two shapes are congruent by measuring sides or sides and angles.
- Reason about spatial relationships.
- Understand and recognize line symmetry and rotational symmetry.

10. ***Match 3-dimensional shapes with their 2- dimensional representations.*** *(6.G.7, 6.G.8, 6.G.9)*

Grade 6 (Continued)

- Understand units of measurement, same system conversions, scale models and maps.
- Select and use appropriate tools for measuring.
- Solve problems using proportional relationships.
- Identify and describe a graph or table of relationships between two variables with a constant rate of change (linear).
- Determine the distance between 2 points on horizontal or vertical number lines.
- Describe relative positions of points and lines i.e. midpoints, parallel and perpendicular.

11. Solve measurement problems using models, tables and/or graphs. *(6.G.3, 6.G.5, 6.M.3)*

- Construct, interpret and label line plots, line graphs, bar graphs and circle graphs.
- Construct and interpret stem-and-leaf plots.
- Calculate mean, median, mode, maximum, minimum and range.

12. Represent, interpret and make inferences from data sets and calculate measures of central tendency. *(6.D.1, 6.D.2)*

- Predict the outcome of simple events and test predictions.
- Understand the likelihood of events: likely, unlikely, certain, and impossible.
- Use appropriate ratios from 0 to 1 to represent the probability of outcomes and associate this probability to the likelihood of the events.
- Determine probability using tree diagrams.
- Understand the difference between experimental and theoretical probability.

13. Determine and interpret probability of events. *(6.D.3, 6.D.4)*

Grade 7
Students will be able to:

- Use a number line to find a pair of numbers with a given absolute value.
- Understand that absolute value represents distance from zero on a number line.

1. Investigate absolute value and solve problems involving absolute value *(7.N.4)*

- Understand percents greater that 100 and less than one.
- Write a product of multiplied numbers as an exponent and a base and vice-versa i.e. $2^4 = 2x2x2x2$.
- Use exponents to represent; 10, 100, 1000, 10000, and 100000.
- Represent large numbers using exponential, scientific and calculator notation appropriately.
- Compare, order, estimate, and translate among fractions, mixed numbers, decimals and percents.
- Develop and use algorithms for computing and estimating with fractions, mixed numbers and decimals.
- Determine when to use estimation and apply in problem solving.
- Develop and use algorithms for computing with integers.

2. Develop and analyze algorithms for computing with rational numbers and become fluent in their use *(7.N.1, 7.N.3, 7.N.5, 7.N.6, 7.N.7, 7.N.8, 7.N.9)*

- Understand and compute unit rates and scale factors.
- Evaluate symbolic algebraic expressions, rules, or formulas for given variable values (substitution).
- Extend a variety of patterns with tables, graphs, words and symbolic expressions.
- Make tables, charts, or graphs to solve problems with unit rates, scale factors and ratio and proportion.
- Match words with symbolic and graphic representations.
- Represent and solve linear equations using properties of equality, graphs, tables and models.
- Apply scaling to create and model equivalent ratios and to solve situations involving a constant rate.

3. Understand and use graphs, tables, verbal and symbolic representations as well as dependent and independent variables for linear relations. *(7.P.1, 7.P.2, 7.P.3, 7.P.4, 7.P.5, 7.P.6)*

Grade 7 (Continued)

- Identify parallel lines, intersecting lines, perpendicular lines.
- Identify right angles, vertical angles and corresponding angles and know when these angles are equal.
- Determine missing angle measures in corresponding, vertical and alternate interior/exterior angle relationships.

4. Discuss the relationship of angles formed by intersecting lines to include parallel lines cut by a transversal and perpendicular lines. *(7.G.3)*

- Understand a translation (slide), rotation (turn), and reflection (flip).
- Graph/identify points on a four quadrant coordinate plane on paper and with a graphing calculator.

5. Predict the results of transformations on unmarked or coordinate planes and draw the transformed figure. *(7.G.4, 7.G.6)*

- Know and understand that "regular" polygons have equal sides and equal angles.
- Discuss and apply the relationship between the number of sides and the sum of the interior and exterior angle measures of polygons.
- Use ratio and proportion including scale factors to determine missing side lengths in congruent and similar polygons.

6. Classify figures in terms of congruence and similarity and apply to the solution of problems. *(7.G.1, 7.G.2)*

- Convert within the same system of measurement i.e. yards = ? inches.
- Identify triangles (classified by angles and sides), circles (attributes: radii and diameter), and all types of quadrilaterals.
- Understand and construct the altitude of a polygon.
- Develop and use formulas for circumference, perimeter, and areas of: triangles, parallelograms, trapezoids, and circles.
- Identify prisms, pyramids, cones, cylinders and spheres by their distinguishing attributes i.e. parallel faces, edges, vertices etc.
- Match a flat pattern of a solid to its 3-dimensional representation.
- Understand and be able to compute the surface area of rectangular prisms and cylinders i.e. SA equals the sum of the areas of all of the faces.

7. Determine measures, surface areas, and volumes of rectangular prisms and cylinders. *(7.M.1, 7.M.3, 7.G.7)*

Grade 7 (Continued)

- Reinforce concepts of range and measures of central tendency.

8. Determine and evaluate inferences based on the analysis of circle graphs, Venn Diagrams, histograms, and stem-and-leaf plots. *(7.D.1, 7.D.2)*

- Determine and interpret probability of events.

9. Use organized lists, area models and tree diagrams to analyze and compute probabilities of simple events. *(7.D.3)*

Grade 8
Students will be able to:

- Locate rational numbers on a number line.
- Write a power as a product of multiplied numbers and vice versa (e.g., 2^4=2x2x2x2).
- Use powers/exponents to represent 10, 100, 1000, 10, 000 and 100,000 and use correct terminology.
- Use powers to represent numbers (e.g., 8x 10^3= 8000).
- Compare numbers written exponentially.
- Calculate the value of a power (e.g., 2^3=8).
- Apply rules for multiplying and dividing powers.
- Find the positive square root of a perfect square.
- Calculate with exponents and roots (e.g., 3^2x2^3).
- Solve problems with scientific notation.

1. ***Solve problems applying the Order of Operations to include non-negative exponents.*** *(8.N.1, 8.N.7, 8.N.12)*

- Add, subtract, multiply and divide integers, fractions and decimals.
- Apply the associative property.
- Apply the commutative property.
- Apply the distributive property.
- Use inverse relationships to simplify computations and solve problems.
- Estimate and compute with rational numbers.
- Demonstrate an understanding of identities.

2. ***Use associative, commutative, distributive and inverse properties to simplify computations with integers, fractions, and decimals and solve problems.*** *(8.N.7, 8.N.8, 8.N.9, 8.N.10, 8.N.11)*

- Identify and distinguish irrational numbers given a set of values.
- Locate frequently used irrational numbers on the number line.

3. ***Compare, order, and apply frequently used irrational numbers such as pi and square root of 2.*** *(8.N.2)*

- Describe and use a variable to translate contextual situations.
- Relate a simple equation to a contextual situation (variables on one side).
- Relate a simple equation to a contextual situation (variables on both sides).
- Represent real-world situations as algebraic equations and vice versa.

4. ***Translate verbal phrases and equations into mathematical expressions and equations and vice versa.*** *(8.P.4, 8.P.6)*

Grade 8 (Continued)

- From a graph, notice the "slant" (slope) of the graph, its steepness, and the constant rate of change.
- From a graph determine if the slope is positive, negative, zero or undefined.
- From a graph, determine the value of the slope of a line both with and without grid marks.
- From a graph, determine where the line crosses the *x* axis and the *y* axis and recognize these points as the *x, y* intercepts.
- From an equation in slope-intercept form determine the slope and the *y* intercept of the graph of the equation.
- Write equations in slope-intercept form.
- From an equation that is not in slope-intercept form find the slope and the *y* intercept of the graph of the equation.
- From a table determine the slope [e.g. using (Y2-Y1)/(X2-X1)].
- Determine if a point with given coordinates is on the graph of a line given its equation or graph.

5. ***From a graph, table or equation, identify the x, y intercepts and/ or slope as a constant rate of change.*** *(8.P.5, 8.P.7)*

- Order numbers using the number line.
- Demonstrate an understanding of the graphs of inequalities i.e. $x > 4$, $x < 6$, $x \leq 5$, on a number line.
- Make a table of pairs of numbers whose sum is equal to a number [e.g., pairs that are equal to ten (1, 9), (2, 8), (-9, 19)].
- Understand the independent and the dependent variables for a linear relation.
- Create a table and a graph with at least 3 values given a linear equation.
- Given a table of values, determine if the relationship is linear and find its equation.
- Plot the graph of a line of an equation in the form $ax + by = c$ (e.g., $x + y = 10$).
- Demonstrate an understanding of absolute value.
- Differentiate between continuous and discrete data and ways to graph each.

6. ***Represent and solve linear relations to include inequalities using models and symbols.*** *(8.N.6, 8.P.4, 8.P.6, 8.P.7, 8.P.8)*

- Compute with non-negative exponents.
- Understand and compute squares and square roots.
- Learn what characterizes the legs of a right triangle.
- Understand that the hypotenuse is the longest side of a right triangle and is opposite the right angle.
- Understand that the area of the square drawn on the hypotenuse of a right triangle equals the sum of the areas of the squares drawn on the legs.
- Apply the Pythagorean Theorum to find the missing sides of right triangles.

Grade 8 (Continued)

- Recognize common Pythagorean triples i.e. (3, 4, 5), (5, 12, 13) and their multiples.
- Apply the relationships between legs and hypotenuse of right triangles to real world problems i.e. shadows, ladders, etc.
- Understand that the slope of the hypotenuse of a right triangle is equal to the ratio of its vertical leg divided by its horizontal leg with the sign determined by visual inspection.

7. Apply the Pythagorean Theorem to the solution of problems. *(8.N.12, 8.G.4)*

- Find areas and perimeters (circumferences0 of circles, triangles, and parallelograms.
- Determine measures, surface areas, and volumes of rectangular prisms, cylinders.

8. Develop strategies and use formulas to calculate areas including shaded regions. *(8.M.3)*

- Understand dilations.
- Graph dilation images.
- Find a scale factor.
- Find image when scale factor is known.
- Use proportion to find part of a whole, to find a percent, or to find a whole amount.
- Understand ratios as part to part, part to whole and whole to part.
- Find unit rates.

9. Use scale factors, ratios and proportions to find missing measures in 2 and 3-dimensional figures. *(8.M.4)*

- Name basic geometric terms/figures and write them using correct mathematical notation i.e. point, line, plane, line segment, ray, polygons, circles, triangles, angles etc.
- Understand parallel, perpendicular and intersecting lines and the relationship of their angles.
- Identify and classify types of symmetry.
- Recognize, perform or describe the effect of transformations (reflections across a line of symmetry, rotations, translations) on 2- or 3- dimensional shapes.

10. Identify, describe or define geometric objects in a plane (2-D) or space (3-D). *(8.G.2, 8.G.3, 8.G.8)*

Grade 8 (Continued)

- Understand various representations of data sets i.e. tables and charts, line plots, histograms, bar graphs, line graphs, circle graphs, stem-and-leaf plots, and box-and-whisker plots.
- Compare and contrast different representations of same data.
- Draw and compare different representations of data.
- Compare 2 or more data sets.
- Determine and evaluate inferences based on the analysis of circle graphs, Venn Diagrams, Stem-and-Leaf Plots and histograms.

11. Select, create, interpret and use various representations of data. *(8.D.1, 8.D.2)*

- Understand and calculate mean, median, mode and range of sets of data.
- Understand how to find the missing value to determine a given mean.
- Understand how additions to the data set affect the measures of center.

12. Calculate, use and interpret measures of central tendency. *(8.D.3)*

- Use probability analysis to help make decisions.
- Use organized lists, area models and tree diagrams to analyze and compute probabilities for simple events.

13. Compute probabilities for single and compound events. *(8.D.4)*

Grade 9
Students will be able to:

- Identify the properties of operations including:
  - Commutative Property.
  - Associative Property.
  - Zero Property.
  - Distributive Property.
  - Identity Property.
  - Inverse Property.
  - Symmetric Property.
  - Transitive Property.
  - Reflexive Property.
- Demonstrate an understanding of properties.
- Use basic operations on algebraic expressions (expanding- monomial by a binomial).
- Use basic operations on algebraic expressions (use correct order of operations).
- Use basic operations on algebraic expressions (substituting for unknowns).

1. ***Identify the properties of operations on real numbers including absolute value and use them to simplify numerical expressions.*** *(10.N.1, 10.N.2, AI.N.1, AI.N.2, AI.P.10)*

- Describe and use a variable in a contextual situation.
- Express a simple equation from a contextual situation (variables on one side).
- Express a simple inequality from a contextual situation (variables on one side).
- Express an equation from a contextual situation (variables on both sides).
- Express an inequality from a contextual situation (variables on both sides).
- Represent real-world functions using an equation/ inequality.

2. ***Translate verbal expressions/equations into mathematical expressions/equations.*** *(10.N.4, 10.P.8, AI.P.12)*

- Use equations to represent situations involving variable quantities with exponents.
- Simplify polynomials by combining like terms.
- Find a common factor for all terms in a polynomial.
- Multiply binomials.
- Recognize and factor the difference of 2 squares.
- Recognize and factor perfect square binomials.
- Recognize and factor 2^{nd} and 3^{rd} degree polynomials.

3. ***Demonstrate facility in manipulation of polynomials including factoring quadratics.*** *(10.P.3, 10.P.4, 10.P.5, AI.P.7, AI.P.8, AI.P.9)*

Grade 9 (Continued)

- Solve one step linear equations.
- Solve simple inequality open sentences.
- Solve two step linear equations.
- Solve linear equations with decimals, integers, fractions.
- Solve linear equations with rational number solutions.
- Solve linear equations using substitution.
- Solve linear equations in a real-world context using a given formula.
- Determine the graph of a horizontal or vertical line.
- Solve simple inequalities using graphs.
- Determine and explain the x and y intercept of an equation.
- Recognize and explain the slope of vertical and horizontal lines.
- Determine and explain the slope given an equation.
- Determine and explain the graph of a line when given the equation (including the slope, x and y intercepts).
- Determine, graph and explain parallel and perpendicular lines (including the slope, x and y intercepts).

4. ***Solve, graph and analyze linear equations and inequalities, including those involving radicals explaining slope, x and y intercepts, maximum and minimum points and lines of symmetry.*** *(10.P.2, 10.P.5, 10.P.6, AI.P.4, AI.P.10, 10.G.8, G.G.11, G.G.13)*

- Extend simple number patterns.
- Recognize patterns in sets representing numbers.
- Recognize decimal and fraction linear patterns.
- Recognize simple growing patterns.
- Analyze patterns to identify rules.
- Analyze patterns in equations to identify rules.
- Identify rules and apply them to new patterns.
- Recognize and extend geometric sequences.
- Recognize and extend a sequence of triangular numbers.
- Recognize and extend arithmetic sequences.
- Recognize and extend the Fibonacci sequence.
- Represent linear patterns using algebraic expressions.
- Use an algebraic expression to represent exponential patterns.

5. ***Recognize patterns of numbers, including those involving exponents.*** *(10.P.1, AI.P.1)*

Grade 9 (Continued)

- Solve simple problems based on data from tables, graphs and charts.
- Interpret data using tally charts.
- Organize, read and interpret data from a bar graph.
- Draw conclusions from data and graphs.
- Read, interpret and create simple line graphs and dual bar graphs.
- Read, interpret and create circle graphs including data given in percent form.
- Solve problems using line, bar and circle graphs.
- Read, interpret and create Venn Diagrams.
- Determine the mean of a set of data.
- Solve simple problems involving mean.
- Solve problems with missing data when the mean is known.
- Determine the mode of a set of data.
- Determine the median of a set of data.
- Explain rationale for use of the mean, median or mode of a set of data.
- Determine the range of a complex set of data.
- Identify outliers on a data display.
- Read, interpret and create stem and leaf plots.
- Read, interpret and create box-and-whisker plots.
- Select appropriate graphical representation for a set of data.
- Use random sampling techniques.
- Compare the mean, median, mode, and range to demonstrate that they may differ for a given set of data.
- Evaluate how adding data to a set of data affects the measures of center.

6. ***Select and use appropriate statistical methods to analyze data.*** *(10.D.1, AI.D.1)*

- Investigate probability of "more likely" or "less likely" using a table, spinner, or dart board.
- Recognize events that are certain, likely, unlikely, possible or impossible.
- Use the concept of chance to determine the likelihood of an event.
- Determine the possible outcomes for a simple probability experiment using one or more coins.
- Determine the possible outcomes for a simple probability experiment using objects.
- Determine the possible outcomes for a simple probability experiment using a frequency table.
- Determine the possible outcomes for a simple probability experiment using dice and/or spinners.
- Determine the probability when drawing objects from containers.
- Determine the probability from a real-world situation.
- Determine the compliment of a simple event and a complex event.

Grade 9 (Continued)

- Determine the number of possible combinations of given items.
- Solve problems involving permutations and combinations including using formulas.
- Compare the outcome of the experiment to the actual data.
- Use the results of experimental and theoretical probability experiments or events to predict future events.
- Determine the outcome of simple multiple events.
- Determine sample space to find probability.
- Determine probability using tree diagrams.
- Compute probability as a fraction, given equivalent forms.
- Explain the relationship between probability and odds, and compute one when given the other.
- Explain the difference between predictions based on theoretical and experimental probability.
- Determine certainty from a set of data.
- Determine the probabilities of compound events (dependent).

7. Apply the basic concepts of experimental and theoretical probability.
(10.D.1, 10.D.3, AI.D.1, AI.D.3)

- Identify and name a quadrilateral.
- Identify and name a trapezoid.
- Identify the radius of a circle.
- Identify the diameter of a circle.
- Identify the number of degrees in a circle.
- Identify the circumference of a circle.
- Identify the number of diagonals of regular polygons.
- Identify the properties of quadrilaterals.
- Classify figures by type of angle.
- Compare polygons by properties.
- Identify the number of edges on solid figures.
- Determine which lines are perpendicular (analysis).
- Identify rays.
- Identify properties of parallel and perpendicular lines.
- Identify and measure acute angles and straight angles.
- Identify right angles within adjacent angles.
- Identify and determine missing angle measures for supplementary angles.
- Classify equilateral, isosceles and scalene triangles.
- Recognize the interior angle relationships of triangles.
- Identify properties of circles.

Grade 9 (continued*)*

- Classify square pyramids by their properties (e.g. base shape, lateral surface shape, vertices).
- Determine a missing angle measure in corresponding vertical, and alternate exterior/interior angles.
- Identify, compare, and define parts of a right triangle (legs, hypotenuse, angles).
- Recognize the interior angle relationships of triangles.

8. Identify and classify Geometric figures. *(10.G.1, 10.G.8, G.G.1, G.G.10, G.G.13)*

- Solve problems involving the perimeter of irregular or complex shapes.
- Solve perimeter problems comparing width and length.
- Identify the formula for perimeter with a variable.
- Describe the change in perimeter when dimensions of an object are altered.
- Determine the circumference when given the area of a circle (or vice versa).
- Determine the circumference when given the diameter or radius (or vice versa).
- Identify the formula for the circumference of a circle.

9. Determine the perimeter or circumference of geometric figures. *(10.G.3, G.G.14)*

- Determine the area of a square or rectangle.
- Determine the length of a side of a rectangle, given the area.
- Determine the area, length or width, given the formula with variables.
- Determine the area of a triangle, given the formula.
- Determine the area of a parallelogram or trapezoid, with the formula.
- Use the formula for trapezoid or parallelogram to determine area, height, or one of the sides.
- Understand the procedure for finding the area and surface area of figures.
- Solve simple problems involving the area of a square or rectangle.
- Solve problems involving the area of a triangle.
- Solve problems comparing areas of different polygons.
- Describe the change in area when dimensions of an object are altered.
- Calculate the volume of rectangular solids and uses the appropriate unit of measure.
- Solve problems involving volume.
- Identify the formula for the area of a circle.
- Know the relationship between radius, diameter, circumference, and area.

10. Determine Area, Surface Area and Volume of geometric figures
(10.G.3, 10.G.5, 10.G.10, G.G.7, G.G.14, G.G.16)

Grade 10
Students will be able to:

- Demonstrate facility in manipulation of polynomials including factoring quadratics.
- Recognize and factor 2nd, 3rd and higher order degrees of polynomials.
- Solve polynomial equations and inequalities containing a common factor.
- Solve polynomial equations and inequalities containing the difference of 2 squares.
- Solve polynomial equations and inequalities containing perfect square binomials.
- Solve polynomial equations and inequalities of 3rd degree and higher.
- Solve quadratic equations by graphing, factoring, completing the square, and by the quadratic formula.
- Analyze graphs of relations and functions given tabular, story or equation models
- Graph quadratic equations and inequalities.

1. Analyze, graph and solve polynomial equations and inequalities. (*10.P.2, 10.P.3, 10.P.4, 10.P.5, 10.P.6, 10.P.7, AI.P.4, AI.P.10, AI.P.11, AII.P.7, AII.P.8)*

- Solve 1- step linear equations and inequalities.
- Solve 2-step linear equations and inequalities including rational number solutions.
- Solve linear equations and inequalities using substitution.
- Use the Multiplication Property of Equality as a first step in solving systems of equations.
- Use substitution in solving systems of equations and inequalities.
- Use algebraic methods to solve systems of equations and inequalities.
- Solve real-world systems of equations and inequalities.

2. Solve problems using systems of linear equations or inequalities.
(10.N.4, 10.P.8, AI.P.12, AII.P.10)

Grade 10 (continued)

- Simplify polynomials by combining like terms.
- Find a common factor for all terms in a polynomial.
- Add, subtract, multiply and divide polynomials.
- Recognize and factor the difference of 2 squares.
- Recognize and factor perfect square binomials.
- Recognize and factor 2^{nd} and 3^{rd} degree polynomials.
- Simplify radicals.
- Rationalize a fraction containing radicals.
- Write and evaluate expressions with rational exponents.
- Solve simple problems involving polynomial functions, radicals and rational expression.
- Simplify square roots containing negative radicands.
- Add, subtract, and multiply complex numbers.

3. ***Explore and apply polynomial functions, radical and rational expressions.*** *(10.N.3, 10.P.3, 10.P.4, 10.P.5, AI.P.3, AI.P.7, AII.P.7, AII.P.8)*

- Identify, name and classify a rhombus, cone, cylinder, cube, sphere, pyramid, prism and polygon with sides (N) and compare them by properties.
- Define angles using properties (e.g. acute, obtuse, right, straight, reflex).
- Identify and determine missing angle measures for complimentary angles.
- Identify corresponding and alternate exterior/interior angles.
- Determine a missing angle measure in corresponding, vertical, and alternate exterior/interior angles.
- Identify properties of congruent angles.
- Construct congruent figures.
- Classify right triangles by defining properties.
- Recognize that the sum of the measures of 2 sides of a triangle must be greater that the measure of the 3^{rd} side.
- Recognize the exterior angle relationships of triangles.
- Use properties of angles and figures to solve algebraic and mathematical problems.
- Use sums of exterior/interior angles to identify polygons.
- Use number of sides to find angle measures of polygons.
- Define the properties or relationships between planes, including parallel, perpendicular, and intersecting planes and their angles of incidence.
- Use reasoning to verify properties of parallel and perpendicular lines
- Recognize and use medians in triangles.
- Solve problems involving properties of triangles.

4. ***Identify and classify geometric figures.*** *(10.G.1, 10.G.2, 10.G.8, G.G.1, G.G.4, G.G.13)*

Grade 10 (Continued)

- Identify, perform and interpret geometric transformations including: rotations, translations, reflections and dilations and the results of successive transformations.
- Identify symmetry of a sphere.
- Determine whether a given pattern or polygon will tessellate.
- Use picture representations to solve problems involving symmetry of figures with respect to a point or line.
- Use picture representations to solve problems involving transformations of figures.
- Write coordinate rules for specifying the image of a general point (x, y) under particular transformations.
- Apply transformations to the solution of problems.

5. Identify and apply symmetry and geometric transformations. *(10.G.9, G.G.15)*

- Identify, understand and describe properties of congruent and similar figures.
- Use measuring tools to examine congruence and symmetries.
- Solve problems involving similar polygons (not triangles).
- Verify congruency of triangles using ASA, SAS, SSS, or AAS.
- Solve problems involving properties of similar triangles (e.g., using geometric mean, triangle proportionality Theorem).
- Apply congruence and similarity correspondences and properties of figures to find missing parts of geometric figures.
- Draw congruent and similar figures and draw figures with specified symmetries.

6. Identify and apply similarity and congruence.
(10.G.2, 10.G.4, 10.G.6, G.G.1, G.G.2, G.G.4, G.G.5, G.G.8, G.G.10)

- Use and apply the Pythagorean Theorum to solve problems.
- Determine the midpoint of a line on a coordinate grid.
- Determine symmetry with respect to a point or line of a figure under transformation.
- Determine and apply the midpoint and distance formulas.
- Use the properties of 30-60-90 triangles to solve problems.
- Determine the sine, cosine and tangent of a given angle.
- Use trigonometric ratio methods to solve real-world problems.

7. Apply the Pythagorean Theorum and coordinate plane
(10.G.5, 10.G.6, 10.G.7, G.G.1, G.G.3, G.G.7, G.G.8, G.G.9, G.G.12)

- Solve problems involving the perimeter and area of squares, rectangles, triangles, or irregular shaped polygons.
- Solve perimeter problems comparing width and length.
- Determine the perimeter and area of a figure when plotting ordered pairs with or without a grid.

Grade 10 (continued)

- Describe the change in perimeter and area when 1 dimension of an object is altered.
- Solve problems comparing area and perimeter.
- Solve problems involving measurement of angles.
- Determine the area of a parallelogram or trapezoid using the formulas.
- Solve complex problems involving inscribed figures.
- Solve complex problems involving the measurement of angles.
- Determine the circumference when given the area of a circle (or vice versa).
- Determine the diameter or radius when given the area of a circle (or vice versa).
- Determine the circumference when given the diameter or radius.
- Determine the surface area and volume of regular shaped polygons.
- Solve problems using volume to calculate the length of a side or area of a face of a rectangular solid.
- Determine the effects of changing dimensions on volume.
- Solve problems determining an unknown dimension when given the volume.
- Solve real-world problems involving surface area and volumes.
- Solve complex problems comparing the areas of circles.

8. Apply knowledge of perimeter, circumference, area, surface area and volume
(10.M.1, 10.M.2, 10.M.3, 10.m.4, G.M.1, G.M.2, G.M.3, G.M.4, G.M.5)

- Read, interpret and create scatter plots.
- Graph and interpret points on a scatter plot.
- Know how to enter the x- and y- values in two lists using a graphing calculator.
- Know how to run a linear regression from the statistics menu.
- Determine the deviation of data points.
- Determine the sums of the squares of the deviations.
- Determine the sums of the squares of the residuals.
- Calculate the coefficient of determination.
- Calculate the correlation coefficient.
- Determine from the correlation coefficient that a function fits the data.
- Uses line of best fit to predict real life situations.

9. Approximate a line of best fit (trend line) given a set of data (e.g. scatter plot)
(10.D.1, 10.D.2, 10.D.3, AI.D.1, AI.D.2, AI.D.3)

Grade 11
Students will be able to:

- Simplify polynomials by combining like terms.
- Find a common factor for all terms in a polynomial.
- Add, subtract, multiply and divide polynomials.
- Recognize and factor the difference of 2 squares.
- Recognize and factor perfect square binomials.
- Recognize and factor 2^{nd} and 3^{rd} degree polynomials.
- Simplify radicals.
- Rationalize a fraction containing radicals.
- Simplify terms/expressions with fractional exponents.
- Simplify terms/expressions with negative exponents.

1. Simplify numerical expressions with powers and roots, including fractional and negative exponents. *(12.N.2, AII.N.2)*

- Define the Real Number System and its subsets including: Natural numbers, Whole numbers, Integers, Rational numbers, and Irrational numbers.
- Perform operations on the Real Number System of numbers including taking square roots.
- Write complex numbers in Cartesian form a+ *bi.*
- Know the names of the parts of the complex number and know the conjugate (real a, imaginary b, conjugate a-b*i*).
- Add, subtract, multiply and divide complex numbers in the Cartesian form.
- Find the sums of complex numbers both algebraically and geometrically.
- Find two complex numbers whose difference is a complex number.
- Simplify rational expressions containing complex numbers.

2. Examine complex numbers and perform operations on them. *(12.N.1, 12.N.2, AII.N.1, AII.N.2, P.C.N.1)*

- Multiply a binomial by a binomial.
- Square a binomial.
- Understand and apply combination notation.
- Understand and apply factorial notation.
- Understand and apply binomial expansion.
- Understand the Binomial Theorem.
- Find the indicated term in a binomial series.

3. Demonstrate an understanding of and use the Binomial Theorem to solve problems. *(12.P.3, AII.P.3)*

Grade 11 (Continued)

- Apply properties of operations including: commutative, associative and distributive.
- Create matrices from word problems.
- Apply use of scalar multiplication of matrices.
- Given two matrices, finds their sum, difference and product.
- Describe and apply the identity matrix.
- Find the multiplicative inverse given a square matrix.
- Finds the determinant of matrices.
- Find the area of a triangle using matrices.
- Solve systems of 2x2 and 3x3 equations by substitution, elimination, graphing, Cramer's Rule and graphing calculators.

4. Use matrices to solve systems of linear equations. *(12.P.9, AII.P.9)*

- Use models, tables and graphs to represent and interpret functions.
- Complete and use function tables or function machines.
- Solve problems involving simple functions.
- Investigate and describe functional relationships of geometric figures (e.g., area is a function of the radius).
- Recognize, describe and represent real-world situations using functions.
- Model real-life functions using function notation including exponential and logarithmic.
- Distinguish between linear and nonlinear functions.
- Solve problems involving complex functions.
- Determine the domain, range, zeros and inverse of a function.
- Perform operations on functions.
- Solve logarithmic functions.
- Determine the effects of parameter changes on functions.
- Determine the minimum and maximum of a function.
- Know and use the function test.
- Determine if a function is even, odd, or neither.
- Use technology to graph and analyze functions and limits.

5. Discuss and recognize functions as linear, polynomial, rational, logarithmic, or exponential, given algebraic, numeric, and/or graphical representations. *(12.P.5, 12.P.6, 12.P.8, 12.P.11, 12.P.12, 12.P.13, AII.P.4, AII.P.5, AII.P.6, AII.P.8, AII.P.11, AII.P.12, AII.P.13)*

Grade 11 (Continued)

- Use the Pythagorean Theorum to solve problems.
- Use the properties of 30-60-90 triangles to solve problems.
- Determine the sine of a given angle.
- Determine the cosine of a given angle.
- Determine the tangent of a given angle.
- Use trigonometric ratio methods to solve mathematical and real-world problems.

6. Define the sine, cosine, and tangent of an acute angle and apply to the solution of problems*.(12.G.1, AII.G.1)*

- Know and apply the right triangle definition of sine and cosine as ratios of the lengths of the sides of a right triangle.
- Find the values of the six trigonometric functions given two sides of a right triangle.
- Understand and explain that the cotangent, secant, and cosecant functions are reciprocals of the tangent, cosine and sine functions respectively.
- Apply the Pythagorean Theorum.
- Apply the distance and midpoint formula.
- Use trigonometry to find the area of a triangle.
- Find the third side of a triangle given two sides and the included angle of a triangle.
- Find the two sides given ASA.

7. Derive and apply basic trigonometric identities and the laws of sines and cosines. *(12.G.1, 12.G.2, AII.G.1, AII.G.2)*

Grade 12
Students will be able to:

- Complete and use function tables.
- Use a graphing calculator to graph and analyze linear, absolute value, quadratic, rational, and exponential functions.
- Name the independent and dependent variables.
- Create and graph a relation that is a function and has an inverse that is also a function.
- Create and graph a relation that is a function and has an inverse that is not a function.
- Analyzes families of graphs.
- Draw the axis of symmetry on a graphed parabola and finds the vertex.
- Explain how the value of the constant of a parabola affects the placement of the graph.
- Find limits of functions including rational functions.

1. ***Use technology to graph and analyze functions and limits.*** *(12.P.2, 12.P.4, 12.P.5, 12.P.10, 12.P.12, AII.P.2, AII.P.4, AII.P.5, AII.P.10, AII.P.12)*

- Represent and interpret linear functions using models including: health, science, employment/finance, manufacturing, etc.
- Represent and interpret quadratic functions including: architectural, pyrotechnic, sports, fees, business, civics, science, etc.
- Model real-life functions using exponential functions including: biology, archeology, demographics, finance, consumerism, etc.
- Use trigonometric ratio methods to solve mathematical and real-world problems including surveying, architecture, sports, entertainment, civil engineering, construction, etc.

2. Model real-world phenomena using a variety of functions. *(12.P.7, 12.P.11, AII.P.4, AII.P.7, AII.P.11)*

- Apply the Pythagorean Theorum to solve problems.
- Apply the properties of 30-60-90 triangles to solve problems.
- Determine the sine of a given angle.
- Determine the cosine of a given angle.
- Determine the tangent of a given angle.
- Set up and solve equations relating sides and angles of a right triangle.
- Set up and solve oblique triangles.
- Apply the Law of Sines and the Law of Cosines.
- Determine the area of triangles using trigonometric methods.

3. Apply triangle trigonometry to analyze a variety of situations. *(12.G.2, 12.G.5, AII.G.2)*

Grade 12 (Continued)

- Know and apply the right triangle definition of sine and cosine as ratios of the lengths of the sides of a right triangle.
- Find the values of the six trigonometric functions given two sides of a right triangle.
- Convert angle measures between degrees and radians.
- Finds trigonometric values given an angle measure in radians.
- Understands and explains the cos x as horizontal coordinate divided by the radius and the sin x as the vertical coordinate divided by the radius.
- Know and apply circular trigonometric ratios.

4. Evaluate trigonometric functions using the unit circle and discuss the relationship between circle and triangle trigonometry. *(12.G.1, 12.G.2, 12.M.1, 12.M.2, AII.G.1, AII.G.2)*

- Multiply a binomial by a binomial.
- Square a binomial.
- Understand and apply binomial expansion.

5. *Construct and apply Pascal's Triangle.* *(12.P.1, 12.P.3, AII.P.1, AII.P.3)*

- Compute and apply factorial notation.
- Understand, identify, and apply arithmetic and geometric sequences.
- Find the sum of arithmetic and geometric sequences.
- Use sigma notation for sums.
- Devise and uses the formula to find a general term of a sequence and the sum of a series with and without a calculator.
- Use combinatorics to solve problems, utilizing technology as appropriate.
- Apply sequences and their sums to real-world situations.

6. Use mathematical induction and summarization formulas. *(12.D.6, AII.D.2, P.C.P.1)*