

Problem Solving (Strategies) Use of manipulatives imperative

- _____ Classify and sort
- _____ Trial and error
- _____ Make up a story
- _____ Create a picture model
- _____ Use board and card games

Numeration (Meaning-Values-Relationships)

- _____ Count by rote to 20
- _____ Demonstrate one to one correspondence
- _____ Count objects 0-10
- _____ Match numerals to objects 1-10
- _____ Match objects to numerals 1-10

Computation (Operating with Numbers) Use of manipulatives imperative

- _____ Compare equal, greater than, and less than
- _____ Create and count a group/set of objects by placing objects within limits
- _____ Explore numbers with calculators

Communication

- _____ Make graphs with concrete objects
- _____ Make a simple bar graph
- _____ Record patterns
- _____ Vocabulary: longer, shorter, tall, taller, small, medium, large, more, less, big, little

Estimation

- _____ Estimate amounts to 10

Measurement

- _____ Use liquid and dry measure in cooking
- _____ Compare: longer, tall, small, heavier, lighter, near, far, shorter, big
- _____ Identify: time, day, night, morning, afternoon

Geometry

- _____ Recognize and name triangle, circle, square, rectangle, diamond, heart, oval
- _____ Identify spatial relationship, i.e., over, under, forward, back
- _____ Recognize and name: curved line, straight line
- _____ Explore spatial relationships through puzzle and block-play
- _____ Distinguish between curved line and straight line

Probability/Statistics

- _____ Recognize pictographs, bar graphs, pie graphs

Patterns

- _____ Recognize sequence of objects
- _____ Identify patterns from one form to another
- _____ Identify, create, copy, and extend simple patterns using manipulatives

Reasoning/Logic (Justification of answers and process)

- _____ Sort, classify, match data and compare
- _____ Introduce sequences of everyday life

Problem Solving (Strategies) Use of manipulative imperative

- _____ Collect data
- _____ Sort & classify data
- _____ Find and extend a pattern
- _____ Make a tally
- _____ Draw a picture/model
- _____ Act it out
- _____ Choose objects that don't belong to a group
- _____ Trial and error/Guess and check
- _____ Make reasonable choices
- _____ Choose operations
- _____ Learn basics of computer
- _____ Use board games & card games
- _____ Identify Venn Diagrams

Numeration (Meaning-Values-Relationships)

- _____ Represent commonly used fractions such as $\frac{1}{4}$, $\frac{1}{2}$
- _____ Match numerals to objects up to 31
- _____ Count objects 0-31
- _____ Order and write numbers to 10
- _____ Order and write numbers to 10
- _____ Compare numbers & sets using terms "more, less, equal, before, after"
- _____ Recognize orally ordinal numbers first to thirty-first
- _____ Count backwards from 10
- _____ Identify: 1 more than, 1 less than
- _____ Demonstrate one to one correspondence
- _____ Set up groups and subgroups to 10
- _____ Recognize number words to ten
- _____ Recognize the terms: first to tenth
- _____ Demonstrate place value with manipulatives

Computation (Operating with Numbers) Use of manipulative imperative

- _____ Use number line
- _____ Sort and classify sets
- _____ Add & subtract with manipulatives
- _____ Explore numbers with calculators

Communication

- _____ Identify and make pictographs, bar graphs
- _____ Record data
- _____ Vocabulary: equal, length, height, weight, add, subtract, more, less, shorter, taller, longer, small, medium, large, fewer, whole, part, total, next, last

Estimation

- _____ Estimate amounts to 20
- _____ Use visual comparison (e.g. which container holds more?)
- _____ Estimate units of time

Measurement

- _____ Compare and group according to size, length, height, weight, capacity
- _____ Compare distance
- _____ Recognize calendar – day, date, month, year
- _____ Identify time sequence (first, next, last)
- _____ Identify pennies, nickels, dimes, quarters, dollars
- _____ Measure objects using standard English and non-standard units
- _____ Measure using non-standard units
- _____ Tell time to hour and half hour
- _____ Identify equal parts

Geometry

- _____ Identify spatial relationships: right, left, middle, over, under, beside, through, on top of, next to, inside, outside, between, above, below
- _____ Identify, compare & draw two dimensional figures such as circle, square, triangle, rectangle, oval, diamond, heart
- _____ Recognize three-dimensional figures such as sphere, cube, cylinder, etc.
- _____ Recognize two and three dimensional figures as objects in the real world
- _____ Distinguish between curved line and straight line

Algebra

- _____ Find numbers in a sequence of objects
- _____ Complete number sentences using manipulatives

Patterns

- _____ Identify, create, copy and extend patterns using manipulatives, pictures, and actions
- _____ Identify patterns in real world
- _____ Recognize symmetry
- _____ Order shapes according to size, order, color patterns/gradations
- _____ Follow an order using dot to dot
- _____ Identify number patterns

Reasoning/Logic (Justification of answers and process)

- _____ Sort, classify, color, match & compare by size and shape
- _____ Recognize objects that do not belong to a specific classification
- _____ Think through a problem
- _____ Explain how you solved a problem
- _____ Justify the answer using manipulatives

Probability/Statistics

- _____ Collect, organize, interpret data using concrete objects
- _____ Interpret pictographs, bar graphs, pie graphs
- _____ Compare predictions to results
- _____ Tally data

Problem Solving (Strategies) Use of manipulative imperative

- _____ Organize data
- _____ Sort and classify
- _____ Find a pattern
- _____ Use a check list
- _____ Draw a picture or model
- _____ Think about what needs to be done
- _____ Ask questions about problem
- _____ Eliminate facts not necessary to solve problem
- _____ Trial and error/Guess and check
- _____ Estimate answers
- _____ Identify key words
- _____ Choose operation(s)
- _____ Label answers
- _____ Use computer program/basic commands
- _____ Use calculator for exploration and verification
- _____ Use board/card games
- _____ Participate in cooperative learning
- _____ Model Venn Diagrams
- _____ Recall and use mental math

Numeration (Meaning-Values-Relationships)

- _____ Count by 2's, 5's, and 10's
- _____ Identify & compare $\frac{1}{2}$, $?$, $\frac{1}{4}$
- _____ Count backwards from 100
- _____ Complete sequence of consecutive numbers
- _____ Compare numbers using greater than, less than, equal to
- _____ Identify place value of ones and tens
- _____ Read, order, count & write numerals to 100
- _____ Read and write ordinals to tenth
- _____ Identify even and odd numbers
- _____ Group & subgroup to 20
- _____ Identify value to 99

- _____ Write greater than, less than and equal to
- _____ Recognize relationship between addition and subtraction
- _____ Recognize fact families

Mathematics (Operating with Numbers) Use of manipulative imperative

- _____ Add and subtract money amounts
- _____ Add 3 numbers
- _____ Add & subtract vertically and horizontally
- _____ Regroup using manipulatives
- _____ Add & subtract facts to 18
- _____ Add & subtract two 2-digit numbers without regrouping
- _____ Identify equivalent expressions
- _____ Mentally recall math facts
- _____ Use number line
- _____ Use calculators to explore number relationships

Communication

- _____ Dramatize math situations
- _____ Identify, make, and interpret picture and bar graphs.
- _____ Recognize a flow chart
- _____ Vocabulary: equal, sum, difference, addend, numeral, ordinal words, most/least, digit, number sentence, metric terms, greater, fewer, more/less, plus, minus
- _____ Create and use journals to organize, record, and communicate mathematical ideas

Estimation

- _____ Estimate units of time and money
- _____ Estimate measurements
- _____ Estimate to nearest 10
- _____ Estimate sums & differences
- _____ Estimate using visual comparisons

Measurement

- _____ Measure in metric, standard English and nonstandard units: length, weight, temperature (Fahrenheit, Celsius), capacity/volume
- _____ Compare size, quantity, length
- _____ Identify money: penny, nickel, dime, quarter
- _____ Count through 99 cents using pennies, nickels, dimes, quarters, and dollars
- _____ Tell time to the hour, half hour, digital and analog clocks
- _____ Read calendar: days, weeks, months, date, and year
- _____ Use ruler

Geometry

- _____ Identify, compare and create two dimensional figures
- _____ Identify attributes of two-dimensional figures such as sides, corners, open/closed curves
- _____ Recognize symmetry and congruence
- _____ Recognize attributes of three-dimensional figures
- _____ Identify, compare, and sort three-dimensional figures such as cone, cube, cylinder, sphere etc.

Algebra

- _____ Find missing addends and operational signs
- _____ Search for cues and clues in equality
- _____ Identify properties of: addition, commutative and associative
- _____ Complete and write number sentence
- _____ Utilize number line

Patterns

- _____ Find, create, and extend number patterns
- _____ Continue a given number pattern
- _____ Identify, reproduce, create, and extend patterns
- _____ Identify patterns in real world
- _____ Order shapes according to size, dot to dot, and color patterns

Reasoning/Logic (Justification of answers and process)

- _____ Make generalizations
- _____ Sort & classify by more than one attribute
- _____ Justify process
- _____ Justify answer using manipulatives
- _____ Find and follow a rule
- _____ Compose open and closed questions

Probability/Statistics

- _____ Interpret and design line graphs, pictographs, bar graphs, tables, charts
- _____ Tally data
- _____ Identify outcomes

Problem Solving (Strategies) Use of manipulatives imperative

- _____ Organize data
- _____ Sort & classify data
- _____ Find a pattern
- _____ Make and use a checklist
- _____ Draw a picture or model
- _____ Think about what needs to be done
- _____ Ask questions about problem
- _____ Eliminate facts not necessary
- _____ Trial and error
- _____ Estimate answers
- _____ Identify key words
- _____ Choose operation(s)
- _____ Label answers
- _____ Use computer programs/basic commands
- _____ Use calculator for exploration and verification
- _____ Use board/card games
- _____ Participate in cooperative learning
- _____ Use Venn diagram
- _____ Recall and use mental math

Numeration (Meaning-Values-Relationships)

- _____ Compare numbers using $>$, $<$, $=$, (2 or 3 digits)
- _____ Order count and write numbers up to 1,000
- _____ Write and read a cardinal and ordinal numbers to twenty/twentieth place
- _____ Identify place value to 100's
- _____ Use grouping and sub grouping of sets
- _____ Change number word form to written numeral
- _____ Write a fraction for a shaded area, $\frac{1}{2}$, $?$, $\frac{1}{4}$
- _____ Count by number patterns

- _____ Read and write Roman numerals to 10
- _____ Recognize relationship between addition and subtraction
- _____ Use odd and even numbers
- _____ Know and write fact families

Computation - Use of manipulative imperative

- _____ Master basic addition & subtraction facts through 20
- _____ Add and subtract numbers of 2 and 3 digits with regrouping
- _____ Add and subtract money
- _____ Find product of 2 numbers each 5 or less using manipulatives
- _____ Mentally recall math facts
- _____ Use number line
- _____ Use calculators to explore number relationships

Communication

- _____ Interpret & design graphs (picture, bar, pie and line)
- _____ Make and plot information on grid
- _____ Interpret flow chart
- _____ Vocabulary: addend, sum, difference, product, metric terms
- _____ Inverse relationship of addition and subtraction
- _____ Interpret symbols: $<$, $>$, $=$, $+$, $-$, \times
- _____ Create and use journals to organize, record, and communicate mathematical ideas

Estimation

- _____ Estimate sums and difference
- _____ Round to the nearest 10, 100 or 10 and 100
- _____ Estimate lengths, capacity, volume, mass/weight, quantity
- _____ Estimate units of time and money

Measurement

- _____ Measure in metric, standard English & nonstandard units:
length, weight, temperature, capacity
- _____ Compare metric, standard English & nonstandard measurement
- _____ Identify time to the quarter hour

- _____ Create a model calendar
- _____ Identify money amounts to \$10.00
- _____ Use manipulatives for measuring
- _____ Sequence time events

Geometry

- _____ Identify and compare 3 dimensional figures
- _____ Recognize congruent and symmetric figures, lines and segments
- _____ Introduce perimeter and area
- _____ Identify the attributes of 3 dimensional figures
- _____ Recognize slides, flips, and turns

Algebra

- _____ Find missing operational signs and addends, subtrahends, minuends
- _____ Recognize inequalities
- _____ Identify properties of addition and subtraction (including the reversible nature of addition ($3 + 2 = 2 + 3$))
- _____ Utilize number line
- _____ Introduce the concept of variable (using a blank/box for missing numbers)

Patterns

- _____ Create and extend number patterns
- _____ Identify, create, reproduce and extend patterns (figures and numbers)
- _____ Identify patterns in real world

Reasoning/Logic (Justification of answers and process)

- _____ Justify answers using manipulatives
- _____ Give verbal explanation to solution of problem
- _____ Develop if...then statements in cooperative learning
- _____ Compose open and closed questions
- _____ Use calculator to verify answers
- _____ Use addition to check subtraction
- _____ Recognize alternative ways to solve problems

Probability/Statistics

- _____ Collect & tally data
- _____ Make predictions
- _____ Interpret and design graphs, tables, and charts
- _____ Justify outcomes

Problem Solving (Strategies) Use of manipulatives imperative

- _____ Sort and classify data
- _____ Select essential data
- _____ Identify key words
- _____ Determine steps to solve a problem
- _____ Determine operation(s)
- _____ Draw or create a picture or model or array
- _____ Take a poll
- _____ Chart or graph data-start with answer
- _____ Label answer(s)
- _____ Make and use a checklist
- _____ Identify extra information
- _____ Identify missing information
- _____ Guess and check
- _____ Work backwards
- _____ Estimate answers
- _____ Given solution, create a problem
- _____ Design a Venn Diagram
- _____ Use computer strategy programs
- _____ Use calculators for exploration and verification
- _____ Recall and use mental math
- _____ Use board/card games
- _____ Participate in cooperative learning
- _____ Use patterns

Numeration (Meaning-Values-Relationships)

- _____ Know place value to 100,000 and introduce to one million.
- _____ Count by number patterns including tens, hundreds
- _____ Compare pairs of numbers less than 10,000 using symbols, $<$ $>$
- _____ Count in sequence starting on any given number less than 10,000
- _____ Write word names for numbers 999,999
- _____ Read and write numbers through 999,999
- _____ Read and write Roman Numerals to twenty and recognize to 100
- _____ Know relation of whole numbers to fractions
- _____ Recognize and count by even and odd numbers
- _____ Write & read ordinals to hundreds
- _____ Write expanded form 999,999

- _____ Write and compare tenths & hundredths
- _____ Read, write and compare fractions/mixed numbers
- _____ Write a fraction for a shaded region
- _____ Recognize relationship between multiplication and division

Computation (Operating with Numbers) Use of manipulatives imperative

- _____ Apply basic addition, subtraction, multiplication, and division facts
- _____ Add and subtract 4-digit & 5 digit numbers with or without regrouping
- _____ Introduce division with remainders
- _____ Multiply 2-digit by 1-digit with and without regrouping
- _____ Divide 2-digit by 1-digit with and without remainder
- _____ Compare 2 fractions using $<$, $>$, or $=$
- _____ Divide 3-digit by 1-digit with and without remainder
- _____ Identify mixed numbers
- _____ Find equivalent fractions
- _____ Relate decimals to fractions and mixed numbers
- _____ Master basic multiplication and division facts to 12
- _____ Continue to add and subtract money
- _____ Recall math facts mentally
- _____ Use number line
- _____ Use calculators for computation
- _____ Add and subtract fractions of like denominators

Communication

- _____ Interpret and design graphs: bar, pictographs, pie, and line
- _____ Vocabulary: sum, addends, difference, products, factors, quotient, divisor, dividend, grids, fraction, numerator, denominator, geometry terms, metric terms, multiplicand, multiplier
- _____ Design flow chart
- _____ Write schedules
- _____ Interpret symbols: \div , \neq
- _____ Create and use journals to organize, record, and communicate mathematical ideas

Estimation

- _____ Round to the nearest ten and hundred
- _____ Estimate sums and differences, products & quotients
- _____ Estimate measurements
- _____ Estimate length, time, volume, mass/weight, temperature
- _____ Estimate/round money to nearest dollar
- _____ Comparative shopping

Measurement

- _____ Measure metric, standard English, and nonstandard units
- _____ Read and write temperature on a thermometer F or C
- _____ Know capacity in cup, pint, quart, half-gallon, gallon
- _____ Recognize elapsed time, time intervals & equivalents
- _____ Give oral and written name for time to the nearest minute
- _____ Give the value of a collection of dollar bills and change
- _____ Create and interpret calendar
- _____ Read maps using a key
- _____ Manipulate and master money values
- _____ Measure length, perimeter, area, temperature, and volume

Geometry

- _____ Identify line of symmetry & congruent figures
- _____ Identify two & three dimensional figures by their characteristics
- _____ Build 3 dimensional figures from patterned 2 dimensional representations
- _____ Identify lines, points, segments and intersections, angles, rays, and parallel lines
- _____ Identify right angles
- _____ Introduce diameter and radius of circle
- _____ Introduce volume
- _____ Find perimeter
- _____ Explore area
- _____ Define slides, flips, and turns and predict and describe the results
- _____ Identify coordinate points

Algebra

- _____ Determine missing addends, factors, divisors, subtrahends, minuends in given equations/inequalities
- _____ Write number sentence
- _____ Identify properties of +, -, \times and \div
- _____ Recognize a variable
- _____ Translate word expressions into math symbols

Patterns

- _____ Use manipulatives to establish block patterns
- _____ Determine & create patterns in sequence
- _____ Use patterns to solve problems
- _____ Identify patterns in real world

Reasoning/Logic (Justification of answers and process)

- _____ Justify answers and give verbal explanation
- _____ Verify answers by using opposite process
- _____ Use calculator to verify answers
- _____ Use a logical process to solve verbal and/or written problems by connecting mathematical ideas
- _____ Make & investigate mathematical predictions, arguments, and proofs
- _____ Recognize and apply mathematics in context outside of mathematics

Probability/Statistics

- _____ Collect & tally data
- _____ Predict results from data
- _____ Interpret and design graphs, coordinate grids, tables & charts
- _____ Design a flow chart

Problem Solving (Strategies) Use of manipulatives imperative

- _____ Sort and classify data
- _____ Select essential data
- _____ Identify key words
- _____ Determine steps to solve a problem
- _____ Determine operation(s)
- _____ Draw or create a picture or model or array
- _____ Take a poll
- _____ Chart or graph data-start with answer
- _____ Label answer(s)
- _____ Make use of a checklist
- _____ Identify extra information
- _____ Guess and check
- _____ Work backwards
- _____ Estimate answers
- _____ Given solution, create a problem
- _____ Design a Venn Diagram
- _____ Use computer strategy programs
- _____ Use calculators for exploration and verification
- _____ Recall and use Mental Math
- _____ Use board card games
- _____ Participate in cooperative learning
- _____ Use patterns

Numeration (Meaning-Values-Relationships)

- _____ Change a number that is less than 1 million from word form to standard and expanded form
- _____ Write Roman Numerals to 100 and recognize to 500
- _____ Know place value – 100,000,000
- _____ Use fractions: mixed, improper, lowest terms, decimals
- _____ Use divisibility rules 2, 3, 5,10
- _____ Use symbols to compare and order #'s(-, >, <)
- _____ Introduce prime and composite numbers
- _____ Recognize relationship between multiplication and division

Computation (Operating with Numbers) Use of manipulatives imperative

- _____ Multiply any 3 digit by 1 digit number
- _____ Multiply and divide any 3 digit number by a 2 digit number
- _____ Multiply and divide numbers using zeros
- _____ Addition and subtraction of decimals including money
- _____ Divide: 4-digit by one and 2-digit, with or without remainders
- _____ Multiply with 0's in multiplier
- _____ Find fraction equivalent to given fraction
- _____ Apply \times and \div facts
- _____ Add & subtract multi digit #'s utilizing grouping and regrouping
- _____ Find averages
- _____ Master basic multiplication and division facts to 12
- _____ Recall math facts mentally
- _____ Use number line
- _____ Use calculators for computation, verification, and exploration
- _____ Add & subtract fractions of like and unlike denominators

Communication

- _____ Name points on a grid and plot points
- _____ Vocabulary: denominator, numerator, mean or average, divisor, dividend, multiple, factors, product, quotient
- _____ Interpret, design and create graphs, tables and charts
- _____ Create & use journals to organize, record, and communicate mathematical ideas

Estimation

- _____ Estimate sums/differences by rounding (inc. money), quotients and products
- _____ Round numbers to 1000's
- _____ Estimate length, weight, temperature, time, volume, mass, weight

Measurement

- _____ Measure using metric units/standard English system
- _____ Measure perimeter, area, volume
- _____ Calculate time intervals
- _____ Find temperature Celsius, Fahrenheit
- _____ Make change from a given amount of money

- _____ Find value of coins and bills
- _____ Determine standard English measurement equivalents

Geometry

- _____ Classify angles
- _____ Build a 3 dimensional figure from a dimensional representation
- _____ Identify line of symmetry of some plane figures
- _____ Identify characteristics of and relationships among plane figures, including segments, rays, lines and angles, points
- _____ Identify and draw radius/diameter/center of a circle/chord
- _____ Use perimeter/area formulas
- _____ Locate coordinate points
- _____ Graph ordered pairs on the coordinate plane

Algebra

- _____ Write number sentences
- _____ Know properties of +, -, x, division
- _____ Identify integers on a number line
- _____ Determine missing addends, subtrahends & factors in given equations/inequalities
- _____ Recognize variables
- _____ Translate word expressions into math expressions

Patterns

- _____ Use manipulatives to establish patterns
- _____ Determine & create patterns in sequence
- _____ Create geometric patterns
- _____ Identify patterns in real world

Reasoning/Logic (Justification of answers and process)

- _____ Verify solution by opposite process
- _____ Justify answers (i.e., use multiplication to check division) and provide verbal explanation
- _____ Use calculator to verify answers
- _____ Use multiplication to check division
- _____ Continue to investigate mathematical predictions, arguments, and proofs

- _____ Recognize & apply mathematics in context outside of mathematics

Probability/Statistics

- _____ Collect & tally data
- _____ Determine mean, median, and mode or average
- _____ Determine result from data collected
- _____ Interpret, design, and construct graphs, tables and charts

Problem Solving (Strategies) Use of manipulative imperative

- _____ Sort and classify data
- _____ Select essential data
- _____ Identify key words
- _____ Make & use a check list
- _____ Determine steps to solve a problem
- _____ Determine operation(s)
- _____ Draw or create a picture or model or array
- _____ Take a poll
- _____ Chart or graph data, start with given answer
- _____ Label answer(s)
- _____ Make use of a check list
- _____ Work backwards
- _____ Estimate answers
- _____ Design a Venn Diagram
- _____ Use computer strategy programs
- _____ Use calculator for exploration and verification
- _____ Use board/card/games/math puzzles
- _____ Participate in cooperative learning
- _____ Use patterns
- _____ Recall and use Mental Math

Numeration (Meaning-Values-Relationships)

- _____ Write Roman Numerals to 500 and recognize to 1000
- _____ Write expanded & standard notation
- _____ Know prime and composite numbers
- _____ Demonstrate fraction, decimal and percent relationships
- _____ Apply divisibility rules for 2, 3, 5, 9, 10
- _____ Compare and order whole numbers, fractions and decimals

Computation (Operating with Numbers) Use of manipulatives imperative

- _____ Compute with varying types of measurement
- _____ Reduce fraction to lowest term
- _____ Change improper to proper fraction
- _____ Multiply 2 and 3 digit numbers
- _____ Divide by 2 and 3 digit numbers
- _____ Add with mixed numbers
- _____ Add & subtract to 3 decimal places (including money)
- _____ Multiply two decimal places
- _____ Divide decimal by whole number
- _____ Compare sales tax
- _____ Find averages, LCD/LCM, GCF
- _____ Divide money
- _____ Add, subtract, multiply & divide fractions with mixed numbers
- _____ Compute using percents
- _____ Recall and use Mental Math
- _____ Use number line
- _____ Compute with time
- _____ Use calculators for computation

Communication

- _____ Create and interpret graphs and charts
- _____ Ordered pairs to locate points on grid
- _____ Read and interpret maps
- _____ Vocabulary: numerator, denominator, mean or average, mode, median, range, LCD/LCM, GCF, Π , tangent
- _____ Use journals to organize, record, and communicate mathematical ideas

Estimation

- _____ Round decimals
- _____ Estimate products, quotients, sums, & differences
- _____ Estimate using fractional parts
- _____ Estimate measurements
- _____ Estimate circumference, area, perimeter, volume
- _____ Estimate temperature in C and F
- _____ Round whole numbers
- _____ Estimate with decimals (including money)

Measurement

- _____ Measure length to nearest $\frac{1}{16}$ inch
- _____ Use metric, standard English and nonstandard measures
- _____ Determine metric equivalents
- _____ Find temperature Celsius and Fahrenheit
- _____ Identify time intervals
- _____ Convert within metric system
- _____ Define and use measurement as unit and square unit

Geometry

- _____ Identify and compare symmetrical and asymmetrical figures
- _____ Find volume of plane figures
- _____ Identify, name, and classify lines, rays, planes and angles
- _____ Construct, draw, and measure angles
- _____ Name triangles and quadrilaterals
- _____ Find/graph number pairs
- _____ Use compass & protractor
- _____ Recognize formulas for perimeter, area, volume
- _____ Classify polyhedrons
- _____ Find area, perimeter/circumference of figures

Algebra

- _____ Recognize inequalities
- _____ Find negative and positive number on number line
- _____ Define variable
- _____ Determine order of operations

- _____ Recognize properties of addition and multiplication
- _____ Determine missing addends & factors in given equation
- _____ Use formulas
- _____ Identify inverse operations
- _____ Translate English sentences into math symbols

Patterns (Use of manipulative imperative)

- _____ Determine & create patterns in sequence
- _____ Make geometric patterns
- _____ Identify patterns in real world

Reasoning/Logic (Justification of answers and process)

- _____ Justify solutions (i.e., use multiplication to check division) and explain verbally
- _____ Use computer/calculator to verify solutions
- _____ Verify solution by opposite process
- _____ Use multiplication to check division

Probability/Statistics

- _____ Find averages
- _____ Determine range, mean or average, median, mode
- _____ Interpret, design, and construct graphs, tables and charts
- _____ Collect and tally data
- _____ Create a list of possible outcomes in an experiment and calculate Simple probabilities

Problem Solving (Strategies) Use of manipulatives is imperative

- _____ Sort and classify data
- _____ Select essential data
- _____ Identify key words
- _____ Determine steps to solve problem
- _____ Determine operation(s)
- _____ Draw or create a picture or model
- _____ Take a poll
- _____ Chart or graph data-start with given answer
- _____ Label answer(s)
- _____ Determine extraneous information
- _____ Analyze lists and tables
- _____ Design a Venn diagram
- _____ Guess, test and revise
- _____ Work backwards
- _____ Estimate answers
- _____ Find alternate solutions
- _____ Use computer strategy programs
- _____ Use calculator as a tool to support computation & problem solving
- _____ Use board /card games / math puzzles
- _____ Participate in cooperative learning
- _____ Use patterns
- _____ Use mental math

Numeration (Meaning - Values – Relationships)

- _____ Identify place value to billions and billionths
- _____ Write expanded & standard notations
- _____ Use prime and composite numbers
- _____ Introduce and use exponents
- _____ Compare and order whole numbers, fractions and decimals

Computation (Operating with Numbers) Use of manipulative is imperative

- _____ Compute using percents
- _____ Add, subtract, multiply, divide with 3 and more digits of whole numbers
- _____ Find product: one factor is 99 or less and the other factor is 9,999 or less
- _____ Find quotient: divided of 4 digits and divisor of 2 digits
- _____ Add, subtract, multiply and divide decimals through thousandths
- _____ Add, subtract, multiply and divide fractions and mixed numerals (grouping & regrouping)
- _____ Add, subtract, multiply and divide money problems
- _____ Use multiples – LCM, factors, GCF, prime factorization
- _____ Recognize patterns and change equivalent fractions, decimals, percents
- _____ Compute with variables of measurement
- _____ Divide decimals by whole numbers
- _____ Master the most frequently used percent/fraction equivalents
- _____ Use number line
- _____ Use “mental math”
- _____ Use calculator for computation, exploration, and verification

Communication

- _____ Read, interpret and create graphs, tables, charts, and maps
- _____ Graph ordered number pairs and linear equations
- _____ Vocabulary: protractor, compass, ratio quadrants, exponent, ?, tangent
- _____ Use journals to organize, record, and communicate mathematical ideas.

Estimation

- _____ Round whole numbers, decimals and fractions
- _____ Estimate perimeter, area, circumference, and volume
- _____ Estimate measurements

Measurement

- _____ Compare metric, standard English and nonstandard units
- _____ Use standard English and metric units to measure
- _____ Convert metric to other metric units

Geometry

- _____ Identify, classify, construct, and measure geometric figures
- _____ Find circumference, area, perimeter, volume and surface area of figures
- _____ Distinguish between congruent and similar figures
- _____ Recall and apply formulas for perimeter, area and volume
- _____ Identify transformations of geometric figures

Algebra

- _____ Order, graph, add, subtract, multiply & compare integers
- _____ Recognize negative and positive numbers
- _____ Recognize properties of addition and multiplication (associative, commutative, identify, zero, distributive)
- _____ Apply correct order of operations
- _____ Use formulas (like interest)
- _____ Explore inverse operations
- _____ Translate English sentences into math symbols

Patterns

- _____ Determine & create patterns in sequence
- _____ Identify patterns in real world
- _____ Establish number patterns like: decimal, percentage, factors
- _____ Identify and complete arithmetic and geometric sequences

Reading/Logic (Justification of answers and process)

- _____ Justify solutions and explain verbally
- _____ Justify answers by tables, graphs, lists, diagrams and calculators/computers
- _____ Evaluate evidence and verify
- _____ Predict and verify

Probability / Statistics

- _____ Determine range, mean, mode, median
- _____ Collect and tally data
- _____ Construct circle graphs
- _____ Find probability of simple outcomes

Problem Solving (Strategies) Use of manipulative is imperative

- _____ Sort and classify data
- _____ Select essential data
- _____ Identify key words
- _____ Determine steps to solve problem
- _____ Determine operation(s)
- _____ Draw or create a picture or model
- _____ Take a poll
- _____ Chart or graph data-start with given answer
- _____ Label answer(s)
- _____ Determine extraneous information
- _____ Analyze lists and tables
- _____ Design and interpret a Venn diagram
- _____ Guess, test and revise
- _____ Work backwards
- _____ Estimate answers
- _____ Find alternate solutions
- _____ Use computer strategy programs
- _____ Use board /card games / math puzzles
- _____ Participate in cooperative learning
- _____ Use patterns

Numeration (Meaning - Values – Relationships)

- _____ Find multiples and factors
- _____ Write expanded / standard numerals
- _____ Find prime factors and reciprocals
- _____ Apply divisibility rules
- _____ Multiply and divide using scientific notation
- _____ Determine place value in whole numbers and decimal numerals to 9 digits
- _____ Compare and order numbers

Computation (Operating with Numbers) Use of manipulative is imperative

- _____ Compute with variables
- _____ Add, Subtract, multiply, divide: decimals, fractions, integers
- _____ Find percent of numbers
- _____ Operate with exponents
- _____ Use ratio / proportions
- _____ Use proper order of operations
- _____ Determine interest, tax, discount, markup
- _____ Change percents to fractions and decimals (reciprocal)
- _____ Use number line
- _____ Use “mental math”
- _____ Use calculators for computation, exploration, and verification

Communication

- _____ Read, interpret and construct graphs, charts, tables and maps from data
- _____ Plot points on grid
- _____ Use math journal to organize, record, and communicate mathematical ideas
- _____ Develop and use mathematical terminology (ex. equation)
- _____ Graph linear equations on grid

Estimation

- _____ Round decimals and fractions, percents
- _____ Estimate answers
- _____ Estimate measurements

Measurement

- _____ Add, and subtract mixed units of length, liquid and dry measure, time
- _____ Measure perimeter/circumference, area, volume, surface, area & angles
- _____ Measure lengths in scale drawings

Geometry

- _____ Use proportion to determine similar figures
- _____ Recall and apply geometric formulas
- _____ Determine rotational symmetry
- _____ Find diameter/radius/arc
- _____ Find coordinates of a point
- _____ Identify, classify & construct geometric figures
- _____ Compute perimeter/circumference area, volume and surface area
- _____ Identify complementary and supplementary angles

Algebra

- _____ Translate word expressions into symbols
- _____ Solve equations containing integers
- _____ Know & use order of operations
- _____ Introduce laws of exponents
- _____ Use proportional ratio with missing variables
- _____ Use inverse operations to solve equations and inequalities
- _____ Recognize positive and negative operations
- _____ Write equations
- _____ Use variables in equations and inequalities
- _____ Solve simple one-variable equations
- _____ Find square roots of perfect squares
- _____ Evaluate simple algebraic expressions
- _____ Use formulas

Patterns

- _____ Determine & create patterns in sequence
- _____ Establish number patterns like: decimal, percentage, factors
- _____ Recognize simple algebra patterns, e.g. like terms, inverses
- _____ Use tessellations

Reasoning/Logic (Justification of answers and process)

- _____ Justify solutions and explain verbally
- _____ Use calculators and computers for verification
- _____ Use estimation in checking reasonableness of answers

Probability / Statistics

- _____ Determine mean, median, mode, range
- _____ Collect and tally data
- _____ Make predictions and approximations
- _____ Construct line and bar graphs with given data.

Problem Solving (Strategies) Use of manipulative is imperative

- _____ Sort and classify data
- _____ Select essential data
- _____ Identify key words
- _____ Determine steps to solve a problem
- _____ Determine operations
- _____ Draw or create a picture or model
- _____ Take a poll
- _____ Chart or graph data
- _____ Label answer(s)
- _____ Determine extraneous information
- _____ Analyze lists and tables
- _____ Use computer strategy programs
- _____ Design a Venn diagram
- _____ Guess, test and revise
- _____ Work backwards
- _____ Estimate answers
- _____ Find alternate solutions
- _____ Use equations, formulas, proportions
- _____ Participate in cooperative learning

Numeration (Meaning - Values – Relationships)

- _____ Know meanings and relationship between fractions, decimals, percent, and ratios
integers, rational and irrational numbers, prime and composite number
- _____ Define powers and roots
- _____ Use fractions and terminating and repeating decimals
- _____ Compare, order and/or interpret place value of whole and decimal numbers
- _____ Use all real number sets
- _____ Use scientific notation
- _____ Find LCM & GCF
- _____ Raise any number to given power

Computation (Operating with Numbers) Use of manipulative is imperative

- _____ Add, Subtract, multiply and divide decimals, fractions, mixed numbers, (complex fractions), integers, numbers in scientific notation
- _____ Compute with percent, ratio, proportion, exponents, absolute value
- _____ Apply in computation: properties, divisibility rules, prime factorization, Pythagorean Theorem
- _____ Recall math mentally
- _____ Use number line
- _____ Use calculators for computation, exploration, and verification

Communication

- _____ Read, interpret, create tables, graphs, (line, bar, circle, pictographs, histograms) and other statistical graphs and charts
- _____ Translate phrases/expressions and sentences/equations from English to math and math to English
- _____ Use correct mathematical terminology
- _____ Write math journals

Estimation

- _____ Determine when estimation is appropriate or necessary
- _____ Check for the reasonableness of answers including techniques of clustering, front end estimating, rounding

Measurement

- _____ Know categories of measurement (type of measurable units)
- _____ Understand the value and relationship of metric units, standard English units, temperature (Fahrenheit and Celsius), standard units of time

- _____ Read and/or measure lines and angles, length, capacity (volume), weight, perimeter, circumference, area, surface area
- _____ Determine the precision in measurement tools
- _____ Identify the greatest possible error in measurements e.g., by using rulers and meter sticks

Geometry

- _____ Recognize types of angles
- _____ Know and apply Pythagorean theorem
- _____ Construct/bisect angles, triangles
- _____ Use formulas for area, perimeter, volume and surface area
- _____ Define, draw and name cube, sphere, cone, cylinder, pyramid, rectangular prism
- _____ Compute volume of cube, prism, cone, sphere, cylinder
- _____ Construct solid figures

Algebra

- _____ Compare and solve simple algebra expressions
- _____ Solve 2 step algebraic equations
- _____ Recognize order of operations
- _____ Work with exponents
- _____ Introduce use of variables and polynomials

Patterns

- _____ Recognize patterns of percent increase/decrease
- _____ Create and analyze patterns
- _____ Use tessellations

Reasoning/Logic (Justification of answers and process)

- _____ Recognize how statistics can be misleading
- _____ Use matrix logic problems
- _____ Use computer spread sheet for data
- _____ Apply computing skills to simulated bank accounts, promissory note and loans
- _____ Justify solutions
- _____ Explain solutions verbally
- _____ Use calculator/computer to verify solutions

Probability / Statistics

- _____ Find probability of simple event/compound outcomes
- _____ Compute odds of outcome
- _____ Introduce and compute simple permutations (rearrangements)
- _____ Introduce and compute simple combinations.

Problem Solving (Strategies) Use of manipulatives imperative

- _____ Use simulations, work backwards, estimate, guess and check, trial and error
- _____ Apply formulas
- _____ Develop steps for solving word problems
- _____ Choose operations
- _____ Translate expressions and write equations
- _____ Use drawings, diagrams, graphs, tables, charts, models
- _____ Recognize extraneous information
- _____ Solve problems involving geometric figures, patterns, percent, rate, ratio, distance, direct and inverse variation, and consumer topics
- _____ Participate in cooperative learning
- _____ Use patterns

Numeration (Meaning-Values-Relationships)

- _____ Know various sets of numbers including integers, whole, rational, irrational, real and Roman numerals
- _____ Recognize relationships between numbers including conversions between per cent, decimal, and fraction, repeating or terminating decimals and fractions, and place value
- _____ Use number line
- _____ Classify a number as prime or composite
- _____ Compare and order decimals, fractions
- _____ Use mathematical symbols
- _____ Know by memory the frequently used decimals, fractions and percent equivalents
- _____ Translate back and forth from English into the decimal system
- _____ Find GCF, LCM
- _____ Sequences
- _____ Use exponential notation, scientific notation, factorization, divisibility

Computation (Operating with Numbers) Use of manipulative imperative

- _____ Know the general properties for operating with positive and negative numbers
- _____ Add, subtract, multiply and divide whole numbers, fractions, decimals, integers, rational/irrational numbers
- _____ Find prime factorization, LCM, GCF
- _____ Find interest, percent of a number
- _____ Simplify fractions
- _____ Use properties of equality commutative, associative, reflexive, and distributive and evaluate expressions
- _____ Simplify expressions using standard order of operations including use of grouping symbols
- _____ Compute with exponents, roots
- _____ Convert simple fractions and mixed numbers to decimals, percents to decimals, terminating decimals to fractions or percents
- _____ Calculate absolute value
- _____ Solve proportions
- _____ Compute using “mental math”, “calculator” math, “computer” math

Communication

- _____ Translate sentences to equations
- _____ Define variable
- _____ Define sets of: whole numbers, natural numbers, integers, rational numbers, irrational and real number
- _____ Interpret line graphs, bar graphs, pictographs, and circle graphs, tables, diagrams, scale drawings, and tree diagrams
- _____ Graph equations and inequalities on number line
- _____ Interpret situations with two directions as positive, negative, or corresponding to zero
- _____ Indicate key sequences for doing an arithmetic problem on a calculator
- _____ Develop an awareness of historical evolution of key ideas in arithmetic measurement and algebra
- _____ Use a number line to locate numbers and perform operations
- _____ Write math journals (learning log)

Estimation

- _____ Estimate with whole numbers, integers, decimals, percents
- _____ Use estimation to check the reasonableness of an answer
- _____ Round to estimate a given number
- _____ Give situations where estimates are preferred over exact values
- _____ Estimate square roots of a number without a calculator
- _____ Estimate sums, difference, products and quotients, decimals, square roots
- _____ Estimate lengths, time, temperature, weight
- _____ Develop techniques for estimation

Measurement

- _____ Apply area formulas for rectangles, squares, triangles, circles, and parallelograms, perimeter formulas for circles, rectangles and squares
- _____ Find volumes and surface area of rectangular prisms
- _____ Expose formulas for Celsius and Fahrenheit conversion and identify reasonable Celsius and Fahrenheit temperatures
- _____ Identify the greatest possible error of a measurement (precision and accuracy) and the interval of measure time
- _____ Measure an angle to the nearest degree using a protractor
- _____ Distinguish between acute, right, and obtuse angles by sight
- _____ Know the relationships and conversion in the metric system within units of length, weight, and capacity
- _____ Know the relationships and conversions between units within the metric and within standard English systems of measurements
- _____ Give appropriate units for measuring mass, length, and capacity in the U. S. or metric system of measurement
- _____ Use unit multipliers

Geometry

- _____ Identify various polygons by name
- _____ Find the areas of two dimensional figures: trapezoid, triangle, rectangle, square, parallelogram, circle
- _____ Compute volume of prism, cylinder, pyramid, cone, sphere and rectangular solid
- _____ Identify congruence and similarity of geometric figures
- _____ Find perimeter of polygons & circumference of circles or sectors of circles
- _____ Find surface area: prisms, cylinders, pyramid, cones, sphere, and rectangular solid
- _____ Draw and/or construct a line segment of a given length or an angle with a given measure
- _____ Find measures of angles and sides in special quadrilaterals without measuring
- _____ Classify and apply the definitions of parallelogram, rectangle, rhombus, triangle, trapezoid and square to determine properties of these figures
- _____ Use the Pythagorean Theorem to find lengths of third sides in right triangles
- _____ Recognize angle relationships: angles in linear pair, vertical angles, angles formed by intersecting perpendicular/parallel lines, angles in a triangle, complementary and supplementary angles, bisectors, points, lines, planes graph and label points from ordered pairs in all four quadrants
- _____ Graph lines from equations

Algebra

- _____ Solve for various unknowns
- _____ Add polynomials
- _____ Know distributive property
- _____ Recognize inequalities and solve and graph simple inequalities
- _____ Use exponents – multiplying and dividing with, raising to powers, square roots
- _____ Evaluate algebraic expressions given the values of all variables
- _____ Find solutions to equations involving simple arithmetic
- _____ Write an algebraic expression for an English expression involving arithmetic operations
- _____ Use and solve algebraic equations involving addition, subtraction, multiplication, and division with integers, fractions, and decimals

Reasoning/Logic (Justification of answers and process)

- _____ Use the strategies of looking for hidden facts and guess and test strategy
- _____ Given a figure, identify its symmetry lines
- _____ Apply the definition of congruence as it relates to translations, rotations, and reflections
- _____ Recognize the Means-Extremes Property and know why it works
- _____ Give situations that represent the division of negative numbers
- _____ Know how square roots and geometric squares are related
- _____ Estimate answers
- _____ Use inverse operations
- _____ Relate fractions
- _____ Use mental parentheses, implied ratios, inductive or deductive reasoning
- _____ Recognize conditional and compound statements, true or false equations, negations of statements
- _____ Use calculators/computers to verify solutions

Probability/Statistics

- _____ Count possible outcomes of an event (listing) and find the probability of an event
- _____ Find the probability of two or more independent events
- _____ Find the probability of two or more dependent events
- _____ Use frequency tables, bar graphs, broken line and circle graphs, tree diagrams, scatter graphs, box or whisker plots
- _____ Gather, record, and organize statistical information
- _____ Use statistics to calculate: measures of central tendency, mean, median, mode, measures of variation
- _____ Recognize misleading statistics
- _____ Compute permutations and combination

Patterns

- _____ Recognize and extend arithmetic or geometric sequences
- _____ Multiply by powers of ten
- _____ Give instances of a pattern described with variables
- _____ Make a table to find patterns and make generalizations
- _____ Use special cases to determine that a property is false or to give evidence that it is true
- _____ Recognize symmetry
- _____ Know base 2 and 10
- _____ Recognize subtraction patterns (inverses)
- _____ Recognize factor patterns
- _____ Recognize Fibonacci sequence
- _____ Identify like terms

Problem Solving (Strategies) Use of manipulative imperative

- _____ Use a problem solving plan
- _____ Recognize extraneous information in problems
- _____ Decide the best way to solve equations and systems of equations
- _____ Use a variety of strategies leading to solutions such as estimation, using simulations, working backwards, guess and check, trial and error
- _____ Solve word problems involving single variable equations and systems of equations (Direct, inverse, and joint variation problems; chemical mixture problems; work problems are Algebra II requirements.)
- _____ Solve problems using modeling to write equations or formulas
- _____ Solve problems involving one variable first degree equations and inequalities, quadratic equations, systems of linear equations and inequalities
- _____ Use charts, sketches, graphs or other pictorial representations to help solve problems
- _____ Participate in cooperative learning

Numeration (Meaning-Values-Relationships)

- _____ Classify the various subsets of real numbers
- _____ Master the first 20 squares, first 6 cubes, first 3 fifths
- _____ Understand the relationship between numbers including scientific vs. decimal notation, powers and roots, numbers and their reciprocals, numbers and their opposites
- _____ Use prime factorization to find GCF/LCD, to identify prime/composite numbers
- _____ Compare and order rational/irrational numbers, absolute values and integers
- _____ Understand the relationships between inverse operations
- _____ Recognize when an answer should be simplified and perform the simplification

Computation (Operating with Numbers) Use of manipulative imperative

- _____ Use the correct order of operations with all subsets of real numbers (irrationals only through square roots)
- _____ Simplify and operate with radicals
- _____ Find solution sets given a replacement set
- _____ Evaluate absolute values
- _____ Evaluate expressions containing exponents (including zero and negative exponents)
- _____ Calculate and simplify square roots
- _____ Compute in scientific notation
- _____ Apply algebraic methods
- _____ Use calculators

Communication

- _____ Graph equalities and inequalities, ordered pairs, linear equations and inequalities, systems of linear equations and inequalities.
- _____ Read tables, statistical graphs/charts, spreadsheets
- _____ Recognize misleading graphs
- _____ Translate English words to algebraic expressions / equations (and vice versa)
- _____ Use real number postulates
- _____ Identify additive inverse, multiplicative inverse, equations and functions or non-functions, domain/range of functions, linear or non-linear equations, slope and y-intercept of linear equations, degrees and coefficients of polynomials
- _____ Require sentence answers to word problems, ordered pairs as answers to solutions of systems
- _____ Answer precisely what is asked for
- _____ Define and use correct mathematical terminology, e.g., ordered pairs, relation, function, domain, range, solve, simplify, graph, factor, term, numerator, expression, denominator, coefficient, base, exponent, polynomial, quadratic, radical, radicand, index, equation, formula, replacement set, solution set
- _____ Define and use correct mathematical symbols

Estimation

- _____ Estimate square roots
- _____ Use guess and check method
- _____ Use linear graphs to estimate answers
- _____ Check reasonableness of solutions
- _____ Round
- _____ Find the best-fit line through a set of ordered pairs in the coordinate plane
- _____ Recognize problems that do not have solutions

Measurement

- _____ Use distance formula
- _____ Use correct units of measure in solving all problems like metric, standard English for perimeter, area, uniform motion, velocity, volume

Geometry

- _____ Use formulas to solve algebraic problems involving slope of a line, midpoint of a line segment, distance between two points, Pythagorean theorem, perimeter, area, angle measures

- _____ Use geometric formulas to re-enforce evaluation with real numbers
- _____ Sketch shapes such as triangles, quadrilaterals, trapezoids, circles, spheres, cubes, prisms when solving geometric problems
- _____ Graph linear equations
- _____ Use composite shapes, unit conversions, ratio and proportion
- _____ Write equations of lines in slope-intercept form, point-slope form, and standard or general form
- _____ Determine the equation of a line given slope and intercept, 2 points

Algebra

- _____ Evaluate numerical and algebraic expressions
- _____ Solve single variable equations for the variable or multivariable equations for a specific variable
- _____ Recognize compound sentences, zero product property
- _____ Operate with polynomials including simplifying, adding, subtracting, multiplying, dividing, factoring
- _____ Identify variables, terms, factors, degrees of polynomials, equations, inequalities
- _____ Solve linear inequalities in one and two variables
- _____ Solve quadratic equations by factoring, taking a root, quadratic formula
- _____ Operate with rational expressions including simplifying, adding, subtracting, multiplying, dividing
- _____ Solve equations involving absolute value, radicals, rational expressions
- _____ Solve inequalities, absolute value equations, system of linear inequalities by graphing
- _____ Recognize factoring rules like difference of squares, perfect square trinomials
- _____ Define functions with equations
- _____ Develop the concept of a variable as something that really varies rather than simply standing for an unknown.
- _____ Introduce the laws of exponents

Reasoning/Logic (Justification of answers and process)

- _____ Check solutions answering the question “Did you answer the question?”
- _____ Make predictions and draw conclusions
- _____ Recognize patterns and problems without solutions
- _____ Explore problems and develop formulas
- _____ Analyze given information
- _____ Use calculators and computers to verify solutions
- _____ Make generalizations

- _____ Think mathematically and critically and develop questions
- _____ Evaluate reasonableness of answers
- _____ Prove statements using properties of real numbers
- _____ View algebraic manipulations as extensions of arithmetic
- _____ Use intersection/union of sets
- _____ Decide the best way to solve equations and systems of equations

Probability/Statistics

- _____ Organize and collect data
- _____ Analyze data
- _____ Evaluate mean, median mode
- _____ Draw conclusions from experiments

Patterns

- _____ Recognize patterns in proof
- _____ Solve types of quadratic equations
- _____ Use patterns to complete a sequence, to solve linear equations, to solve word problems, to factor, to square, to simplify rational expressions
- _____ Write polynomials in ascending/descending power order of a specified variable
- _____ Investigate number patterns to generalize consecutive integer type problems
- _____ Recognize patterns in systems of lines
- _____ Identify like terms and radicals
- _____ Use number patterns for prime factorization
- _____ Use patterns in Cartesian graphing, finding slopes of lines

Problem Solving (Strategies) Use of manipulative imperative

- _____ Solve problems using modeling to write equations or formulas
- _____ Solve problems by substitution into formulas
- _____ Solve problems involving one variable, first degree equations
- _____ Solve problems involving ratio, proportion and percent
- _____ Use a variety of strategies leading to solutions such as estimation, using simulations, working backwards, guess and check, trial and error
- _____ Use charts, sketches, graphs or other pictorial representations to help solve problems
- _____ Recognize extraneous information in problems
- _____ Participate in cooperative learning

Numeration (Meaning-Values-Relationships)

- _____ Recognize and apply special properties of the numbers 0 and 1
- _____ Identify relationship between fractions, decimals, and percents
- _____ Understand the different number systems
- _____ Master the first 20 squares, first 6 cubes, first 3 fifths
- _____ Use prime factorization to find GCF/LCD, to identify prime/composite numbers
- _____ Compare and order integers
- _____ Recognize rational and irrational numbers
- _____ Understand the relationships between inverse operations
- _____ Recognize when an answer should be simplified and perform the simplification

Computation (Operating with Numbers) Use of manipulative imperative

- _____ Review of fractions, decimals and percent
- _____ Operate with integers
- _____ Find solution sets given a replacement set
- _____ Simplify square roots
- _____ Evaluate absolute value
- _____ Evaluate powers
- _____ Apply order of operations
- _____ Compute with algebraic fractions
- _____ Apply algebraic methods
- _____ Use calculator/computer to compute

Communication

- _____ Graph equalities, inequalities and ordered pairs
- _____ Recognize misleading graphs
- _____ Translate English words to algebraic expressions (and vice versa)
- _____ Require sentence answers to word problems
- _____ Answer precisely what is asked for
- _____ Define and use correct mathematical symbols
- _____ Define and use correct mathematical terminology, e.g., factors, multiples, prime/composite numbers, prime factorization, GCF/LCM, integers, real numbers, ordered pairs, expression, coefficient, base, index, radical, radicand, term, domain, range, numerator, denominator, exponents, powers, rational/irrational numbers, square roots, absolute value, sum, product, quotient, difference, less, less than, more, more than, solve, simplify, equation/formula/function, replacement set, solution set
- _____ Identify additive inverse, multiplicative inverse, linear or non-linear equations, degrees and coefficients of polynomials

Estimation

- _____ Use estimation to see if results/solutions are reasonable
- _____ Use guess and check method
- _____ Round
- _____ Recognize problems that do not have solutions

Measurement

- _____ Find area and perimeter of squares, rectangles, and triangles
- _____ Use correct units of measure in solving all problems like metric, standard English for perimeter, area, and volume

Geometry

- _____ Find angles in triangle
- _____ Use geometric formulas to re-enforce evaluation with real numbers
- _____ Sketch shapes such as triangles, quadrilaterals, trapezoids, circles, spheres, cubes, prisms when solving geometric problems

Algebra

- _____ Evaluate numerical and algebraic expressions
- _____ Solve single variable equations for the variable
- _____ Recognize compound sentences
- _____ Operate with polynomials including simplifying, adding and subtracting
- _____ Identify variables, terms, factors, degrees of polynomials, equations, inequalities
- _____ Solve linear inequalities in one variable
- _____ Solve inequalities by graphing
- _____ Define functions with equations
- _____ Develop the concept of a variable as something that really varies rather than simply standing for an unknown

Reasoning/Logic (Justification of answers and process)

- _____ Check solutions answering the question “Did you answer the question?”
- _____ Make predictions and draw conclusions
- _____ Explore problems and develop formulas
- _____ Use calculators and computers to verify answers
- _____ Make generalizations
- _____ Evaluate reasonableness of answers
- _____ Recognize patterns and problems without solutions
- _____ Use intersection/union of sets
- _____ Decide the best way to solve equations

Probability/Statistics

- _____ Collect data
- _____ Organize data
- _____ Evaluate mean, median, mode
- _____ Draw conclusions from data

Patterns

- _____ Recognize patterns
- _____ Use patterns to complete a sequence, to solve linear equations, to solve word problems, to square
- _____ Write polynomials in ascending/descending power order of a specified variable
- _____ Identify like terms
- _____ Use number patterns for prime factorization

Problem Solving – Strategies Use of manipulative imperative

- _____ Translate and solve one variable word problems
- _____ Translate and solve word problems by systems of two variable equations
- _____ Participate in cooperative learning

Numeration (Meaning-Values-Relationships)

- _____ Identify number sets
- _____ Translate between scientific and standard notation
- _____ Recognize rational and irrational numbers

Computation (Operating with Numbers) Use of manipulative imperative

- _____ Evaluate opposites and absolute value
- _____ Evaluate powers: zero and negative exponents
- _____ Operate with rational expressions and their operations
- _____ Operate with radicals
- _____ Use calculator/computer to computer

Communication

- _____ Use properties of real numbers
- _____ Graph inequalities on the number line
- _____ Define the coordinate plane and graph linear equations and inequalities
- _____ Graph systems of equations

Estimation

- _____ Estimate square roots
- _____ Use estimation to see if results/solutions are reasonable

Measurement

- _____ Use correct units of measure in solving all problems like metric, standard English for perimeter, area, uniform motion, velocity, and volume

Algebra

- _____ Solve linear equations/inequalities
- _____ Find algebraic solutions to systems of equations
- _____ Solve quadratic equations by factoring by the quadratic formula
- _____ Simplify radicals
- _____ Combine like polynomial terms
- _____ Operate with polynomials including factoring

Reasoning/Logic (Justification of answers and process)

- _____ Check answers
- _____ Determine the equation of a line
- _____ Use calculators/computers to verify solutions

Patterns

- _____ Solve equations by using patterns
- _____ Use number patterns for factoring
- _____ Use patterns in Cartesian graphing

Problem Solving (Strategies) Use of manipulative imperative

- _____ Translate and solve word problems with systems of one variable equations, 2 or 3 variable equations
- _____ Translate and solve word problems using Quadratic equations
- _____ Solve word problems using inequalities and linear programming
- _____ Solve word problems using rational expressions, direct, inverse, and joint variation
- _____ Solve word problems using the trigonometry of right triangles, Laws of Sines and Cosines (If not included in Algebra II, these must be included in a full Trigonometry curriculum.)
- _____ Solve rate-time and mixture problems
- _____ Use mathematical models
- _____ Explain and use a “logical” approach to solve all word problems
- _____ Find equations for lines given certain information
- _____ Participate in cooperative learning

Numeration (Meaning-Values-Relationships)

- _____ Introduce imaginary, complex and irrational numbers beyond square root
- _____ Interpret rational exponents
- _____ Use higher index radical expressions
- _____ Use properties of real numbers

Computation (Operating with Numbers) Use of manipulative imperative

- _____ Operate with complex fractions involving rational expressions
- _____ Operate with radicals of higher indices (indexes)
- _____ Add, subtract, multiply, divide complex numbers and imaginary numbers
- _____ Use synthetic division
- _____ Calculate the determinants of matrices
- _____ Use calculator/computer to compute

Communication

- _____ Use axioms of real numbers
- _____ Identify functions and relations
- _____ Work in 3-D space and graphing points, line segments, planes, and coordinate boxes (If not included in Algebra II, these must be included in an Advanced Algebra curriculum)
- _____ Graph circles, parabolas

- _____ Find graphic solutions to quadratic systems
- _____ Obtain information and equations from graphs
- _____ Read and interpret math symbolism
- _____ Graph complex numbers

Estimation

- _____ Estimate an equation from a graph
- _____ Recognize problems without a solution
- _____ Predict the solution from the discriminant
- _____

Measurement

- _____ Determine distance between two points in the coordinate plane
- _____ Emphasize the importance of the correct unit of measurement

Geometry

- _____ Use distance formula and determine whether lines are perpendicular or parallel
- _____ Solve perimeter and area problems
- _____ Use equations to solve geometric problems
- _____ Graph linear and quadratic equations and special functions including multi-defined equations

Algebra

- _____ Solve absolute value and compound sentences
- _____ Solve direct variation problems
- _____ Solve systems of equations with 3 variables
- _____ Solve quadratic equations
- _____ Solve rational expression equations
- _____ Solve equations involving radicals
- _____ Find solutions to linear-quadratic and quadratic-quadratic systems
- _____ Solve absolute value equations and inequalities
- _____ Factor polynomials of higher order than 2
- _____ Simplify complex fractions and rational expressions
- _____ Manipulate identities in trigonometry (If not in Algebra II, these must be included in a full trig curriculum.)
- _____ Use the trigonometry of right triangles. (If not included in Algebra II, these must be included in a full trig curriculum)

- _____ Identify functions, domain, range, inverse, composite, one-to-one
- _____ Master factoring, completing the square, and the quadratic formula as ways to solve quadratic functions

Reasoning/Logic (Justification of answers and process)

- _____ Create algebraic proofs.
- _____ Check answers
- _____ Determine the equations of lines from given information
- _____ Determine the shape of a graph from analyzing its equation
- _____ Find all possible rational roots of a polynomial equation
- _____ Determine the relationship between roots and coefficients
- _____ Develop formulas
- _____ Recognize problems without solutions
- _____ Use calculators/computers to verify solutions

Probability/Statistics

- _____ Obtain data from graphs to produce linear equations
- _____ Use statistical data and charts
- _____ Interpret normally distributed data

Patterns

- _____ Work with Arithmetic/Geometric sequences and series (If not in Algebra II, then must be in Advanced Algebra curriculum.)
- _____ Identify the conjugate and complex conjugate
- _____ Develop matrices

Problem Solving (Strategies) - Use of manipulative imperative

- _____ Apply right angle Trigonometry
- _____ Solve uniform circular motion
- _____ Solve oblique triangles
- _____ Solve simple harmonic motion
- _____ Use vectors in navigational problems
- _____ Determine an equation from a graph

Numeration (Meaning-Values-Relationships)

- _____ Apply laws to recognize oblique triangles
- _____ Identify period, amplitude, phase shift, and vertical shift
- _____ Master sine, cosine, tangent values for multiples of $0, \pi/6(30^\circ), \pi/4(45^\circ), \pi/3(60^\circ), \pi/2(90^\circ), \pi(180^\circ), 3\pi/2(270^\circ)$ and multiples of same

Computation (Operating with Numbers) - Use of manipulative imperative

- _____ Calculate directed distance
- _____ Use calculator/computer to compute, i.e., all trig functions and their inverses

Communication

- _____ Graph:
 - A. Trig functions
 - B. Addition of ordinates
 - C. Families of lines and circles
 - D. All conic sections
- _____ Determine equations from graphs
- _____ Use graphing calculator to graph any trigonometric functions with appropriate domain and range

Estimation

- _____ Predict the shape of sinusoidal graphs from numbers in an equation (graphical additions)

Measurement

- _____ Evaluate rectangular coordinate system values
- _____ Measure angles in degree/radian measure
- _____ Emphasize the importance of the correct unit of measurement

Geometry

- _____ Use geometric concepts
- _____ Define and use circular trigonometric functions
- _____ Define and use trigonometric functions of right triangles
- _____ Graph polynomials, rational functions, root functions, exponential, and logarithmic functions
- _____ Graph conic sections

Algebra

- _____ Solve Trigonometric equations
- _____ Develop equations from a graph
- _____ Solve quadratic systems
- _____ Recognize and analyze conic sections
- _____ Analyze translations of conic sections
- _____ Recognize and analyze conic sections equations given in general form
- _____ Master methods for finding all critical points of polynomials

Reasoning/Logic (Justification of answers and process)

- _____ Develop analytic proofs
- _____ Identify conic sections
- _____ Prove trigonometric identities

Probability/Statistics

- _____ Use statistical data

Patterns

- _____ Recognize circular function patterns
- _____ Impose circular function, graphs onto x-y coordinate system
- _____ Recognize the pattern of translations for all Algebraic and Trigonometric equations

Problem Solving (Strategies) Use of manipulative imperative

- _____ Find measures of angles
- _____ Solve word problems and “real world” problems such as right triangles, areas, perimeter and volumes
- _____ Observe a pattern then find a general rule based on the pattern
- _____ Use models to develop conjecture.
- _____ Use counter examples
- _____ Discover a formula.
- _____ Integrate algebraic and geometric problems
- _____ Solve locus problems of intersection.
- _____ Use investigations requiring use of manipulatives to form conjectures
- _____ Participate in cooperative learning
- _____ Draw and label figures and diagrams

Numeration (Meaning – Values – Relationships)

- _____ Identify properties of equality and inequality
- _____ Identify degree measures of angles between 0 and 180 degrees
- _____ Relate interior/exterior angles of polygene
- _____ Specify inequality relationships in geometric figures
- _____ Figure similar figures using ratios

Computation (Operating with Numbers) Use of manipulative imperative

- _____ Compute with real numbers of all types
- _____ Work with supplementary and complementary angles
- _____ Apply concepts of ration proportion to geometric figures
- _____ Calculate areas of parallelograms, trapezoids and regular polygons
- _____ Evaluate area and circumference of circles
- _____ Calculate volumes of solids
- _____ Use properties for similar figures and for similar triangles
- _____ Apply Pythagorean Theorem
- _____ Calculate measure of angles without using protractor
- _____ Compute with calculator/computer

Communication

- _____ Require accurate definition of all terms
- _____ Summarize in the correct order properties of polygons, parallelograms, for example, Venn diagrams, charts illustrating points, lines, planes
- _____ Identify parallel lines, planes, congruent triangles, quadrilaterals, similar polygons, right triangles, and circles
- _____ Use coordinate geometry to illustrate definitions and theorems
- _____ Use correct symbols for all geometric terms
- _____ Understand relationships between postulates and theorems, definitions, axioms, corollaries, investigations, conjectures
- _____ State conditionals in if-then form
- _____ Differentiate between sketch, draw and construct

Estimation

- _____ Use proportions and similarity relationships
- _____ Use transformations
- _____ Use tools of measure such as ruler, protractor.

Measurement

- _____ Use protractor to measure angles
- _____ Use a ruler to measure line segments
- _____ Use constructions to form geometric shapes with compass and straight edge
- _____ Calculate using correct unit of measure area, volume, arc, circumference, perimeter
- _____ Create scale drawings
- _____ Use sine, cosine, tangent (If not introduced in Geometry, this must be covered in Trigonometry.)
- _____ Use compass to measure relative lengths

Geometry

- _____ Introduce other forms of geometry beyond plane Euclidean geometry
- _____ Apply properties and theorems for congruent and similar polygons
- _____ Apply various formulas and theorems like: Pythagorean Theorem right triangles relationships (30 deg. – 60 deg. – 90 deg. , 45 deg. – 45 deg. – 90 deg.)
- _____ Trigonometric functions (If not in Geometry, this must be in Trigonometry curriculum>)

- _____ Identify and illustrate the terminology of circles, for example, arcs, tangents, chords, circumference, area
- _____ Recognize that from three undefined terms in plane geometry (point, line, plane) come all other geometric figures like rays, angles, polygons, etc.
- _____ Interpret geometric vocabulary
- _____ Analyze geometric figures using symmetry, rotation, reflections, and half turns
- _____ Use the various parallel line relationships, definitions and theorems
- _____ Compute the sums of angles in polygons

Algebra

- _____ Solve for X in finding missing measures in geometric figures
- _____ Use quadratic equations in solving geometric problems
- _____ Use equations of lines and circles
- _____ Apply symmetric, transitive, reflexive properties
- _____ Solve proportions of equality, similarity and congruence

Patterns

- _____ Recognize patterns in congruence proofs
- _____ Use the pattern relationships of polygon measurements
- _____ Evaluate the trigonometry of a right triangle (If not in Geometry, this must be in Trigonometry curriculum.)
- _____ Study number patterns to inductively form generalizations
- _____ Find the next term in a sequence

Reasoning/Logic (Justification of answers and process)

- _____ Use syllogisms
- _____ Analyze conditional statements (hypothesis and conclusion) and other statements of logic
- _____ Create written paragraphs as proofs
- _____ Create deductive (formal 2 column) proofs
- _____ Compare and contrast deductive and inductive reasoning
- _____ Use indirect reasoning to create indirect proofs
- _____ Draw conclusions from given information
- _____ Recognize short sequences of related theorems
- _____ Use calculators/computers to verify solutions

Problem Solving (Strategies) - Use of manipulative imperative

- _____ Apply right angle Trigonometry
- _____ Solve uniform circular motion
- _____ Solve oblique triangles
- _____ Solve simple harmonic motion
- _____ Use vectors in navigational problems
- _____ Determine an equation from a graph

Numeration (Meaning-Values-Relationships)

- _____ Apply laws to recognize oblique triangles
- _____ Identify period, amplitude, phase shift, and vertical shift
- _____ Master sine, cosine, tangent values for multiples of $0, \pi/6(30^\circ), \pi/4(45^\circ), \pi/3(60^\circ), \pi/2(90^\circ), \pi(180^\circ), 3\pi/2(170^\circ)$ and multiples of same

Computation (Operating with Numbers) - Use of manipulative imperative

- _____ Calculate directed distance
- _____ Use calculator/computer to compute, i.e., all trig functions and their inverses

Communication

- _____ Graph:
 - A. Trig functions
 - B. Addition of ordinates
 - C. Families of lines and circles
 - D. All conic sections
- _____ Determine equations from graphs
- _____ Use graphing calculator to graph any trigonometric functions with appropriate domain and range

Estimation

- _____ Predict the shape of sinusoidal graphs from numbers in an equation. (graphical additions)

Measurement

- _____ Evaluate rectangular coordinate system values
- _____ Measure angles in degree/radian measure
- _____ Emphasize the importance of the correct unit of measurement

Geometry

- _____ Use geometric concepts
- _____ Define and use circular trigonometric functions
- _____ Define and use trigonometric functions of right triangles
- _____ Graph polynomials, rational functions, root functions, exponential, and logarithmic functions
- _____ Graph conic sections

Algebra

- _____ Solve Trigonometric equations
- _____ Develop equations from a graph
- _____ Solve quadratic systems
- _____ Recognize and analyze conic sections
- _____ Analyze translations of conic sections
- _____ Recognize and analyze conic sections equations given in general form
- _____ Master methods for finding all critical points of polynomials

Reasoning/Logic (Justification of answers and process)

- _____ Develop analytic proofs
- _____ Identify conic sections
- _____ Prove trigonometric identities

Probability/Statistics

- _____ Use statistical data

Patterns

- _____ Recognize circular function patterns
- _____ Impose circular function, graphs onto x-y coordinate system
- _____ Recognize the pattern of translations for all algebraic and Trigonometric equations

Problem Solving (Strategies) Use of manipulative imperative

- _____ Solve problems involving right triangles and trig functions
- _____ Solve problems involving triangles and the law of Sines/Cosines
- _____ Solve vector word problems

Numeration (Meaning-Values-Relationships)

- _____ Compare radian and degree measure

Computation (Operating with Numbers) Use of manipulative imperative

- _____ Use calculator/computer to evaluate trig function values

Communication

- _____ Review conic section graphs
- _____ Define standard position, coterminal angles, radian/degree measure, the 6 trigonometric functions, periodic function
- _____ Graph sine, cosine, secant, cosecant, tangent and cotangent functions
- _____ Analyze and graph the above graphs for amplitude, cycle, vertical/horizontal shift
- _____ Graph the inverse trig functions
- _____ Graph polar pairs/equations

Estimation

- _____ Estimate an equation from a graph

Measurement

- _____ Find/use measures of angles and sides of triangles
- _____ Convert degree and radian measure
- _____ Change revolutions per minute to radian (or degrees) per minute (or second)
- _____ Use trigonometric methods to measure very large distances
- _____ Emphasize the importance of the correct unit of measurement

Geometry

- _____ Identify unit circle and circular functions (sine, cosine, tangent, secant, cosecant, cotangent)
- _____ Define angles, parts of angles and two types of angle measure

- _____ Use right triangles to define the trig functions
- _____ Recognize, use and prove trigonometric identities
- _____ Define geometric vectors
- _____ Operate with geometric vectors (add, subtract, scalar multiply)
- _____ Derive and use facts about 45-45-90 and 30-60-90 triangles
- _____ Interpret polar pairs

Algebra

- _____ Define periodic function, circular functions, trig functions, inverse trig functions
- _____ Apply the Law of Sines/Cosines
- _____ Solve trigonometric equations
- _____ Define and operate with vectors as ordered pairs
- _____ Find coterminal angles, angular velocity, arc lengths
- _____ Use right triangles to give ratios of 6 trig functions
- _____ Find values of quadrant angles, reference angles
- _____ Find missing parts of right triangles
- _____ Evaluate trigonometric functions of nonacute angles
- _____ Evaluate trig functions of real numbers
- _____ Use multiple angle formulas
- _____ Determine period, amplitude, vertical/horizontal shift
- _____ Find the equation of a given trigonometric graph
- _____ Add and compare trig graphs
- _____ Evaluate inverse trig functions
- _____ Convert between polar and Cartesian pairs/equations

Reasoning/Logic (Justification of answers and process)

- _____ Prove trig identities

Patterns

- _____ Recognize and compare co-functions

Problem Solving (Strategies) Use of manipulatives imperative

- _____ Solve trigonometric, vector, rate/clock, and exponential growth/decay problems
- _____ Solve conic section problems
- _____ Solve problems involving bearings

Numeration (Meaning-Values-Relationships)

- _____ Evaluate logarithms, exponentials, and radicals
- _____ Use radian measure
- _____ Use real and complex numbers
- _____ Find roots of complex numbers
- _____ Calculate vector magnitude
- _____ Know trigonometric function values of $0, \pi/6, \pi/4, \pi/3, \pi/2, \pi, 3\pi/2$ and multiples of same and be able to use
- _____ Use $30^\circ - 60^\circ - 90^\circ$ and $45^\circ - 45^\circ - 90^\circ$ triangles to derive those values

Computation (Operating with Numbers) Use of manipulative imperative

- _____ Use laws of exponents/logarithm
- _____ Evaluate factorials
- _____ Convert between degree and radian measure
- _____ Use synthetic division
- _____ Apply Heron's Formula
- _____ Use Binomial Theorem

Communication

- _____ Graph linear and quadratic functions, trig functions, exponential functions, logarithmic functions, conic sections, rational functions, and special functions
- _____ Find domain and range
- _____ Use the Cartesian plane, distance formula
- _____ Use vectors and rotations
- _____ Graph polynomial functions, composite and inverse functions, inequalities, polar coordinates, polar equations, parametric equations
- _____ Determine equations from graphs
- _____ Create/use normal distribution graphs

Estimation

- _____ Use approximate decimals for trig functions
- _____ Approximate limits
- _____ Find zeros of equations applying exponents, radicals, and logarithms to estimate

Measurement

- _____ Use radian measure
- _____ Evaluate angular/linear velocity
- _____ Emphasize the importance of the correct unit of measurement
- _____ Convert degree measures into radian measures
- _____ Convert radian measures into degree measures

Geometry

- _____ Recognize chords/arcs of circles
- _____ Evaluate/use area and volume
- _____ Use the unit circle and arc/angle measurement
- _____ Define the trig and inverse trig functions
- _____ Manipulate fundamental identities, sum and difference formulas, multiple angle formulas, product and sum formulas
- _____ Use law of sines/cosines
- _____ Graph rational and root functions
- _____ Apply central angle theorem
- _____ Graph polynomials after algebraically analyzing all aspects (y intercept, turns, end behavior, etc.)
- _____ Graph conic sections

Algebra

- _____ Solve trig equations
- _____ Analyze conic sections
- _____ Factor polynomials
- _____ Solve inequalities
- _____ Analyze exponential and logarithmic functions
- _____ Perform partial fraction decomposition
- _____ Use Descartes' Rule of signs
- _____ Analyze polynomial functions, rational functions, and root functions

Reasoning/Logic (Justification of answers and process)

- _____ Create deductive proofs
- _____ Use inductive reasoning
- _____ Prove trig identities
- _____ Develop rules for graphing functions
- _____ Check solutions to equations
- _____ Explore methods for finding and reasonableness of answers

Probability/Statistics

- _____ Use summation notation
- _____ Use theories of combination and permutation
- _____ Use theories of combination and permutation in expanding binomials

Patterns

- _____ Recognize arithmetic/geometric sequences and series
- _____ Apply Pascal's Theorem
- _____ Analyze general forms for equations
- _____ Use patterns for exponents and logarithms
- _____ Analyze systems of equations (linear and nonlinear) in two or more variables
- _____ Use matrices

Problem Solving (Strategies) Use of manipulative imperative

- _____ Determine continuity
- _____ Apply derivative to physics (motion) and economics (marginal revenue costs and profits)
- _____ Organize and present all information used to sketch curves
- _____ Sketch and label sketches to solve related rate problems
- _____ Use derivatives in velocity and acceleration problems
- _____ Use implicit differentiation in related rate problems
- _____ Solve optimization problems
- _____ Find area under curves
- _____ Use integration to find volume of solids of revolution
- _____ Use integration to find moments and centers of mass
- _____ Solve exponential growth and decay problems

2nd Year

- _____ Use integration to do work and force problems
- _____ Use substitution and trigonometric functions in integration
- _____ Calculate surface areas

Computation (Operating with Numbers) Use of manipulative imperative

- _____ Evaluate “slope of a curve” using derivatives
- _____ Evaluate definite integrals
- _____ Evaluate derivatives and integrals of trig functions
- _____ Use calculator/computer to evaluate functional values

Communication

- _____ Define terms related to functions: domain, range, symmetry, even, odd
- _____ Define limit, continuity, derivative, maxima, minima, concavity of curves, vertical and horizontal asymptotes, definite and indefinite integrals
- _____ Use schematic diagrams for motion problems
- _____ Graph all classifications of functions using derivatives
- _____ Graph conic sections by analyzing equations (This includes translating and rotating)
- _____ Graph primary and derivative functions

Estimation

- _____ Sketch curves using first and second derivatives
- _____ Use sigma summations to approximate integrals
- _____ Approximate values for limits
- _____ Use slopes of tangent lines to curves to provide a rough sketch of a graph

Measurement

- _____ Use correct units of measure in all applications

Geometry

- _____ Apply geometry facts/formulas in word problems
- _____ Use geometric formulas for plane and solid figures
- _____ Interpret integrals as area
- _____ Analyze polar coordinates and equations
- _____ Evaluate area and arc length in polar coordinates

2nd Year

- _____ Use inverse trig functions in derivatives/integrals/hyperbolic trig functions

Algebra

- _____ Identify/give characteristics of “special functions”
- _____ Identify domain and range of functions (giving answers in algebraic or interval notation)
- _____ Perform arithmetic operations, composition and inversion of functions
- _____ Evaluate limits
- _____ Determine if a function is continuous
- _____ Define derivatives as a limit
- _____ Find derivative by definition and by theorems
- _____ Interpret derivatives as applied to motion/economics
- _____ Apply Chain Rule
- _____ Find derivatives of polynomials/products/powers/quotients/sums/differences
- _____ Find second derivatives and apply them
- _____ Find implicit derivatives
- _____ Find derivative and limits of trig functions

- _____ Use Newton's method to identify real zeros of a function (to a specified number of decimal places)
- _____ Determine intervals of concavity/on which a function is increasing or decreasing
- _____ Identify vertical/horizontal asymptotes
- _____ Use the Intermediate Value Theorem
- _____ Find area bounded by curves
- _____ Define area as a limit and find area by this definition
- _____ Interpret Fundamental Theorem of Calculum
- _____ Find derivatives/integrals involving natural logarithmic and exponential functions
- _____ Define functions
- _____ Define limits and continuity
- _____ Use derivatives to find tangent and normal lines
- _____ Use derivatives to find extrema in an interval
- _____ Use the Mean Value Theorem

Algebra

- _____ Use indeterminate forms & L'Hopital's Rule
- _____ Apply integration technique including "by parts", partial fractions, trig substitutions
- _____ Analyze/graph parametric equations
- _____ Find derivatives of parametric equations
- _____ Identify Taylor polynomial series and sequences
- _____ Determine convergence of series
- _____ Use convergence tests
- _____ Use Taylor/MacLaurin series

Reasoning/Logic (Justification of answers and process)

- _____ Use first and second derivative tests to justify maximum, minimum, points of inflection, increasing/decreasing concavity
- _____ Use the vertical/horizontal line tests
- _____ Create formal and informal limit proofs
- _____ Test answers for reasonableness

2nd Year

- _____ Use mathematical induction to prove statements

Patterns

- _____ Determine sigma notation for series

Numeration (Meaning-Values-Relationships)

- _____ Define characteristics for levels of numerical scaling of numbers

Computation (Operating with Numbers) Use of manipulative imperative

- _____ Compute the mean, median, and mode for a set of numbers
- _____ Compute harmonic and geometric means for a set of data
- _____ Compute the sum of squares of the deviation scores
- _____ Calculate the standard deviation
- _____ Use calculator/computer to compute

Communication

- _____ Develop methods of displaying numerical data in an organized form
- _____ Construct a bar graph from given data
- _____ Distinguish between types of graphs
- _____ Construct a circle graph from given data
- _____ Identify distortions (illusions) in graphs or picture charts
- _____ Locate the relative positions of the mean, median, and mode on a skewed frequency distribution
- _____ Organize or normalize data into a frequency or relative distribution tables
- _____ Construct a joint frequency contingency table from two categorical variables
- _____ Construct a histogram, frequency polygon, and frequency curve from a frequency (or relative frequency) distribution
- _____ Construct an objective given a relative cumulative frequency distribution
- _____ Plot points on a scattergram when given a bivariate distribution
- _____ Distinguish between a histogram and a stem-and-leaf diagram

Geometry

- _____ Distinguish among definitions of the range of a set of data
- _____ Distinguish between “real” and “apparent” class intervals
- _____ Describe how measures of dispersion differ from measures of central tendency
- _____ Determine an appropriate measure of central tendency for data scaled on nominal, on ordinal, and on interval and ratio levels
- _____ Explain why the mean is influenced by extreme values in a distribution while the median is relatively unaffected by extreme values

Algebra

- _____ Describe common characteristics of the mean, median, and mode
- _____ Interpret the mean deviation
- _____ Interpret the variance
- _____ Interpret the standard deviation from a given value of the variance for a variable
- _____ Describe the role of measures of dispersion in summarizing data
- _____ Describe in terms of the mean and standard deviation, Z-score and T-score numerical distributions
- _____ Transform raw scores into corresponding standard Z-scores
- _____ Convert a set of Z-scores into a distribution of T-scores.
- _____ Convert a set of Z-scores into a distribution of standard scores with any given mean and standard deviation
- _____ Interpret the meaning of an individual standard score relative to the distribution of concern
- _____ Describe characteristics of the normal curve
- _____ Give a set of Z-scores and use characteristics of the normal curve to convert the Z-scores into percentile equivalents
- _____ Give a percentile score and use the characteristics of the normal curve to transform the percentile to a standard Z-score