

**Problem Solving (Strategies)**

Problem solving is integrated throughout the content strands. The development of problem-solving skills is a major goal of the mathematics program at every grade level. Instruction in the process of problem-solving, which should include problems involving Catholic Social Teaching, not just textbook word problems, will need to be integrated early and continuously into each student's mathematics education. Students must be helped to develop a wide range of skills and strategies for solving a variety of problem types.

The student will apply the following problem solving strategies to solve real life situations (use of manipulatives is imperative):

	Numeration	Computation	Communication	Estimation	Measurement	Geometry	Algebra	Patterns	Reasoning/Logic	Probability/ Statistics/Data Analysis
Classify and sort objects										
Draw a picture										
Make up a story										
Guess and check										
Use board games and card games										

**A. Numeration (Meaning-Values-Relationships)**

- 1. \_\_\_\_\_ Count by rote to 20
- 2. \_\_\_\_\_ Demonstrate one-to-one correspondence
- 3. \_\_\_\_\_ Count objects 0-10
- 4. \_\_\_\_\_ Match numerals to objects 1-10
- 5. \_\_\_\_\_ Match objects to numerals 1-10

**B. Computation (Operating with Numbers) Use of manipulatives is imperative.**

- 1. \_\_\_\_\_ Compare equal, greater than, and less than
- 2. \_\_\_\_\_ Create and count a group / set of objects by placing objects within limits

**C. Communication**

- 1. \_\_\_\_\_ Understand and use vocabulary: \_\_\_ long \_\_\_ longer \_\_\_ short  
\_\_\_ shorter \_\_\_ tall \_\_\_ taller \_\_\_ small \_\_\_ medium \_\_\_ large  
\_\_\_ more \_\_\_ less \_\_\_ big \_\_\_ little

**D. Estimation**

- 1. \_\_\_\_\_ Estimate amounts to 10

**E. Measurement**

- 1. \_\_\_\_\_ Use liquid and dry measure in cooking
- 2. \_\_\_\_\_ Compare: longer, tall, small, heavier, lighter, near, far, shorter, big
- 3. \_\_\_\_\_ Identify: time, day, night, morning, afternoon

**F. Geometry**

- 1. \_\_\_\_\_ Recognize and name: triangle, circle, square, rectangle, diamond, heart, oval
- 2. \_\_\_\_\_ Identify spatial relationships, i.e., over, under, forward, back
- 3. \_\_\_\_\_ Explore spatial relationships through puzzle and block-play
- 4. \_\_\_\_\_ Recognize and name: curved line, straight line
- 5. \_\_\_\_\_ Distinguish between curved line and straight line

**G. Algebra**

There are no skills at this level.

**H. Patterns**

- 1. \_\_\_\_\_ Recognize sequence of objects
- 2. \_\_\_\_\_ Identify patterns from one form to another
- 3. \_\_\_\_\_ Identify, create, copy, and extend simple patterns using manipulatives
- 4. \_\_\_\_\_ Record patterns

**I. Reasoning / Logic (Justification of answers and process)**

- 1. \_\_\_\_\_ Sort, classify, match data, and compare
- 2. \_\_\_\_\_ Explore sequences of everyday life
- 3. \_\_\_\_\_ Use board games and card games

**J. Probability / Statistics / Data Analysis**

- 1. \_\_\_\_\_ Recognize pictographs, bar graphs
- 2. \_\_\_\_\_ Make graphs with concrete objects
- 3. \_\_\_\_\_ Make a simple bar graph

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	Numeration	Computation	Communication	Estimation	Measurement	Geometry	Algebra	Patterns	Reasoning/Logic	Probability/ Statistics/Data Analysis
Collect data										
Sort & classify data										
Find and extend a pattern										
Make a tally										
Draw a picture/model										
Act it out/Tell a story										
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 and card games										

**A. Numeration (Meaning-Values-Relationships)**

- 1. \_\_\_\_\_ Count by rote to 100
- 2. \_\_\_\_\_ Count by 5’s and 10’s to 100
- 3. \_\_\_\_\_ Count backwards from 10
- 4. \_\_\_\_\_ Count objects 0-31
- 5. \_\_\_\_\_ Demonstrate one-to-one correspondence with objects up to 31
- 6. \_\_\_\_\_ Order and write numbers to 10
- 7. \_\_\_\_\_ Recognize the terms: first to fifth
- 8. \_\_\_\_\_ Recognize number words to ten
- 9. \_\_\_\_\_ Compare numbers and sets using terms “more, less, equal, before, after”
- 10. \_\_\_\_\_ Identify: 1 more than, 1 less than
- 11. \_\_\_\_\_ Set up groups and subgroups to 10
- 12. \_\_\_\_\_ Represent commonly used fractions such as 1/4, 1/2
- 13. \_\_\_\_\_ Demonstrate place value with manipulatives

**B. Computation (Operating with Numbers) Use of manipulatives is imperative.**

- 1. \_\_\_\_\_ Use number line
- 2. \_\_\_\_\_ Sort and classify sets
- 3. \_\_\_\_\_ Add with manipulatives
- 4. \_\_\_\_\_ Subtract with manipulatives

**C. Communication**

- 1. \_\_\_\_\_ Make predictions
- 2. \_\_\_\_\_ Dramatize math situations
- 3. \_\_\_\_\_ Understand and use vocabulary: \_\_\_equal \_\_\_length \_\_\_height \_\_\_weight  
\_\_\_ add \_\_\_subtract \_\_\_more \_\_\_less \_\_\_short \_\_\_shorter \_\_\_shortest \_\_\_tall  
\_\_\_ taller \_\_\_tallest \_\_\_long \_\_\_longer \_\_\_longest \_\_\_small \_\_\_medium  
\_\_\_large \_\_\_fewer \_\_\_whole \_\_\_part \_\_\_total \_\_\_next \_\_\_last \_\_\_sum  
\_\_\_difference

**D. Estimation**

- 1. \_\_\_\_\_ Estimate amounts to 20
- 2. \_\_\_\_\_ Use visual comparison (e.g. which container holds more?)
- 3. \_\_\_\_\_ Estimate units of time:  
\_\_\_ longer \_\_\_ shorter \_\_\_ day \_\_\_ night

**E. Measurement**

- 1. \_\_\_\_\_ Compare and group according to:  
\_\_\_ size \_\_\_ length \_\_\_ height \_\_\_weight \_\_\_capacity
- 2. \_\_\_\_\_ Compare distance (longer, shorter)
- 3. \_\_\_\_\_ Measure using non-standard units (e.g., how many hand spans or pencil-lengths?)
- 4. \_\_\_\_\_ Measure objects using standard English units
- 5. \_\_\_\_\_ Identify instruments to measure:
  - \_\_\_ length (ruler)
  - \_\_\_ weight (scale)
  - \_\_\_ temperature (thermometer)
  - \_\_\_ time (clock, calendar)
- 6. \_\_\_\_\_ Recognize calendar: day, date, month, year
- 7. \_\_\_\_\_ Identify time sequence (first, next, last)
- 8. \_\_\_\_\_ Tell time to hour and half hour
- 9. \_\_\_\_\_ Identify pennies, nickels, dimes, quarters, dollars
- 10. \_\_\_\_\_ Determine value of pennies, nickels, dimes up to 10 cents
- 11. \_\_\_\_\_ Identify equal parts

**F. Geometry**

- 1. \_\_\_\_\_ Identify, compare, and draw two dimensional figures such as circle, square, triangle, rectangle, oval, diamond, heart
- 2. \_\_\_\_\_ Identify spatial relationships: right, left, middle, over, under, beside, through, on top of, next to, inside, outside, between, above, below
- 3. \_\_\_\_\_ Recognize three-dimensional figures such as sphere, cube, cylinder, cone
- 4. \_\_\_\_\_ Recognize two and three dimensional figures as objects in the real world

- 5. \_\_\_\_\_ Distinguish between curved line and straight line
- 6. \_\_\_\_\_ Recognize symmetry

**G. Algebra**

- 1. \_\_\_\_\_ Find numbers in a sequence of objects
- 2. \_\_\_\_\_ Complete number sentences using manipulatives

**H. Patterns**

- 1. \_\_\_\_\_ Identify, create, copy, and extend patterns using manipulatives, pictures, and actions
- 2. \_\_\_\_\_ Identify patterns in real world
- 3. \_\_\_\_\_ Order shapes according to size, order, color patterns / gradations
- 4. \_\_\_\_\_ Follow an order using dot to dot
- 5. \_\_\_\_\_ Identify number patterns

**I. Reasoning / Logic (Justification of answers and process)**

- 1. \_\_\_\_\_ Sort, classify, color, match and compare by size and shape
- 2. \_\_\_\_\_ Recognize objects that do not belong to a specific classification
- 3. \_\_\_\_\_ Think through a problem
- 4. \_\_\_\_\_ Explain how you solved a problem
- 5. \_\_\_\_\_ Justify the answer using manipulatives
- 6. \_\_\_\_\_ Use board games and card games

**J. Probability / Statistics / Data Analysis**

- 1. \_\_\_\_\_ Record
- 2. \_\_\_\_\_ Tally data
- 3. \_\_\_\_\_ Collect, organize, and interpret data using concrete objects
- 4. \_\_\_\_\_ Identify, interpret, and create:  
\_\_\_\_\_ bar graphs \_\_\_\_\_ pictographs
- 5. \_\_\_\_\_ Compare predictions to results
- 6. \_\_\_\_\_ Identify Venn Diagrams

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	Numeration	Computation	Communication	Estimation	Measurement	Geometry	Algebra	Patterns	Reasoning/Logic	Probability/ Statistics/Data Analysis
Collect and organize data										
Sort & classify data										
Find and extend a pattern										
Make a tally										
Draw a picture/model										
Act it out/Tell a story										
Use a check list										
Trial and error/Guess and check										
Ask questions										
Choose operations										
Eliminate facts not necessary to solve the problem										
Estimate answers										
Use mental math										
Use a number line										
Use computer programs/basic commands										
Use board games and card games										
Participate in cooperative learning										

**Explore simply means “introduce” or “expose” students to the new concept.**

\* Denotes new skill being taught for the first time.

**A. Numeration (Meaning-Values-Relationships)**

- 1. \_\_\_\_\_ Count by 2's, 5's, and 10's to 100
- 2. \_\_\_\_\_ Count backwards from 100 by 1's
- 3. \_\_\_\_\_ Read, order, count, and write numerals correctly to 100  
       \_\_\_ standard form \_\_\_ expanded form \_\_\_ ordinal form through 2 digits  
       \_\_\_ word form
- 4. \_\_\_\_\_ Read and write ordinals correctly first through tenth
- 5. \_\_\_\_\_ Identify even and odd numbers
- 6. \_\_\_\_\_ Identify number words from zero through twenty
- 7. \_\_\_\_\_ \* Compare numbers and write: greater than, less than, equal to
- 8. \_\_\_\_\_ Identify numbers before, after, and between to 100
- 9. \_\_\_\_\_ Group and subgroup to 20
- 10. \_\_\_\_\_ Recognize and draw groups with one fewer and one more than a given group
- 11. \_\_\_\_\_ Identify equivalent and non-equivalent sets
- 12. \_\_\_\_\_ Recognize relationship between addition and subtraction
- 13. \_\_\_\_\_ \* Identify and complete addition and subtraction facts to 12 in a fact family
- 14. \_\_\_\_\_ \* Identify place value of ones and tens up to 100
- 15. \_\_\_\_\_ Identify and compare  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$
- 16. \_\_\_\_\_ \* Write a fraction for a shaded area

**B. Computation (Operating with Numbers) Use of manipulatives is imperative.**

- 1. \_\_\_\_\_ Use number line
- 2. \_\_\_\_\_ Explore use of calculators
- 3. \_\_\_\_\_ Add vertically and horizontally
- 4. \_\_\_\_\_ Subtract vertically and horizontally
- 5. \_\_\_\_\_ \* Add 3 numbers
- 6. \_\_\_\_\_ Master addition facts to 12 (Mentally recall facts)
- 7. \_\_\_\_\_ Master subtraction facts to 12 (Mentally recall facts)
- 8. \_\_\_\_\_ Master addition of two 2-digit numbers without regrouping
- 9. \_\_\_\_\_ Master subtraction of two 2-digit numbers without regrouping
- 10. \_\_\_\_\_ \* Explore addition of two 2-digit numbers with regrouping
- 11. \_\_\_\_\_ \* Explore subtraction of two 2-digit numbers with regrouping
- 12. \_\_\_\_\_ Add money amounts
- 13. \_\_\_\_\_ Subtract money amounts

**C. Communication**

- 1. \_\_\_\_\_ Make predictions
- 2. \_\_\_\_\_ Dramatize math situations
- 3. \_\_\_\_\_ Understand and uses math vocabulary:  
       \_\_\_ equal \_\_\_ sum \_\_\_ difference \_\_\_ addend \_\_\_ numeral \_\_\_ ordinal words  
       \_\_\_ most \_\_\_ least \_\_\_ digit \_\_\_ number sentence \_\_\_ metric terms \_\_\_ greater  
       \_\_\_ fewer \_\_\_ more \_\_\_ less \_\_\_ plus \_\_\_ minus \_\_\_ whole \_\_\_ part  
       \_\_\_ Venn diagram \_\_\_ vertex \_\_\_ face \_\_\_ edge \_\_\_ symmetry \_\_\_ minute hand  
       \_\_\_ hour hand \_\_\_ perimeter \_\_\_ foot \_\_\_ cup \_\_\_ pint \_\_\_ quart \_\_\_ inches  
       \_\_\_ centimeter \_\_\_ regroup \_\_\_ equal parts \_\_\_ fraction

**D. Estimation**

- 1. \_\_\_\_\_ \* Explore rounding to the nearest 10
- 2. \_\_\_\_\_ Estimate the quantity in a set of up to 60 objects
- 3. \_\_\_\_\_ Estimate sums
- 4. \_\_\_\_\_ Estimate differences
- 5. \_\_\_\_\_ Estimate using visual comparisons
- 6. \_\_\_\_\_ Estimate:
  - \_\_\_\_\_ length
  - \_\_\_\_\_ capacity
  - \_\_\_\_\_ volume
  - \_\_\_\_\_ mass/weight
  - \_\_\_\_\_ quantity
  - \_\_\_\_\_ units of time
  - \_\_\_\_\_ units of money

**E. Measurement**

- 1. \_\_\_\_\_ Compare and group according to:  
\_\_\_\_ size \_\_\_\_ length \_\_\_\_ height \_\_\_\_ weight \_\_\_\_ capacity \_\_\_\_ quantity
- 2. \_\_\_\_\_ Use non-standard units to measure length, height, and weight (paper clips, unifix cubes)
- 3. \_\_\_\_\_ Measure in standard English units:  
\_\_\_\_ height/length (inches/feet) \_\_\_\_ weight (pounds) \_\_\_\_ temperature (Fahrenheit) \_\_\_\_ capacity/volume (cups, pints, quarts)
- 4. \_\_\_\_\_ Measure in metric units:  
\_\_\_\_ height/length (centimeters) \_\_\_\_ weight (kilograms) \_\_\_\_ capacity/volume (liters)
- 5. \_\_\_\_\_ Select an appropriate unit/tool for the attribute being measured  
\_\_\_\_ length (ruler) \_\_\_\_ weight (scale) \_\_\_\_ temperature (thermometer)  
\_\_\_\_ time (clock, calendar)
- 6. \_\_\_\_\_ Compare the weights of two objects using a balance scale
- 7. \_\_\_\_\_ Compare lengths using the phrases shortest to longest, longest to shortest
- 8. \_\_\_\_\_ Use a ruler to measure inches
- 9. \_\_\_\_\_ \* Use a ruler to measure centimeters
- 10. \_\_\_\_\_ Identify time sequence (first, next, last)
- 11. \_\_\_\_\_ Create, interpret, and read a calendar: days, weeks, months, date, and year
- 12. \_\_\_\_\_ Tell time to the hour and half hour using digital and analog clocks
- 13. \_\_\_\_\_ Identify money: penny, nickel, dime, quarter, dollar
- 14. \_\_\_\_\_ Identify the number of pennies equivalent to a nickel, dime, quarter
- 15. \_\_\_\_\_ Count to 100 cents or less using pennies, dimes, quarters, and dollars

**F. Geometry**

- 1. \_\_\_\_\_ Describe the proximity of objects in space (near, far, close by, below, above, up, down, beside, next to, right, left, inside, outside)
- 2. \_\_\_\_\_ \* Identify open and closed figures
- 3. \_\_\_\_\_ Identify and count sides and corners of plane figures
- 4. \_\_\_\_\_ Draw a plane figure with a given number of sides and corners
- 5. \_\_\_\_\_ Identify and describe objects in the environment that depict plane geometric figures (triangle, rectangle, square, circle, trapezoid, hexagon)
- 6. \_\_\_\_\_ Identify attributes of two-dimensional figures: sides, corners (vertex), edge, face
- 7. \_\_\_\_\_ Describe, draw, and sort plane geometric figures according to the number of sides and corners (triangle, rectangle, square, circle, trapezoid, hexagon)
- 8. \_\_\_\_\_ Identify, compare, sort, and recognize attributes of three-dimensional figures: cone, cylinder, sphere, rectangular prism, pyramid, cube
- 9. \_\_\_\_\_ Identify plane shapes that are flat surfaces of solid figures
- 10. \_\_\_\_\_ Identify, sort, and classify solid figures by the way in which they move: roll, slide, stack
- 11. \_\_\_\_\_ Identify slide, turn, and flip patterns
- 12. \_\_\_\_\_ \* Recognize congruent figures (same shape and size)
- 13. \_\_\_\_\_ Recognize symmetry

**G. Algebra**

- 1. \_\_\_\_\_ \* Find missing addends and operational signs
- 2. \_\_\_\_\_ \* Explore properties of: addition (commutative and associative)
- 3. \_\_\_\_\_ Complete and write number sentences
- 4. \_\_\_\_\_ Identify cues and clues in equality

**H. Patterns**

- 1. \_\_\_\_\_ Identify, create, describe, and extend patterns including rhythmic, color, shape, and numerical (growing and repeating patterns)
- 2. \_\_\_\_\_ Identify patterns in real world
- 3. \_\_\_\_\_ Order shapes according to size, dot to dot, and color patterns

**I. Reasoning / Logic (Justification of answers and process)**

- 1. \_\_\_\_\_ Sort and classify by more than one attribute
- 2. \_\_\_\_\_ Justify process and answer using manipulatives
- 3. \_\_\_\_\_ Find and follow a rule
- 4. \_\_\_\_\_ Explain how you solved a problem:  
\_\_\_\_ identify key words \_\_\_\_ operation \_\_\_\_ solution \_\_\_\_ answer in complete sentence
- 5. \_\_\_\_\_ Compose open and closed questions
- 6. \_\_\_\_\_ \* Use addition to check subtraction

**J. Probability / Statistics / Data Analysis**

- 1. \_\_\_\_\_ Record data
- 2. \_\_\_\_\_ Conduct, organize, and interpret results from a survey
- 2. \_\_\_\_\_ Make, interpret, and record tallies to match the number of objects in a group
- 3. \_\_\_\_\_ Identify outcomes
- 4. \_\_\_\_\_ Collect, organize, read, interpret, and predict data presented in:  
\_\_\_\_bar graphs \_\_\_\_pictographs \_\_\_\_Venn diagrams \_\_\_\_Line graphs
- 5. \_\_\_\_\_ Make predictions and compare results

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Make a tally										
Draw a picture/model										
Act it out/Tell a story										
Use a check list										
Trial and error/Guess and check										
Ask questions										
Choose operations										
Eliminate facts not necessary to solve the problem										
Estimate answers										
Use mental math										
Use a number line										
Use computer programs/basic commands										
Use board games and card games										
Participate in cooperative learning										

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**A. Numeration (Meaning-Values-Relationships)**

- 1. \_\_\_\_\_ \* Count by 2's, 3's, 4's, 5's, and 10's to 100
- 2. \_\_\_\_\_ Count backwards from 100 by 1's
- 3. \_\_\_\_\_ Read, order, count, and write numerals correctly to 999
- 4. \_\_\_\_\_ Read and write ordinal numbers correctly first through fiftieth
- 5. \_\_\_\_\_ Identify even and odd numbers
- 6. \_\_\_\_\_ \* Identify number words from zero through ninety-nine
- 7. \_\_\_\_\_ \* Compare pairs of numbers less than 999 using  $<$   $>$
- 8. \_\_\_\_\_ \* Identify numbers before, after, and between to 999
- 9. \_\_\_\_\_ Use group and subgroup of sets
- 10. \_\_\_\_\_ Identify equivalent and non-equivalent sets
- 11. \_\_\_\_\_ Recognize relationship between addition and subtraction
- 12. \_\_\_\_\_ \* Identify and complete addition and subtraction facts to 20 in a fact family
- 13. \_\_\_\_\_ \* Identify place value of ones, tens and hundreds up to 1000
- 14. \_\_\_\_\_ \* Identify  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$ ,  $\frac{1}{5}$ ,  $\frac{1}{6}$ ,  $\frac{1}{7}$ ,  $\frac{1}{8}$ ,  $\frac{1}{9}$ ,  $\frac{1}{10}$ ,  $\frac{1}{11}$ , and  $\frac{1}{12}$
- 15. \_\_\_\_\_ Write a fraction for a shaded region

**B. Computation (Operating with Numbers) Use of manipulatives is imperative.**

- 1. \_\_\_\_\_ Use number line
- 2. \_\_\_\_\_ Utilize calculators to explore number relations when appropriate
- 3. \_\_\_\_\_ Add vertically and horizontally
- 4. \_\_\_\_\_ Subtract vertically and horizontally
- 5. \_\_\_\_\_ \* Add 3 and 4 numbers
- 6. \_\_\_\_\_ \* Master addition facts to 20 (Mentally recall facts)
- 7. \_\_\_\_\_ \* Master subtraction facts to 20 (Mentally recall facts)
- 8. \_\_\_\_\_ Master addition of two 2-digit numbers with regrouping
- 9. \_\_\_\_\_ Master subtraction of two 2-digit numbers with regrouping
- 10. \_\_\_\_\_ \* Add two 3-digit numbers with regrouping
- 11. \_\_\_\_\_ \* Subtract two 3-digit numbers with regrouping
- 12. \_\_\_\_\_ Add and subtract money amounts
- 13. \_\_\_\_\_ Express monetary values using cent ( $\text{¢}$ ) dollar (\$) and decimal points
- 14. \_\_\_\_\_ \* Multiply by 2, 3, 4, and 5 (products to 45)

**C. Communication**

- 1. \_\_\_\_\_ \* Make predictions with multi step problems
- 2. \_\_\_\_\_ Dramatize math situations/problems using addition and subtraction facts
- 3. \_\_\_\_\_ Understand and use math vocabulary:  
 \_\_\_ equal \_\_\_ sum \_\_\_ difference \_\_\_ addend \_\_\_ numeral \_\_\_ ordinal words  
 \_\_\_ most \_\_\_ least \_\_\_ digit \_\_\_ number sentence \_\_\_ metric terms \_\_\_ greater  
 \_\_\_ fewer \_\_\_ more \_\_\_ less \_\_\_ plus \_\_\_ minus \_\_\_ whole \_\_\_ part \_\_\_ range  
 \_\_\_ mode \_\_\_ median \_\_\_ Venn diagram \_\_\_ vertex \_\_\_ face \_\_\_ edge  
 \_\_\_ corner \_\_\_ symmetry \_\_\_ perimeter \_\_\_ area \_\_\_ inches \_\_\_ foot  
 \_\_\_ centimeters \_\_\_ cup \_\_\_ pint \_\_\_ quart \_\_\_ regroup \_\_\_ equal parts  
 \_\_\_ fraction \_\_\_ minute hand \_\_\_ hour hand

**D. Estimation**

- 1. \_\_\_\_\_ \* Explore rounding to the nearest 100
- 2. \_\_\_\_\_ \* Estimate sums of two 2-digit numbers
- 3. \_\_\_\_\_ \* Estimate differences of two 2-digit numbers
- 4. \_\_\_\_\_ Estimate using visual comparisons
- 5. \_\_\_\_\_ Estimate various measurements
  - \_\_\_\_\_ length
  - \_\_\_\_\_ capacity
  - \_\_\_\_\_ volume
  - \_\_\_\_\_ mass/weight
  - \_\_\_\_\_ quantity
  - \_\_\_\_\_ time
  - \_\_\_\_\_ money

**E. Measurement**

- 1. \_\_\_\_\_ Measure in metric, standard English, and nonstandard units:  
\_\_\_\_\_ height \_\_\_\_\_ length \_\_\_\_\_ weight (pounds/kilograms) \_\_\_\_\_ temperature  
(Fahrenheit) \_\_\_\_\_ capacity/volume (cups, pints, quarts, liters)
- 2. \_\_\_\_\_ Compare and group according to  
\_\_\_\_\_ size \_\_\_\_\_ length \_\_\_\_\_ height \_\_\_\_\_ weight \_\_\_\_\_ capacity \_\_\_\_\_ quantity
- 3. \_\_\_\_\_ Use non-standard units to measure length, height, and weight (paper clips, unifix cubes)
- 4. \_\_\_\_\_ Select an appropriate unit/tool for the attribute being measured  
\_\_\_\_\_ length (ruler) \_\_\_\_\_ weight (scale) \_\_\_\_\_ temperature (thermometer)  
\_\_\_\_\_ time (clock, calendar)
- 5. \_\_\_\_\_ Compare the weights of two objects using a balance scale
- 6. \_\_\_\_\_ Compare lengths using the phrases shortest to longest, longest to shortest
- 7. \_\_\_\_\_ Use a ruler to measure inches
- 8. \_\_\_\_\_ Use a ruler to measure centimeters
- 9. \_\_\_\_\_ Find perimeter by counting nonstandard units
- 10. \_\_\_\_\_ \* Find area
- 11. \_\_\_\_\_ Identify time sequence (first, next, last)
- 12. \_\_\_\_\_ \* Interpret and read a calendar: days, weeks, months, date, and year to solve problems
- 13. \_\_\_\_\_ Identify seasons
- 14. \_\_\_\_\_ \* Tell time to the hour, half hour, quarter hour, and 5 minute intervals using digital and analog clocks
- 15. \_\_\_\_\_ Identify money: penny, nickel, dime, quarter, half dollar, and dollar
- 16. \_\_\_\_\_ Identify the number of pennies equivalent to a nickel, dime, quarter, half dollar, and dollar
- 17. \_\_\_\_\_ Count through 100 cents or less using pennies, dimes, quarters, half dollars, and dollar

**F. Geometry**

- 1. \_\_\_\_\_ Describe the proximity of objects in space (near, far, close by, below, above, up, down, beside, next to, right, left, inside, outside)
- 2. \_\_\_\_\_ Identify open and closed figures

- 3. \_\_\_\_\_ \* Identify and count sides and corners of plane and solid figures
- 4. \_\_\_\_\_ Draw a plane figure with a given number of sides and corners
- 5. \_\_\_\_\_ \* Identify and describe objects in the environment that depict plane geometric figures: rectangle, square, triangle, circle, trapezoid, hexagon, rhombus, and pentagon
- 6. \_\_\_\_\_ Identify attributes of two-dimensional figures: sides, corners (vertex), edge, face
- 7. \_\_\_\_\_ \* Describe, draw, and sort plane geometric figures according to the number of sides and corners (triangle, rectangle, square, circle, trapezoid, hexagon, pentagon, and rhombus)
- 8. \_\_\_\_\_ Identify, compare, sort, and recognize attributes of three-dimensional figures: cone, cylinder, sphere, rectangular prism, cone, pyramid, and cube
- 9. \_\_\_\_\_ Identify plane shapes that are flat surfaces of solid figures
- 10. \_\_\_\_\_ Identify, sort, and classify solid figures by the way in which they move: roll, slide, stack
- 11. \_\_\_\_\_ Identify slide, turn, and flip patterns
- 12. \_\_\_\_\_ Identify congruent figures (same shape and size)
- 13. \_\_\_\_\_ Recognize symmetry
- 14. \_\_\_\_\_ Locate and name objects on a grid using ordered pairs (coordinates)

**G. Algebra**

- 1. \_\_\_\_\_ \* Find missing addends, minuends, subtrahends, and operational signs with 2-digit numbers
- 2. \_\_\_\_\_ \* Identify properties of: addition (commutative and associative) with two 2-digit numbers
- 3. \_\_\_\_\_ \* Complete and write number sentences with two 2-digit numbers
- 4. \_\_\_\_\_ Identify cues and clues in equality
- 5. \_\_\_\_\_ \* Recognize the concept of variable (using a blank/box for missing numbers)

**H. Patterns**

- 1. \_\_\_\_\_ Identify, create, describe, and extend patterns including rhythmic, color, shape, and numerical (growing and repeating patterns)
- 2. \_\_\_\_\_ Identify patterns in real world
- 3. \_\_\_\_\_ Order shapes according to size, dot to dot, and color patterns

**I. Reasoning / Logic (Justification of answers and process)**

- 1. \_\_\_\_\_ Sort and classify by more than one attribute
- 2. \_\_\_\_\_ Justify process and answer using manipulatives
- 3. \_\_\_\_\_ Find and follow a rule
- 4. \_\_\_\_\_ Explain how you solved a problem  
\_\_\_\_ identify key words \_\_\_\_ operation \_\_\_\_ solution \_\_\_\_ answer in a complete sentence
- 5. \_\_\_\_\_ Compose open and closed questions
- 6. \_\_\_\_\_ \* Use addition to check subtraction with two 2-digit numbers

**J. Probability / Statistics / Data Analysis**

- 1. \_\_\_\_\_ Record data
- 2. \_\_\_\_\_ Conduct, organize, and interpret results from a survey
- 2. \_\_\_\_\_ Make, interpret, and record tallies to match the number of objects in a group

- 3. \_\_\_\_\_ Identify outcomes
- 4. \_\_\_\_\_ Collect, organize, read, interpret, and predict data presented in:
  - \_\_\_\_\_ bar graphs
  - \_\_\_\_\_ pictographs
  - \_\_\_\_\_ Venn diagrams
  - \_\_\_\_\_ line graphs
  - \_\_\_\_\_ surveys
- 5. \_\_\_\_\_ Make predictions and compare results
- 6. \_\_\_\_\_ \* Find and use the range for a set of data
- 7. \_\_\_\_\_ \* Find the mode for a set of data
- 8. \_\_\_\_\_ \* Find the median for a set of data



**\*Denotes new skill being taught for the first time.**

**A. Numeration (Meaning-Values-Relationships)**

- 1. \_\_\_\_\_ Identify the place value of each digit in a whole number to six digit numerals and explore to one million
- 2. \_\_\_\_\_ Count by number patterns including tens and hundreds
- 3. \_\_\_\_\_ Compare pairs of numbers less than 10,000 using symbols (<, >, and =)
- 4. \_\_\_\_\_ Count in sequence starting on any given number less than 10,000
- 5. \_\_\_\_\_ Write word names for numbers with six digit numerals
- 6. \_\_\_\_\_ Read, write, and name numbers through six digit numerals in
  - \_\_\_\_\_ standard form
  - \_\_\_\_\_ expanded form
  - \_\_\_\_\_ ordinal form through three digits
  - \_\_\_\_\_ word form
- 7. \_\_\_\_\_ Read and write Roman Numerals to twenty and introduce to one hundred
- 8. \_\_\_\_\_ Recognize and count by even and odd numbers
- 9. \_\_\_\_\_ Demonstrate whole numbers, mixed numbers, fractions, decimals, and percent relationships
- 10. \_\_\_\_\_ Recognize and name commonly used fractions  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$ ,  $\frac{1}{5}$ ,  $\frac{1}{6}$ ,  $\frac{1}{7}$ ,  $\frac{1}{8}$ ,  $\frac{1}{9}$ ,  $\frac{1}{10}$ ,  $\frac{1}{11}$ , and  $\frac{1}{12}$
- 11. \_\_\_\_\_ Read, write, and compare decimals to the nearest tenth and hundredth
- 12. \_\_\_\_\_ Read, write, and compare the value of two fractions / mixed numbers having unlike denominators that include halves, thirds, fourths, eighths, tenths, and twelfths
- 13. \_\_\_\_\_ Write a fraction for a shaded region
- 14. \_\_\_\_\_ Use models / manipulatives and equivalent forms to judge the size of fractions

**B. Computation (Operating with Numbers) Use of manipulatives is imperative.**

- 1. \_\_\_\_\_ Solve addition equations with 3 or more addends
- 2. \_\_\_\_\_ Add and subtract 4-digit and 5-digit numbers with and without regrouping
- 3. \_\_\_\_\_ Multiply a 4-digit number by a 1-digit number with and without regrouping
- 4. \_\_\_\_\_ Divide a 4-digit number by a 1-digit number with and without remainders
- 5. \_\_\_\_\_ Identify mixed numbers
- 6. \_\_\_\_\_ Find equivalent fractions
- 7. \_\_\_\_\_ Add and subtract proper fractions having like denominators
- 8. \_\_\_\_\_ Add and subtract decimals expressed as tenths and hundredths
- 9. \_\_\_\_\_ Master multiplication and division facts for products and dividends through 144
- 10. \_\_\_\_\_ Use number line
- 11. \_\_\_\_\_ Give the value of a collection of dollar bills and coins
- 12. \_\_\_\_\_ Add and subtract fractions with like denominators
- 13. \_\_\_\_\_ Express monetary values using cents ( $\text{\cent}$ ), dollars ( $\text{\$}$ ), and decimal points

**C. Communication**

- 1. \_\_\_\_\_ Add and subtract with decimals expressed as tenths and hundredths
- 2. \_\_\_\_\_ Interpret and design graphs: bar, pictographs, pie, and line

3. \_\_\_\_\_ Understand and use math vocabulary:  
 \_\_\_ sum \_\_\_ addends \_\_\_ multiplicand \_\_\_ multiplier \_\_\_ difference \_\_\_ products  
 \_\_\_ factors \_\_\_ quotient \_\_\_ divisor \_\_\_ dividend \_\_\_ fraction \_\_\_ numerator  
 \_\_\_ denominator \_\_\_ range \_\_\_ median \_\_\_ mode \_\_\_ vertex \_\_\_ face \_\_\_ edge  
 \_\_\_ corner \_\_\_ symmetry \_\_\_ perimeter \_\_\_ area \_\_\_ inches \_\_\_ foot \_\_\_ cup  
 \_\_\_ pint \_\_\_ quart \_\_\_ gallon \_\_\_ metric terms
4. \_\_\_\_\_ Design flow chart
5. \_\_\_\_\_ Interpret symbols:  $\div$ ,  $\neq$

**D. Estimation**

1. \_\_\_\_\_ Round a 4-digit whole number to the nearest the nearest ten, hundred, and thousand
2. \_\_\_\_\_ Estimate sums, differences, products, and quotients
3. \_\_\_\_\_ Estimate measurements:
- \_\_\_\_\_ volume
  - \_\_\_\_\_ weight/ mass
  - \_\_\_\_\_ quantity
  - \_\_\_\_\_ length
  - \_\_\_\_\_ time
  - \_\_\_\_\_ temperature
4. \_\_\_\_\_ Estimate / round money to the nearest dollar and tenth of a dollar

**E. Measurement**

1. \_\_\_\_\_ Write schedules
2. \_\_\_\_\_ Recognize elapsed time, time intervals, and equivalents
3. \_\_\_\_\_ Give oral and written name for time to the nearest minute
4. \_\_\_\_\_ Create and interpret a calendar
5. \_\_\_\_\_ Represent multiplication and division using area and set modes
6. \_\_\_\_\_ Add and subtract with proper fractions having like denominators of 10 or less using concrete materials and pictorial models representing areas / regions, lengths / measurements, and sets
7. \_\_\_\_\_ Measure the following:

	Metric	Standard
Length	centimeters, meters	inches, feet, yards
Capacity	liters	cups, pints, quarts, gallons
Weight / Mass	grams, kilograms	ounces, pounds
Temperature	Celsius	Fahrenheit

**F. Geometry**

- 1. \_\_\_\_\_ Recognize and describe plane and solid geometric figures:
  - \_\_\_\_\_ square
  - \_\_\_\_\_ rectangle
  - \_\_\_\_\_ triangle
  - \_\_\_\_\_ cube
  - \_\_\_\_\_ rectangular solid
  - \_\_\_\_\_ cone
  - \_\_\_\_\_ sphere
  - \_\_\_\_\_ cylinders
- 2. \_\_\_\_\_ Classify using identifying properties:
  - \_\_\_\_\_ number of corners
  - \_\_\_\_\_ number of square corners
  - \_\_\_\_\_ number and shape of faces
  - \_\_\_\_\_ number of edges
- 3. \_\_\_\_\_ \* Identify, draw, and label points, lines, line segments, angles, and diagonals using a ruler or straightedge
- 4. \_\_\_\_\_ Introduce how to identify appropriate congruent and symmetrical two-dimensional figures using tracing procedures when given drawings or models
- 5. \_\_\_\_\_ Predict and describe the results of sliding, flipping, and turning two-dimensional objects when using concrete materials.
- 6. \_\_\_\_\_ Find and measure area and perimeter
- 7. \_\_\_\_\_ \* Identify diameter and radius of circle

**G. Algebra**

- 1. \_\_\_\_\_ Write number sentences
- 2. \_\_\_\_\_ Determine missing addends, factors, divisors, subtrahends, and minuends in given equations
- 3. \_\_\_\_\_ Describe and apply the associative and the commutative properties
- 4. \_\_\_\_\_ Recognize a variable
- 5. \_\_\_\_\_ Translate word expressions into math symbols
- 6. \_\_\_\_\_ Identify inverse operations

**H. Patterns**

- 1. \_\_\_\_\_ Determine and create patterns in sequence
- 2. \_\_\_\_\_ Identify patterns in the real world
- 3. \_\_\_\_\_ Explore and predict visual, arithmetic, and geometric patterns

**I. Reasoning / Logic (Justification of answers and process)**

- 1. \_\_\_\_\_ Justify answers and give verbal explanations
- 2. \_\_\_\_\_ Verify answers by using inverse operations
- 3. \_\_\_\_\_ Use calculator to verify answers
- 4. \_\_\_\_\_ Make and investigate mathematical predictions, arguments, and proofs
- 5. \_\_\_\_\_ Recognize and apply mathematics in contexts outside of mathematics
- 6. \_\_\_\_\_ Recognize the inverse relationship between multiplication and division
- 7. \_\_\_\_\_ Explain verbally the strategy, process, and solution

**J. Probability / Statistics / Data Analysis**

- 1. \_\_\_\_\_ Collect, organize, construct, read, interpret, and predict data represented on:
  - \_\_\_\_\_ pictographs
  - \_\_\_\_\_ bar graphs
  - \_\_\_\_\_ line graphs
  - \_\_\_\_\_ tables
  - \_\_\_\_\_ circle graphs
  - \_\_\_\_\_ Venn diagrams
  - \_\_\_\_\_ flow charts
- 2. \_\_\_\_\_ Find the mean, median, and mode
- 3. \_\_\_\_\_ Make predictions and compare results



**\*Denotes new skill being taught for the first time.**

**A. Numeration (Meaning-Values-Relationships)**

- 1. \_\_\_\_\_ Identify factors and multiples of a given number
- 2. \_\_\_\_\_ Identify orally and in writing the place value of each digit in a whole number to six digit numerals and introduce to one million
- 3. \_\_\_\_\_ Count by number patterns including tens and hundreds
- 4. \_\_\_\_\_ \* Compare whole numbers, expressed through millions, using symbols (<, >, and =)
- 5. \_\_\_\_\_ Count in sequence starting on any given number more than 10,000
- 6. \_\_\_\_\_ \* Write word names for numbers with seven digit numerals or greater
- 7. \_\_\_\_\_ Read, write, and name the place value of whole numbers through the hundreds, thousands, ten thousands, hundred thousands, and millions in:
  - \_\_\_\_\_ standard form
  - \_\_\_\_\_ expanded form
  - \_\_\_\_\_ ordinal form through three digits
  - \_\_\_\_\_ word form
- 8. \_\_\_\_\_ \* Understand the place-value structure of the base ten number system and be able to represent and compare whole numbers and decimals
- 9. \_\_\_\_\_ \* Read and write Roman Numerals to 500
- 10. \_\_\_\_\_ Round whole numbers expressed through millions to the nearest thousand, ten thousand, and hundred thousand
- 11. \_\_\_\_\_ Recognize and count by even and odd numbers
- 12. \_\_\_\_\_ Recognize prime and composite numbers
- 13. \_\_\_\_\_ Recognize the relationship between multiplication and division
- 14. \_\_\_\_\_ Demonstrate whole numbers, mixed numbers, fractions, decimals, and percent relationships
- 15. \_\_\_\_\_ Recognize and name commonly used fractions ( $\frac{1}{3}$ ,  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{5}$ ,  $\frac{1}{6}$ ,  $\frac{1}{7}$ ,  $\frac{1}{8}$ ,  $\frac{1}{9}$ ,  $\frac{1}{10}$ ,  $\frac{1}{11}$ , and  $\frac{1}{12}$ ) in their equivalent forms
- 16. \_\_\_\_\_ Read, write, and compare decimals to the nearest tenth, hundredth, and thousandth
- 17. \_\_\_\_\_ Read, write, and compare the value of two fractions / mixed numbers having unlike denominators that include halves, thirds, fourths, eighths, tenths, and twelfths
- 18. \_\_\_\_\_ Write a fraction for a shaded region
- 19. \_\_\_\_\_ Use models / manipulatives and equivalent forms to judge the size of fractions

**B. Computation (Operating with Numbers) Use of manipulatives is imperative.**

- 1. \_\_\_\_\_ \* Solve addition equations with 4 or more addends
- 2. \_\_\_\_\_ \* Add and subtract 5 and 6 digit numbers with and without regrouping
- 3. \_\_\_\_\_ \* Add and subtract whole numbers, written in vertical and horizontal form, choosing appropriately between paper and pencil methods and calculators
- 4. \_\_\_\_\_ \* Multiply and divide 3 and 4-digit numbers by a 1-digit number (or greater) with and without regrouping

- 5. \_\_\_\_\_ \* Multiply 3-digit numbers by 3-digit numbers
- 6. \_\_\_\_\_ \* Divide by 2 and 3-digit divisors with 0 in the quotient
- 7. \_\_\_\_\_ \* Divide 2, 3, and 4-digit dividends by 2-digit divisors
- 8. \_\_\_\_\_ Divide 4-digit numbers by 2-digit numbers with and without remainders
- 9. \_\_\_\_\_ Identify and represent equivalent fractions and relate fractions to decimals using concrete objects
- 10. \_\_\_\_\_ Add and subtract with fractions having like and unlike denominators of 12 or less, using concrete materials, pictorial representations, and paper and pencil
- 11. \_\_\_\_\_ Identify inverse operations
- 12. \_\_\_\_\_ Recognize mixed numbers
- 13. \_\_\_\_\_ \* Add and subtract with decimals through thousandths
- 14. \_\_\_\_\_ Give the value of a collection of dollars, bills, and change

**C. Communication**

- 1. \_\_\_\_\_ Interpret and design graphs: bar, pictographs, pie, and line
- 2. \_\_\_\_\_ Use appropriate mathematical vocabulary:
  - \_\_\_\_\_ sum
  - \_\_\_\_\_ addends
  - \_\_\_\_\_ difference
  - \_\_\_\_\_ products
  - \_\_\_\_\_ factors
  - \_\_\_\_\_ quotient
  - \_\_\_\_\_ divisor
  - \_\_\_\_\_ dividend
  - \_\_\_\_\_ fraction
  - \_\_\_\_\_ numerator
  - \_\_\_\_\_ denominator
  - \_\_\_\_\_ geometry terms
  - \_\_\_\_\_ metric terms
  - \_\_\_\_\_ multiplicand
  - \_\_\_\_\_ multiplies
- 3. \_\_\_\_\_ Design flow chart
- 4. \_\_\_\_\_ Interpret mathematical symbols
- 5. \_\_\_\_\_ \* Explain verbally and in writing the strategy, process, and solution
- 6. \_\_\_\_\_ Create and use journals to organize, record, and communicate mathematical ideas

**D. Estimation**

- 1. \_\_\_\_\_ Round numbers greater than four digits to the nearest ten, hundred, thousand, ten thousand, and hundred thousand
- 2. \_\_\_\_\_ Estimate sums, differences, products, and quotients
- 3. \_\_\_\_\_ Estimate and measure length using measuring devices

4. \_\_\_\_\_ Describe estimated measurements in both metric and U.S. customary units:
- \_\_\_\_\_ feet
  - \_\_\_\_\_ yards
  - \_\_\_\_\_ millimeters
  - \_\_\_\_\_ centimeters
  - \_\_\_\_\_ meters
  - \_\_\_\_\_ cups
  - \_\_\_\_\_ pints
  - \_\_\_\_\_ quarts
  - \_\_\_\_\_ gallons
  - \_\_\_\_\_ liters
5. \_\_\_\_\_ Estimate / round money to the nearest dollar and tenth of a dollar
6. \_\_\_\_\_ \* Estimate whole number sums and differences and describe the method of estimation.
7. \_\_\_\_\_ \* Refine estimates using terms such as *closer to*, *between*, and *a little more than*.

**E. Measurement**

1. \_\_\_\_\_ Write schedules
2. \_\_\_\_\_ Recognize elapsed time, time intervals, and equivalents
3. \_\_\_\_\_ Create and interpret calendars
4. \_\_\_\_\_ Give oral and written name to the nearest hour, minute, and second
5. \_\_\_\_\_ Represent multiplication and division using area and set modes
6. \_\_\_\_\_ Add and subtract with proper fractions having like denominators of 10 or less using concrete materials and pictorial models representing areas / regions, lengths / measurements, and sets
7. \_\_\_\_\_ Select the appropriate unit of measure and calculate:

	Volume/weight	Metric	Standard
area	cups	centimeters	inches
time	pints	meters	feet
Degrees (F)	quarts	kilometers	yards
Degrees (C)	gallons	grams	
radius	ounces	kilograms	
diameter	pounds	liters	
circumference			

8. \_\_\_\_\_ \* Use measurement to explore and describe the environment
9. \_\_\_\_\_ \* Make “ballpark” comparisons between standard (customary) and metric measurements

**F. Geometry**

1. \_\_\_\_\_ \* Classify angles (right, acute, obtuse)
2. \_\_\_\_\_ \* Recognize a simple closed curve

- 3. \_\_\_\_\_ Analyze and compare the properties of two-dimensional (plane) geometric figures for:
  - \_\_\_\_\_ circle
  - \_\_\_\_\_ square
  - \_\_\_\_\_ rectangle
  - \_\_\_\_\_ triangle
  - \_\_\_\_\_ parallelogram
  - \_\_\_\_\_ rhombus
- 4. \_\_\_\_\_ Identify congruent and non-congruent shapes
- 5. \_\_\_\_\_ Investigate congruence of plane figures after geometric transformations such as:
  - \_\_\_\_\_ flips
  - \_\_\_\_\_ turns
  - \_\_\_\_\_ slides
- 6. \_\_\_\_\_ Recognize and describe plane and solid geometric figures:
  - \_\_\_\_\_ square
  - \_\_\_\_\_ rectangle
  - \_\_\_\_\_ triangle
  - \_\_\_\_\_ cube
  - \_\_\_\_\_ rectangular solid
  - \_\_\_\_\_ cone
  - \_\_\_\_\_ sphere
  - \_\_\_\_\_ cylinders
  - \_\_\_\_\_ prisms
- 7. \_\_\_\_\_ Classify using identifying properties:
  - \_\_\_\_\_ number of corners
  - \_\_\_\_\_ number of square corners
  - \_\_\_\_\_ number and shape of faces
  - \_\_\_\_\_ number of edges
- 8. \_\_\_\_\_ Identify and describe the relationship between a point, line, ray, line segment, angle, and diagonal
- 9. \_\_\_\_\_ Identify appropriate congruent and symmetrical two-dimensional figures using tracing procedures when given drawings or models
- 10. \_\_\_\_\_ Predict and describe the results of sliding, flipping, and turning two-dimensional objects when using concrete materials
- 11. \_\_\_\_\_ Find and measure the perimeter of polygons using standard formulas
- 12. \_\_\_\_\_ Calculate the diameter and radius of circle

**G. Algebra**

- 1. \_\_\_\_\_ Write number sentences
- 2. \_\_\_\_\_ Determine missing addends, factors, divisors, subtrahends, and minuends in given equations
- 3. \_\_\_\_\_ Describe and apply the associative and the commutative properties
- 4. \_\_\_\_\_ Recognize a variable

- 5. \_\_\_\_\_ Use variables in a number sentence
- 6. \_\_\_\_\_ \* Solve for a variable
- 7. \_\_\_\_\_ Translate word expressions into math symbols
- 8. \_\_\_\_\_ \* Recognize and demonstrate the meaning of equality using symbols representing numbers and operations

**H. Patterns**

- 1. \_\_\_\_\_ Recognize, create, and extend numerical and geometric patterns using concrete materials, number lines, symbols, tables, and words
- 2. \_\_\_\_\_ Identify patterns in real world
- 3. \_\_\_\_\_ Explore and predict visual, arithmetic, and geometric patterns

**I. Reasoning / Logic (Justification of answers and process)**

- 1. \_\_\_\_\_ Make and investigate mathematical conjectures
- 2. \_\_\_\_\_ Justify answers and give verbal explanations
- 3. \_\_\_\_\_ Verify answers by using inverse operations
- 4. \_\_\_\_\_ Use calculator to verify answers
- 5. \_\_\_\_\_ Make and investigate mathematical predictions, arguments, and proofs
- 6. \_\_\_\_\_ Recognize and apply mathematics in context outside of mathematics
- 7. \_\_\_\_\_ Recognize the inverse relationship between multiplication and division

**J. Probability / Statistics / Data Analysis**

- 1. \_\_\_\_\_ Collect, organize, design, read, interpret, and predict data represented on:
  - \_\_\_\_\_ pictographs
  - \_\_\_\_\_ bar graphs
  - \_\_\_\_\_ line graphs
  - \_\_\_\_\_ tables
  - \_\_\_\_\_ circle graphs
  - \_\_\_\_\_ Venn diagrams
  - \_\_\_\_\_ flow charts
- 2. \_\_\_\_\_ Identify the mean, median, and mode
- 3. \_\_\_\_\_ Find the average for a set of data
- 4. \_\_\_\_\_ \* Propose and justify conclusions and predictions that are based on data
- 5. \_\_\_\_\_ \* Design studies to further investigate the conclusions or predictions
- 6. \_\_\_\_\_ \* Describe events as likely or unlikely and discuss the degree of likelihood using such words as certain, equally likely, and impossible
- 7. \_\_\_\_\_ \* Determine in a graph the scale increments of one or greater than one and use the display to interpret the results, draw conclusions, and make predictions
- 8. \_\_\_\_\_ \* Determine the probability of a given simple event using concrete



**\*Denotes new skill being taught for the first time.**

**B. Numeration (Meaning-Values-Relationships)**

- 1. \_\_\_\_\_ Identify factors and multiples of a given number
- 2. \_\_\_\_\_ \* Apply divisibility rules for 2, 3, 4, 5, 6, 9, 10
- 3. \_\_\_\_\_ Identify orally and in writing the place value of each digit in a whole number to six digit numerals and introduce to one million
- 4. \_\_\_\_\_ \* Compare and order whole numbers, fractions (with like and unlike denominators), and decimals through thousandths
- 5. \_\_\_\_\_ Read, write, and name whole numbers through millions in:
  - \_\_\_\_\_ standard form
  - \_\_\_\_\_ expanded form
  - \_\_\_\_\_ numerical form
  - \_\_\_\_\_ word form
- 6. \_\_\_\_\_ Read, write, and identify the place values of decimals through ten thousandths
- 7. \_\_\_\_\_ Read and write Roman Numerals to 500 and recognize to 1000
- 8. \_\_\_\_\_ Round whole numbers expressed through millions to the nearest thousand, ten thousand, and hundred thousand
- 9. \_\_\_\_\_ Identify numbers as prime and composite
- 10. \_\_\_\_\_ Demonstrate fraction, decimal, and percent relationships
- 11. \_\_\_\_\_ Recognize and name commonly used fractions ( $\frac{1}{3}$ ,  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{5}$ ,  $\frac{1}{6}$ ,  $\frac{1}{7}$ ,  $\frac{1}{8}$ ,  $\frac{1}{9}$ ,  $\frac{1}{10}$ ,  $\frac{1}{11}$ , and  $\frac{1}{12}$ ) in their equivalent decimal and percent forms

**B. Computation (Operating with Numbers) Use of manipulatives is imperative.**

- 1. \_\_\_\_\_ Add and subtract numbers to 4 decimal places, including money, with and without regrouping
- 2. \_\_\_\_\_ Multiply 3-digit numbers by 3-digit numbers
- 3. \_\_\_\_\_ \* Multiply decimals through ten thousandths by whole numbers or by decimals
- 4. \_\_\_\_\_ Divide 4-digit dividends by 2-digit divisors with and without 0 in the quotient
- 5. \_\_\_\_\_ \* Divide decimals, including money, by a whole number
- 6. \_\_\_\_\_ \* Convert a quotient with a remainder into a mixed number
- 7. \_\_\_\_\_ \* Add, subtract, multiply, and divide fractions and mixed numbers, having like and unlike denominators, with and without regrouping, and answer in lowest terms
- 8. \_\_\_\_\_ \* Compute with varying types of measurement
- 9. \_\_\_\_\_ \* Reduce fractions to lowest terms
- 10. \_\_\_\_\_ \* Change improper fraction to mixed number in lowest terms
- 11. \_\_\_\_\_ \* Compute LCD / LCM and GCF
- 12. \_\_\_\_\_ \* Compute using percents
- 13. \_\_\_\_\_ \* Use a number line to compare fractions, decimals, and percents

**C. Communication**

1. \_\_\_\_\_ Interpret and design graphs: bar, pictograph, pie, and line
2. \_\_\_\_\_ Use appropriate mathematical vocabulary:
- \_\_\_\_\_ numerator
  - \_\_\_\_\_ denominator
  - \_\_\_\_\_ mean
  - \_\_\_\_\_ median
  - \_\_\_\_\_ mode
  - \_\_\_\_\_ range
  - \_\_\_\_\_ LCD / LCM
  - \_\_\_\_\_ GCF
  - \_\_\_\_\_ pi
3. \_\_\_\_\_ Explain verbally and in writing the strategy, process, and solution
4. \_\_\_\_\_ Create and use journals to organize, record, and communicate mathematical ideas

**D. Estimation**

1. \_\_\_\_\_ Round whole numbers to the nearest million
2. \_\_\_\_\_ Round decimals to the nearest thousandth
3. \_\_\_\_\_ Estimate sums, differences, products, and quotients
4. \_\_\_\_\_ \*Estimate using fractional parts
5. \_\_\_\_\_ Estimate measurements in both metric and standard (customary) units
- \_\_\_\_\_ feet
  - \_\_\_\_\_ yards
  - \_\_\_\_\_ cups
  - \_\_\_\_\_ pints
  - \_\_\_\_\_ quart
  - \_\_\_\_\_ gallons
  - \_\_\_\_\_ millimeters
  - \_\_\_\_\_ centimeters
  - \_\_\_\_\_ meters
  - \_\_\_\_\_ liters
6. \_\_\_\_\_ Describe the method of estimation
7. \_\_\_\_\_ \* Estimate circumference, area, perimeter, and volume
8. \_\_\_\_\_ \* Estimate temperature in Celsius and Fahrenheit

**E. Measurement**

1. \_\_\_\_\_ Create and interpret schedules and calendars
2. \_\_\_\_\_ Compute elapsed time, time intervals, and equivalents
4. \_\_\_\_\_ Select the appropriate device and unit of measurement—standard (customary) and metric—to solve problems involving:

Length	Volume / Capacity	Weight / Mass	Temperature
Inches	Cups	Ounces	Degrees Celsius
Feet	Pints	Pounds	Degrees Fahrenheit
Yards	Quarts	Tons	
Millimeters	Gallons	Grams	
Centimeters	Milliliters	Kilograms	
Meters	Liters		
Kilometers	Cubic units of length		

- 5. \_\_\_\_\_ \* Measure length to the nearest  $\frac{1}{8}$  inch
- 6. \_\_\_\_\_ \* Measure area using square units of length, and measure volume using cubic units of length
- 7. \_\_\_\_\_ \* Know basic information about temperature (freezing point, boiling point of water, room temperature in Celsius and Fahrenheit)
- 8. \_\_\_\_\_ \* Determine metric equivalents among milli-, centi-, base units, and kilo-units

**F. Geometry**

- 1. \_\_\_\_\_ \* Measure and draw right, acute, and obtuse angles and triangles using a protractor
- 2. \_\_\_\_\_ Identify figures as congruent, noncongruent, and similar
- 3. \_\_\_\_\_ Recognize the images of figures resulting from geometric transformations such as:
  - \_\_\_\_\_ reflection (flip)
  - \_\_\_\_\_ rotation (turn)
  - \_\_\_\_\_ translation (slide)
- 4. \_\_\_\_\_ \* Identify and describe a line of symmetry
- 5. \_\_\_\_\_ Describe and classify two-dimensional plane figures and three-dimensional (solid) geometric figures by faces, edges, and vertices
 

• _____ square	• _____ parallelogram
• _____ rectangle	• _____ square pyramid
• _____ triangle	• _____ rectangular prism
• _____ cube	• _____ cone
• _____ rhombus	• _____ sphere
• _____ trapezoid	• _____ cylinder
- 6. \_\_\_\_\_ Name and classify lines, segments, rays, planes, and angles
- 7. \_\_\_\_\_ \* Find / graph ordered pairs
- 8. \_\_\_\_\_ Identify and describe the diameter, radius, chord, and circumference of a circle
- 9. \_\_\_\_\_ \* Recognize and apply formulas for perimeter, area, and volume in appropriate situations

**G. Algebra**

- 1. \_\_\_\_\_ \* Recognize inequalities
- 2. \_\_\_\_\_ \* Locate negative and positive numbers on a number line
- 3. \_\_\_\_\_ \* Recognize, describe, and apply the following properties in addition and multiplication: commutative, associative, zero, identity, and distributive
- 4. \_\_\_\_\_ Define variable
- 5. \_\_\_\_\_ \* Write an equation using a variable to represent a given mathematical relationship and solve the equation
- 6. \_\_\_\_\_ Translate English sentences into math symbols
- 7. \_\_\_\_\_ Determine missing addends and factors in a given equation
- 8. \_\_\_\_\_ \* Identify inverse operations
- 9. \_\_\_\_\_ \* Apply order of operations

**H. Patterns**

- 1. \_\_\_\_\_ Recognize, create, and extend visual, numerical, and geometric patterns using manipulatives, pictures, numbers, or symbols
- 2. \_\_\_\_\_ Identify patterns in real world

**I. Reasoning / Logic (Justification of answers and process)**

- 1. \_\_\_\_\_ Justify answers and explain verbally
- 2. \_\_\_\_\_ Verify answers by using inverse operations
- 3. \_\_\_\_\_ Use computer / calculator to verify answers

**J. Probability / Statistics / Data Analysis**

- 1. \_\_\_\_\_ Collect, organize, construct, and interpret data represented on:
  - \_\_\_\_\_ pictographs
  - \_\_\_\_\_ bar graphs
  - \_\_\_\_\_ line graphs
  - \_\_\_\_\_ tables
  - \_\_\_\_\_ circle graphs
  - \_\_\_\_\_ Venn diagrams
  - \_\_\_\_\_ flow charts
  - \_\_\_\_\_ tree diagram
  - \_\_\_\_\_ stem and leaf diagrams
- 2. \_\_\_\_\_ Determine the mean, median, mode, and range
- 3. \_\_\_\_\_ \* Create a list of possible outcomes in an experiment
- 4. \_\_\_\_\_ \* Predict and calculate simple probabilities (with and without manipulatives) as a fraction or decimal or as likely, unlikely, certain or impossible materials



Use mental math																				
Check reasonableness of answers and label appropriately																				
	Numeration	Computation	Communication	Estimation	Measurement	Geometry	Algebra	Patterns	Reasoning/Logic	Probability/ Statistics/Data Analysis										
Find alternate solutions																				
Participate in cooperative learning																				
Identify, predict, and apply visual, geometric, and arithmetic patterns																				
Collect and classify data																				
Use calculators and computer software to explore, verify, and reinforce math concepts																				
Use board/card games/math puzzles																				
Use vocabulary as clues																				
Use logical reasoning																				

**\*Denotes new skill being taught for the first time.**

**A. Numeration (Meaning-Values-Relationships)**

- 1. \_\_\_\_\_ \* Identify and write scientific notation
- 2. \_\_\_\_\_ Know first 10 prime numbers
- 3. \_\_\_\_\_ Identify and describe the arithmetic characteristics of even and odd whole numbers
- 4. \_\_\_\_\_ Compare and order whole numbers, fractions (with like and unlike denominators), and decimals through millionths
- 5. \_\_\_\_\_ Read, write, and name whole numbers through trillions in:
  - \_\_\_\_\_ standard form
  - \_\_\_\_\_ expanded form
  - \_\_\_\_\_ numerical form
  - \_\_\_\_\_ word form
  - \* \_\_\_\_\_ exponential form
- 6. \_\_\_\_\_ Read, write, and identify the place values of decimals through billionths
- 7. \_\_\_\_\_ Understand the structure of Roman Numerals and their applications
- 8. \_\_\_\_\_ Round whole numbers expressed through trillions and decimals through millionths
- 9. \_\_\_\_\_ Understand prime and composite numbers
- 10. \_\_\_\_\_ \* Write numbers in scientific notation and write numbers expressed in scientific notation in standard form
- 11. \_\_\_\_\_ \* Identify ratios, write equivalent ratios, and compare two sets of data using ratios
- 12. \_\_\_\_\_ \* Express a fraction as a ratio of two numbers
- 13. \_\_\_\_\_ \* Identify the terms of a proportion

- 14. \_\_\_\_\_ \* Express proportions in terms of equivalent fractions
- 15. \_\_\_\_\_ Identify reciprocals/multiplicative inverses and understand their uses
- 16. \_\_\_\_\_ \* Express whole numbers, decimals, and fractions as percentages
- 17. \_\_\_\_\_ \* Introduce bases and exponents
- 18. \_\_\_\_\_ \* Recognize the square of the first ten natural numbers
- 19. \_\_\_\_\_ Identify representations of percents and understand the relationships to their decimal equivalents
- 20. \_\_\_\_\_ \* Locate integers, their opposites, and their absolute value on a number line
- 21. \_\_\_\_\_ \* Identify, compare, and order rational numbers

**B. Computation (Operating with Numbers) Use of manipulatives is imperative.**

- 1. \_\_\_\_\_ Divide whole numbers by 2- and 3-digit divisors to 4-digit quotients, with and without remainders
- 2. \_\_\_\_\_ \* Add three or more decimals through the ten thousandths place
- 3. \_\_\_\_\_ Multiply decimals to hundred thousandths and money amounts by decimals and whole numbers
- 4. \_\_\_\_\_ Divide decimals to millionths and money amounts by whole numbers, tenths, hundredths, and thousandths
- 5. \_\_\_\_\_ Calculate mentally in multiples of tens, hundreds, and thousands
- 6. \_\_\_\_\_ \* Apply the concept of prime and composite to find the prime factorization of a number
- 7. \_\_\_\_\_ \* Add, subtract, multiply, and divide integers
- 8. \_\_\_\_\_ Apply order of operations to integer computation
- 9. \_\_\_\_\_ Compute and use the LCD, LCM, and GCF
- 10. \_\_\_\_\_ \* Rename fractions and mixed numbers as decimals and decimals as fractions and mixed numbers
- 11. \_\_\_\_\_ Add, subtract, multiply, and divide fractions and mixed numbers, with like and unlike denominators, by whole numbers, decimals, fractions, and mixed numbers
- 12. \_\_\_\_\_ Multiply and divide money amounts by fractions
- 13. \_\_\_\_\_ \* Write and use equivalent ratios and rates
- 14. \_\_\_\_\_ \* Compute unit rate or unit price
- 15. \_\_\_\_\_ Use proportions to solve problems and a formula to solve proportions
- 16. \_\_\_\_\_ \* Find the percentage, base, and rate of a number
- 17. \_\_\_\_\_ \* Compute discount, sales price, sales tax, commission, and “Better Buy”
- 18. \_\_\_\_\_ \* Use a number line to compare fractions, decimals, and percents

**C. Communication**

- 1. \_\_\_\_\_ Read, interpret, and create graphs, tables, charts, and maps
- 2. \_\_\_\_\_ Use appropriate mathematical vocabulary
- 3. \_\_\_\_\_ Explain verbally and in writing the strategy, process, and solution
- 4. \_\_\_\_\_ Use word processing software to:
  - formulate original word problems
  - enter journal responses to mathematical inquiries
  - create geometric drawings
  - type math symbols
  - create data tables
- 5. \_\_\_\_\_ Use spreadsheet software to:

- calculate
- create graphs
- use formulas

6. \_\_\_\_\_ Use presentation software to:
- prepare reports
  - illustrate concepts
  - create practice reviews and assessments

**D. Estimation**

1. \_\_\_\_\_ Apply clustering, use compatible numbers, and reference benchmarks as aids in estimating
2. \_\_\_\_\_ Round whole numbers, decimals, and fractions to any place value
3. \_\_\_\_\_ Estimate:
- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• _____ whole numbers</li> <li>• _____ decimals</li> <li>• _____ fractions</li> <li>• _____ measurements</li> <li>• _____ percentage</li> </ul> | <ul style="list-style-type: none"> <li>• _____ perimeter</li> <li>• _____ area</li> <li>• _____ circumference</li> <li>• _____ volume</li> </ul> |
|--|--|

**E. Measurement**

1. \_\_\_\_\_ Review and apply customary, metric, and nonstandard units
2. \_\_\_\_\_ Convert between and among customary, metric, and nonstandard units
3. \_\_\_\_\_ Calculate elapsed time

**F. Geometry**

1. \_\_\_\_\_ Identify parallel and perpendicular lines
2. \_\_\_\_\_ Apply the concept of proportion in creating scale drawings
3. \_\_\_\_\_ \* Recognize and create tessellations
4. \_\_\_\_\_ Identify, classify, measure, and draw:
- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• _____ segments/lines</li> <li>• _____ angles</li> <li>• _____ triangles</li> <li>• _____ quadrilaterals</li> <li>• _____ rhombus</li> <li>• _____ trapezoid</li> </ul> | <ul style="list-style-type: none"> <li>• _____ circles</li> <li>• * _____ solid figures</li> </ul> |
|---|--|
5. \_\_\_\_\_ Compute a missing dimension using a formula
6. \_\_\_\_\_ \*Understand the relationship of sides to the size of the angles in a polygon
7. \_\_\_\_\_ Find the circumference, area, perimeter, volume, and surface area of geometric figures
8. \_\_\_\_\_ Distinguish between congruent and similar, regular and irregular figures
9. \_\_\_\_\_ Recognize and apply formulas for geometric figures in appropriate situation situations

**G. Algebra**

- 1. \_\_\_\_\_ \* Identify, order, graph, add, subtract, multiply, and compare integers
- 2. \_\_\_\_\_ \* Use inverse operations to solve equations
- 3. \_\_\_\_\_ \* Understand the concept of and use variables
- 4. \_\_\_\_\_ Recognize and use properties of addition and multiplication (associative, commutative, identity, zero, and distributive)
- 5. \_\_\_\_\_ Apply the correct order of operations
- 6. \_\_\_\_\_ Transform simple formulas
- 7. \_\_\_\_\_ Translate English phrases and sentences into mathematical expressions and equations and evaluate / solve
- 8. \_\_\_\_\_ Simplify algebraic expressions
- 9. \_\_\_\_\_ Use the coordinate plane to graph ordered pairs in four quadrants

**H. Patterns**

- 1. \_\_\_\_\_ Identify, create, and use number sequences found by patterns
- 2. \_\_\_\_\_ Form patterns:
  - \_\_\_\_\_ algebraic
  - \_\_\_\_\_ with decimals
  - \_\_\_\_\_ percent
  - \_\_\_\_\_ with fractions
  - \_\_\_\_\_ geometric (tessalations)
  - \* \_\_\_\_\_ with integers
- 3. \_\_\_\_\_ Identify patterns in real world

**I. Reasoning / Logic (Justification of answers and process)**

- 1. \_\_\_\_\_ Justify solutions and explain verbally
- 2. \_\_\_\_\_ Predict outcomes, evaluate evidence, and verify solutions

**J. Probability / Statistics / Data Analysis**

- 1. \_\_\_\_\_ Collect, organize, construct, and interpret data represented on:
  - surveys
  - frequency tables
  - line plots
  - box-and-whisker plots
  - stem-and-leaf plots
  - line and double line graphs
  - double bar graphs
  - histograms
  - circle graphs
  - scatter diagrams
  - tree diagram

- 2. \_\_\_\_\_ \*Analyze graphs and statistics to determine misleading information
- 3. \_\_\_\_\_ Determine and interpret measures of central tendency (mean, median, and mode) and the range of a set of data
- 4. \_\_\_\_\_ \*Calculate the probability of an event and find the possible outcomes
- 5. \_\_\_\_\_ \*Distinguish between independent and dependent events
- 6. \_\_\_\_\_ \*Find permutations or combinations using the Counting Principle
- 7. \_\_\_\_\_ \*Use theoretical and experimental probability



	Numeration	Computation	Communication	Estimation	Measurement	Geometry	Algebra	Patterns	Reasoning/Logic	Probability/ Statistics/Data Analysis
Check reasonableness of answers and label appropriately										
Find alternate solutions										
Participate in cooperative learning										
Identify, predict, and apply visual, geometric and arithmetic patterns										
Simplify the problem										
Use calculators and computer software to explore, verify, and reinforce math concepts										
Use board/card games/math puzzles										
Use vocabulary as clues										
Use logical reasoning										

**\*Denotes new skill being taught for the first time.**

**A. Numeration (Meaning-Values-Relationships)**

- 1. \_\_\_\_\_ Determine and apply number theory concepts:
  - primes
  - composites
  - factors
  - multiples
  - reciprocals
- 2. \_\_\_\_\_ Apply divisibility rules and use appropriate evaluative tools
- 3. \_\_\_\_\_ Identify and write proportions and ratios representing problem solutions
- 4. \_\_\_\_\_ Compare, order, and develop equivalent relationships between and among fractions, decimals, and percents
- 5. \_\_\_\_\_ Compare and determine equivalent relationships among scientific notations
- 6. \_\_\_\_\_ Write equations using integers to represent problem solutions
- 7. \_\_\_\_\_ Compare and order integers
- 8. \_\_\_\_\_ Understand, compare, and contrast the concepts of variables, expressions, equations, and inequalities
- 9. \_\_\_\_\_ Analyze the relationship between a change in one quantity and how it would affect another
- 10. \_\_\_\_\_ Identify and apply the Laws of Exponents
- 11. \_\_\_\_\_ \*Understand the concept of square roots
- 12. \_\_\_\_\_ Demonstrate the use of a calculator and computer software for appropriate problem solving activities

**B. Computation (Operating with Numbers) Use of manipulatives is imperative.**

- 1. \_\_\_\_\_ Convert between and among fractions, decimals, and percents

- 2. \_\_\_\_\_ Compute the percentage of a number, the percentage one number is of another, find a number when the percentage is known, and find the percentage of change as a number increases or decreases
- 3. \_\_\_\_\_ Transform numbers in standard form into scientific notation
- 4. \_\_\_\_\_ Compute with whole numbers, integers, decimals, and simple and complex fractions
- 5. \_\_\_\_\_ Apply order of operations to simplify expressions (exponents included)
- 6. \_\_\_\_\_ \*Compute using exponents, perfect squares, and square roots
- 7. \_\_\_\_\_ Change percents to fractions, to decimals, and vice versa

**C. Communication**

- 1. \_\_\_\_\_ Read, interpret, construct, and present graphs, tables, charts, and maps from data
- 2. \_\_\_\_\_ Use appropriate mathematical vocabulary
- 3. \_\_\_\_\_ Explain verbally, pictorially, in writing, and graphically the strategy, process, and solution of mathematical ideas
- 4. \_\_\_\_\_ Use word processing software to:
  - formulate original word problems
  - enter journal responses to mathematical inquiries
  - create geometric drawings
  - type math symbols
  - create data tables
- 5. \_\_\_\_\_ Use spreadsheet software to:
  - calculate
  - create graphs
  - use formulas
- 6. \_\_\_\_\_ Use presentation software to:
  - prepare reports
  - illustrate concepts
  - create practice reviews and assessments

**D. Estimation**

- 1. \_\_\_\_\_ Round whole numbers, decimals, fractions, and percents to any place value
- 2. \_\_\_\_\_ Estimate conversions between and among standard and metric units

**E. Measurement**

- 1. \_\_\_\_\_ Use both standard and metric systems of measurement to determine:
  - \_\_\_\_\_ weight/mass
  - \_\_\_\_\_ liquid volume/capacity
  - \_\_\_\_\_ length
  - \_\_\_\_\_ area
  - \_\_\_\_\_ temperature
- 2. \_\_\_\_\_ Add and subtract mixed units of length, liquid and dry measure, and time
- 3. \_\_\_\_\_ Solve measurement problems by selecting to use units of appropriate size and type

**F. Geometry**

- 1. \_\_\_\_\_ Develop and apply perimeter, area, circumference, surface-area, and volume formulas for polygons and three-dimensional figures
- 2. \_\_\_\_\_ Use proportions to solve problems, including scale drawings
- 3. \_\_\_\_\_ Investigate rotations, reflections, and translations of two and three-dimensional figures
- 4. \_\_\_\_\_ Identify, compare, contrast, describe, and classify angles and polygons
- 5. \_\_\_\_\_ Determine the relationship between circumference, diameter, and pi
- 6. \_\_\_\_\_ \*Use a compass and ruler to inscribe squares, equilateral triangles, and hexagons in circles
- 7. \_\_\_\_\_ Distinguish between and define congruent and similar, regular and irregular geometric figures
- 8. \_\_\_\_\_ Recognize and apply formulas for geometric figures in appropriate situations

**G. Algebra**

- 1. \_\_\_\_\_ Identify, order, graph, add, subtract, multiply, and compare integers
- 2. \_\_\_\_\_ Use inverse operations to solve equations
- 3. \_\_\_\_\_ Solve multi-step linear equations and inequalities
- 4. \_\_\_\_\_ Recognize and use properties of addition and multiplication (associative, commutative, identity, zero product, and distributive)
- 5. \_\_\_\_\_ Solve proportional ratios with missing variables
- 6. \_\_\_\_\_ \*Transform and use formulas
- 7. \_\_\_\_\_ Translate English phrases and sentences into mathematical expressions and equations/inequalities and evaluate/solve and graph (when appropriate)
- 8. \_\_\_\_\_ Simplify algebraic expressions
- 9. \_\_\_\_\_ Use the coordinate plane to graph ordered pairs in four quadrants
- 10. \_\_\_\_\_ Graph linear equations on coordinate planes

**H. Patterns**

- 1. \_\_\_\_\_ Create, describe, extend, and analyze numerical and geometric patterns
- 2. \_\_\_\_\_ Use patterns to represent and solve problems
- 3. \_\_\_\_\_ \*Use calculators to investigate and develop exponential patterns (zero, positive, and negative)

**I. Reasoning / Logic (Justification of answers and process)**

- 1. \_\_\_\_\_ Justify a solution is reasonable and explain its relationship to the original problem
- 2. \_\_\_\_\_ Draw conclusions from concrete information/situations and justify mathematical arguments through the use of mathematics

**J. Probability / Statistics / Data Analysis**

- 1. \_\_\_\_\_ Collect, organize, represent, and interpret data in the form of:
  - \_\_\_\_\_ lists
  - \_\_\_\_\_ charts
  - \_\_\_\_\_ pictures
  - \_\_\_\_\_ tree diagrams
  - \_\_\_\_\_ frequency distributions
  - \_\_\_\_\_ line plots
  - \_\_\_\_\_ stem-and-leaf plots
  - \_\_\_\_\_ box-and-whisker plots
  - \_\_\_\_\_ scattergrams
- 2. \_\_\_\_\_ Analyze graphs and statistics to determine misleading information
- 3. \_\_\_\_\_ Create and solve problems involving measures of central tendency (mean, median, and mode) and the range of a set of data
- 4. \_\_\_\_\_ Calculate the probability of an event and explain the possible outcomes
- 5. \_\_\_\_\_ Recognize and apply probabilities in everyday situations
- 6. \_\_\_\_\_ \* Calculate the probability of an event and express outcome as a ratio, decimal, and/or percent as appropriate to the situation
- 7. \_\_\_\_\_ Identify and describe permutations or combinations using the Counting Principle or a tree diagram
- 8. \_\_\_\_\_ Use theoretical and experimental probability



	Numeration	Computation	Communication	Estimation	Measurement	Geometry	Algebra	Patterns	Reasoning/Logic	Probability/ Statistics/Data Analysis
Use mental math										
Check reasonableness of answers and label appropriately										
Find alternate solutions										
Participate in cooperative learning										
Identify, predict, and apply visual, geometric and arithmetic patterns										
Simplify the problem										
Use calculators and computer software to explore, verify, and reinforce math concepts										
Use board/card games/math puzzles										
Use vocabulary as clues										
Use logical reasoning										

**\*Denotes new skill being taught for the first time.**

**A. Numeration (Meaning-Values-Relationships)**

- 1. \_\_\_\_\_ Determine and apply number theory concepts:
  - primes
  - composites
  - factors
  - multiples
  - reciprocals
- 2. \_\_\_\_\_ \* Identify and understand the relationship of matrices to data organization
- 3. \_\_\_\_\_ Identify and write proportions and ratios representing problem solutions
- 4. \_\_\_\_\_ Compare and contrast relations and functions
- 5. \_\_\_\_\_ Compare and determine equivalent relationships among scientific notations
- 6. \_\_\_\_\_ Write equations and inequalities to represent solutions to problems
- 7. \_\_\_\_\_ Compare and order numbers within the Real Number System
- 8. \_\_\_\_\_ Understand, compare, and contrast the concepts of variables, expressions, equations, and inequalities
- 9. \_\_\_\_\_ Analyze and use the relationship between a change in one quantity and how it would affect another
- 10. \_\_\_\_\_ Understand the concept of roots
- 11. \_\_\_\_\_ \* Develop and understand the Pythagorean Theorem
- 12. \_\_\_\_\_ \*Identify and describe the Real Number System subsets
- 13. \_\_\_\_\_ Demonstrate the use of a calculator and computer software for appropriate problem solving activities

**B. Computation (Operating with Numbers) Use of manipulatives is imperative.**

- 1. \_\_\_\_\_ \* Use matrices to organize and evaluate data
- 2. \_\_\_\_\_ Use proportions/equations to represent and solve percentage problems
- 3. \_\_\_\_\_ Compute using scientific notation
- 4. \_\_\_\_\_ Compute with whole numbers, integers, decimals, and simple and complex fractions
- 5. \_\_\_\_\_ Apply order of operations to simplify expressions with and without exponents
- 6. \_\_\_\_\_ \*Compute using perfect square and cubic numbers and roots
- 7. \_\_\_\_\_ Convert between and among fractions, decimals, and percents
- 8. \_\_\_\_\_ Apply the Laws of Exponents
- 9. \_\_\_\_\_ Convert repeating decimals into fractions and percents

**C. Communication**

- 1. \_\_\_\_\_ Read, interpret, construct, and present graphs, tables, charts, and maps from data in all subjects
- 2. \_\_\_\_\_ Use appropriate mathematical vocabulary
- 3. \_\_\_\_\_ Explain verbally, pictorially, in writing, and graphically the strategy, process, and solution of mathematical ideas
- 4. \_\_\_\_\_ Use word processing software to:
  - formulate original word problems
  - enter journal responses to mathematical inquiries
  - create geometric drawings
  - type math symbols
  - create data tables
- 5. \_\_\_\_\_ Use spreadsheet software to:
  - calculate
  - create graphs
  - use formulas
- 6. \_\_\_\_\_ Use presentation software to:
  - prepare reports
  - illustrate concepts
  - create practice reviews and assessments

**D. Estimation**

- 1. \_\_\_\_\_ Round whole numbers, decimals, fractions, and percents to any place value
- 2. \_\_\_\_\_ Estimate conversions between and among standard and metric units
- 3. \_\_\_\_\_ \* Round irrational numbers

**E. Measurement**

- 1. \_\_\_\_\_ Use standard and metric systems of measurement to determine:
  - \_\_\_\_\_ weight/mass
  - \_\_\_\_\_ liquid volume/capacity
  - \_\_\_\_\_ length

- \_\_\_\_\_ area
  - \_\_\_\_\_ temperature
2. \_\_\_\_\_ Solve measurement problems requiring standard and metric system conversions and select units of appropriate size and type (memorization of conversion factors not required) Ex: feet to miles, milliliters to liters, yards to meters, Fahrenheit to Celsius

**F. Geometry**

1. \_\_\_\_\_ Develop and apply perimeter, area, circumference, surface-area, and volume formulas for polygons, spheres, pyramids, and other three-dimensional figures
2. \_\_\_\_\_ Use proportions to solve problems, including scale drawings, with decimals, fractions, and radicals
3. \_\_\_\_\_ Investigate rotations, reflections, translations, and dilations of two and three-dimensional figures
4. \_\_\_\_\_ Identify, compare, contrast, describe, and classify angles and polygons
5. \_\_\_\_\_ Develop solid figure constructions
6. \_\_\_\_\_ Use proportions to represent and evaluate relationships between similar geometric figures
7. \_\_\_\_\_ \*Apply the Pythagorean Theorem to right triangles with a missing dimension
8. \_\_\_\_\_ Define, recognize, and use similarity and congruence
9. \_\_\_\_\_ \*Describe and apply relationships created by two parallel lines cut by a transversal
10. \_\_\_\_\_ Recognize and apply formulas for geometric figures in appropriate situations

**G. Algebra**

1. \_\_\_\_\_ Identify, order, graph, add, subtract, multiply, and compare integers
2. \_\_\_\_\_ Use inverse operations to solve equations
3. \_\_\_\_\_ Solve multi-step linear equations and inequalities
4. \_\_\_\_\_ Recognize and use number properties (associative, commutative, identity, zero, distributive, and closure)
5. \_\_\_\_\_ Solve proportional ratios with missing variables
6. \_\_\_\_\_ Transform and use formulas
7. \_\_\_\_\_ Translate English sentences into multi-step equations and inequalities and solve; graph (when appropriate)
8. \_\_\_\_\_ Simplify algebraic expressions applying the correct order of operations and given replacement values
9. \_\_\_\_\_ Use the coordinate plane to graph ordered pairs in four quadrants
10. \_\_\_\_\_ Understand the standard (general) and y-intercept form of a linear equation
11. \_\_\_\_\_ Recognize and utilize the slope and y-intercepts of a linear equation
12. \_\_\_\_\_ Use the slope and y-intercept to determine the graph of a line represented by the equation
13. \_\_\_\_\_ Solve and graph linear inequalities on a coordinate plane
14. \_\_\_\_\_ Identify, calculate and graph ordered pairs of functions in a coordinate plane

- 15. \_\_\_\_\_ Model and solve linear equations; then graph on a coordinate plane
- 16. \_\_\_\_\_ Solve problems of various complexities which involve all types of rational and real-life data

**H. Patterns**

- 1. \_\_\_\_\_ Create, describe, extend, and analyze numerical and geometric patterns
- 2. \_\_\_\_\_ Use patterns to represent and solve problems
- 3. \_\_\_\_\_ Use words and variables to generalize patterns
- 4. \_\_\_\_\_ Use calculators to investigate and develop exponential patterns (zero, positive, and negative)

**I. Reasoning / Logic (Justification of answers and process)**

- 1. \_\_\_\_\_ Verify a solution is reasonable and explain its relationship to the original problem
- 2. \_\_\_\_\_ Draw conclusions from concrete information/situations and justify mathematical arguments through the use of mathematics

**J. Probability / Statistics / Data Analysis**

- 1. \_\_\_\_\_ Use information collected and displayed in the following to make comparisons, predictions, and inferences:
  - \_\_\_\_\_ lists
  - \_\_\_\_\_ charts
  - \_\_\_\_\_ picture graphs
  - \_\_\_\_\_ tree diagrams
  - \_\_\_\_\_ frequency distributions
  - \_\_\_\_\_ line bar
  - \_\_\_\_\_ stem-and-leaf plots
  - \_\_\_\_\_ box-and-whisker plots
  - \_\_\_\_\_ scattergrams
  - \_\_\_\_\_ histogram
  - \_\_\_\_\_ circle graph
- 2. \_\_\_\_\_ Analyze graphs and statistics to determine misleading information
- 3. \_\_\_\_\_ Create and solve problems involving measures of central tendency (mean, median, and mode) and the range of a set of data
- 4. \_\_\_\_\_ Calculate the probability of an event and explain the possible outcomes
- 5. \_\_\_\_\_ Recognize and apply probabilities in everyday situations
- 6. \_\_\_\_\_ Calculate the probability of an event and express outcome as a ratio, decimal, and/or percent as appropriate to the situation
- 7. \_\_\_\_\_ Identify and describe permutations or combinations using the Counting Principle or a tree diagram
- 8. \_\_\_\_\_ Use theoretical and experimental probability representing everyday situations and analyze grading scales, games of chance, and other real life experiences

**A. Working With Real Numbers**

- 1. \_\_\_\_\_ Identify, distinguish among, compare, order, and use various subsets of the real number system:
  - \_\_\_\_\_ natural numbers
  - \_\_\_\_\_ whole numbers
  - \_\_\_\_\_ integers
  - \_\_\_\_\_ rational numbers
  - \_\_\_\_\_ irrational numbers
  - \_\_\_\_\_ real numbers
- 2. \_\_\_\_\_ Graph real numbers on the number line
- 3. \_\_\_\_\_ Understand basic algebraic properties and use them efficiently to simplify algebraic expressions:
  - \_\_\_\_\_ reflexive, symmetric, and transitive properties
  - \_\_\_\_\_ associative properties
  - \_\_\_\_\_ commutative properties
  - \_\_\_\_\_ closure properties
  - \_\_\_\_\_ identity properties
  - \_\_\_\_\_ property of reciprocals
  - \_\_\_\_\_ property of opposites
  - \_\_\_\_\_ property of opposites of a sum
  - \_\_\_\_\_ multiplicative and additive properties of equalities and inequalities
- 4. \_\_\_\_\_ Apply the order of operations to simplify and evaluate expressions with and without variables and grouping symbols involving:
  - \_\_\_\_\_ fractions
  - \_\_\_\_\_ decimals
  - \_\_\_\_\_ negatives
  - \_\_\_\_\_ absolute value
  - \_\_\_\_\_ exponents

**B. Solving Equations and Problems**

- 1. \_\_\_\_\_ Use appropriate algebraic vocabulary:
  - \_\_\_\_\_ equation
  - \_\_\_\_\_ solve
  - \_\_\_\_\_ like (similar) terms
  - \_\_\_\_\_ combine like terms
  - \_\_\_\_\_ replacement set
  - \_\_\_\_\_ solution set
- 2. \_\_\_\_\_ Translate verbal statements into algebraic expressions / equations and vice versa
- 3. \_\_\_\_\_ Solve equations in one variable by applying real number properties
- 4. \_\_\_\_\_ Solve multiple variable equations for a specific variable (literal equations)
- 5. \_\_\_\_\_ Solve equations and problems with variables on both sides

6. \_\_\_\_\_ Solve real-life application problems including the following types:
- \_\_\_\_\_ multi-step problems
  - \_\_\_\_\_ age problems (including those involving age now, age in the past, and age in the future)
  - \_\_\_\_\_ percent problems
  - \_\_\_\_\_ consecutive integers / multiples
  - \_\_\_\_\_ rate-time-distance problems:
    - \_\_\_\_\_ motion in the same direction
    - \_\_\_\_\_ motion in opposite directions
    - \_\_\_\_\_ round trip problems
  - \_\_\_\_\_ area / perimeter / angle measures
  - \_\_\_\_\_ problems that do not have a solution

**C. Polynomials**

1. \_\_\_\_\_ Use appropriate algebraic vocabulary:
- \_\_\_\_\_ monomial, binomial, trinomial, polynomial
  - \_\_\_\_\_ degree of a variable in a monomial
  - \_\_\_\_\_ degree of a monomial
  - \_\_\_\_\_ degree of a constant term
  - \_\_\_\_\_ degree of a polynomial
2. \_\_\_\_\_ Write a polynomial in ascending / descending order of a specified variable
3. \_\_\_\_\_ Add and subtract polynomials
4. \_\_\_\_\_ Multiply monomials using the rules of exponents to include:
- \_\_\_\_\_ raising a power to a given power
  - \_\_\_\_\_ raising a product to a given power
5. \_\_\_\_\_ Find products in the following ways:
- \_\_\_\_\_ multiply a polynomial by a monomial
  - \_\_\_\_\_ multiply two binomials (using FOIL or similar method)
  - \_\_\_\_\_ multiply a polynomial by a binomial

**D. Factoring Polynomials**

1. \_\_\_\_\_ Find quotients and factors as follows:
- \_\_\_\_\_ find the GCF of several integers
  - \_\_\_\_\_ simplify quotients of monomials
  - \_\_\_\_\_ divide polynomials by monomials
  - \_\_\_\_\_ find the monomial factor (GCF) of a polynomial
2. \_\_\_\_\_ Use factoring patterns as follows:
- \_\_\_\_\_ difference of two perfect squares
  - \_\_\_\_\_ perfect square trinomials
  - \_\_\_\_\_ factor by grouping terms
  - \_\_\_\_\_ apply factoring patterns for  $x^2 + bx + c$ , where  $c$  is positive / negative
  - \_\_\_\_\_ apply factoring patterns for  $ax^2 + bx + c$ , where  $c$  is positive / negative
3. \_\_\_\_\_ Use factoring in solving polynomial equations
4. \_\_\_\_\_ Solve application problems by writing and factoring quadratic equations

**E. Rational Expressions and Equations**

- 1. \_\_\_\_\_ Simplify rational expressions
- 2. \_\_\_\_\_ Multiply rational expressions
- 3. \_\_\_\_\_ Divide rational expressions
- 4. \_\_\_\_\_ Add and subtract rational expressions with like denominators
- 5. \_\_\_\_\_ Add and subtract rational expressions with unlike denominators
- 6. \_\_\_\_\_ Solve equations involving rational expressions
- 7. \_\_\_\_\_ Evaluate exponential expressions containing negative and zero exponents
- 8. \_\_\_\_\_ Understand, interpret, and apply scientific notation

**F. Applying Rational Expressions**

- 1. \_\_\_\_\_ Solve problems involving ratio and proportion
- 2. \_\_\_\_\_ Solve equations with fractional coefficients and corresponding application problems
- 3. \_\_\_\_\_ Work with percents and decimals
- 4. \_\_\_\_\_ Solve problems involving percents and decimals:
  - \_\_\_\_\_ percent of change
  - \_\_\_\_\_ mixture problems

**G. Introduction to Functions**

- 1. \_\_\_\_\_ Use appropriate algebraic vocabulary:
  - \_\_\_\_\_ relation
  - \_\_\_\_\_ function
  - \_\_\_\_\_ domain
  - \_\_\_\_\_ range
  - \_\_\_\_\_ coordinate plane
  - \_\_\_\_\_ horizontal axis
  - \_\_\_\_\_ vertical axis
  - \_\_\_\_\_ ordered pair
  - \_\_\_\_\_ origin
  - \_\_\_\_\_ quadrant
- 2. \_\_\_\_\_ Understand what a function is and define a function by using tables and graphs
- 3. \_\_\_\_\_ Identify the domain and range of a function

**H. Linear Equations**

- 1. \_\_\_\_\_ Use appropriate algebraic vocabulary:
  - \_\_\_\_\_ linear equation
  - \_\_\_\_\_ slope
  - \_\_\_\_\_ x and y intercepts
  - \_\_\_\_\_ slope-intercept form of an equation
  - \_\_\_\_\_ standard / general form of an equation
- 2. \_\_\_\_\_ Identify a linear equation
- 3. \_\_\_\_\_ Differentiate between linear equations written in standard / general form and those written in slope-intercept form

- 4. \_\_\_\_\_ Transform linear equations from one form to another
- 5. \_\_\_\_\_ Understand and use the slope-intercept method of graphing a linear equation
- 6. \_\_\_\_\_ Understand and use the x and y intercept method of graphing a linear equation
- 7. \_\_\_\_\_ Determine the slope of a line when given the graph of the line
- 8. \_\_\_\_\_ Determine the slope of a line algebraically using the slope formula when given two points
- 9. \_\_\_\_\_ Determine the equation of a line when given:
  - \_\_\_\_\_ the slope and the y-intercept
  - \_\_\_\_\_ the slope and one point on the line
  - \_\_\_\_\_ two points on the line
- 10. \_\_\_\_\_ Determine the midpoint of a line segment
- 11. \_\_\_\_\_ Determine the distance between two points

**I. Systems of Linear Equations**

- 1. \_\_\_\_\_ Solve systems of linear equations in two variables by using:
  - \_\_\_\_\_ graphs
  - \_\_\_\_\_ linear combinations
  - \_\_\_\_\_ substitution method
- 2. \_\_\_\_\_ Understand that solution sets of systems of linear equations can result in:
  - \_\_\_\_\_ a single ordered pair (intersecting lines)
  - \_\_\_\_\_ the empty set (parallel lines)
  - \_\_\_\_\_ infinitely many ordered pairs (coincident lines)
- 3. \_\_\_\_\_ Understand the relationship between:
  - \_\_\_\_\_ parallel lines (same slope)
  - \_\_\_\_\_ perpendicular lines (slopes with negative reciprocals)
- 4. \_\_\_\_\_ Solve real-life application problems using systems of linear equations:
  - \_\_\_\_\_ wind and water current problems
  - \_\_\_\_\_ other types of applicable problems

**J. Inequalities**

- 1. \_\_\_\_\_ Solve and graph inequalities in one variable on a number line
- 2. \_\_\_\_\_ Solve and graph combined inequalities involving both “and” / “or” situations
- 3. \_\_\_\_\_ Solve and graph absolute value equations
- 4. \_\_\_\_\_ Solve and graph absolute value inequalities involving both “and” / “or” situations
- 5. \_\_\_\_\_ Solve and graph linear inequalities in two variables
- 6. \_\_\_\_\_ Solve and graph systems of linear inequalities by graphing

**K. Rational and Irrational Numbers**

- 1. \_\_\_\_\_ Express rational numbers as decimals or fractions
- 2. \_\_\_\_\_ Find square roots of numbers that have rational square roots

- 3. \_\_\_\_\_ Master the first 20 squares, the first 6 cubes, and the first 3 fifths
- 4. \_\_\_\_\_ Simplify radicals
- 5. \_\_\_\_\_ Work with problems containing radical expressions in the following ways:
  - \_\_\_\_\_simplify products and quotients of radicals
  - \_\_\_\_\_simplify sums and differences of radicals
  - \_\_\_\_\_multiply binomials containing square-root radicals
  - \_\_\_\_\_rationalize binomial denominators
  - \_\_\_\_\_solve radical equations
- 6. \_\_\_\_\_ Use the Pythagorean Theorem to solve geometric problems

**L. Quadratic Functions**

- 1. \_\_\_\_\_ Solve quadratic equations by finding square roots
- 2. \_\_\_\_\_ Solve quadratic equations by factoring and using the zero product property
- 3. \_\_\_\_\_ Solve quadratic equations by using the quadratic formula
- 4. \_\_\_\_\_ Solve application problems by writing and factoring quadratic equations

**A. Working With Real Numbers**

- 1. \_\_\_\_\_ Identify, distinguish among, compare, order, and use various subsets of the real number system:
  - \_\_\_\_\_ natural numbers
  - \_\_\_\_\_ whole numbers
  - \_\_\_\_\_ integers
  - \_\_\_\_\_ rational numbers
  - \_\_\_\_\_ irrational numbers
  - \_\_\_\_\_ real numbers
- 2. \_\_\_\_\_ Graph real numbers on the number line
- 3. \_\_\_\_\_ Understand basic algebraic properties and use them efficiently to simplify algebraic expressions:
  - \_\_\_\_\_ reflexive, symmetric, and transitive properties
  - \_\_\_\_\_ associative properties
  - \_\_\_\_\_ commutative properties
  - \_\_\_\_\_ closure properties
  - \_\_\_\_\_ identity properties
  - \_\_\_\_\_ property of reciprocals
  - \_\_\_\_\_ property of opposites
  - \_\_\_\_\_ property of opposites of a sum
  - \_\_\_\_\_ multiplicative and additive properties of equalities and inequalities
- 4. \_\_\_\_\_ Apply the order of operations to simplify and evaluate expressions with and without variables and grouping symbols involving:
  - \_\_\_\_\_ fractions
  - \_\_\_\_\_ decimals
  - \_\_\_\_\_ negatives
  - \_\_\_\_\_ absolute value
  - \_\_\_\_\_ exponents

**B. Solving Equations and Problems**

- 1. \_\_\_\_\_ Use appropriate algebraic vocabulary:
  - \_\_\_\_\_ equation
  - \_\_\_\_\_ solve
  - \_\_\_\_\_ like (similar) terms
  - \_\_\_\_\_ combine like terms
  - \_\_\_\_\_ replacement set
  - \_\_\_\_\_ solution set
- 2. \_\_\_\_\_ Translate verbal statements into algebraic expressions / equations and vice versa
- 3. \_\_\_\_\_ Solve equations in one variable by applying real number properties
- 4. \_\_\_\_\_ Solve equations and problems with variables on both sides

5. \_\_\_\_\_ Solve real-life application problems including the following types:
- \_\_\_\_\_ multi-step problems
  - \_\_\_\_\_ consecutive integers
  - \_\_\_\_\_ area / perimeter
  - \_\_\_\_\_ problems that do not have a solution

**C. Polynomials**

1. \_\_\_\_\_ Use appropriate algebraic vocabulary:
- \_\_\_\_\_ monomial, binomial, trinomial, polynomial
2. \_\_\_\_\_ Write a polynomial in ascending / descending order of a specified variable
3. \_\_\_\_\_ Add and subtract polynomials

**D. Factoring Polynomials**

1. \_\_\_\_\_ Find quotients and factors as follows:
- \_\_\_\_\_ find the GCF of several integers
  - \_\_\_\_\_ simplify quotients of monomials
  - \_\_\_\_\_ divide polynomials by monomials (with no remainder)

**E. Applying Rational Expressions**

1. \_\_\_\_\_ Solve problems involving ratio and proportion
2. \_\_\_\_\_ Solve equations with fractional coefficients and corresponding application problems
3. \_\_\_\_\_ Work with percents and decimals

**F. Introduction to Functions**

1. \_\_\_\_\_ Use appropriate algebraic vocabulary:
- \_\_\_\_\_ relation
  - \_\_\_\_\_ function
  - \_\_\_\_\_ domain
  - \_\_\_\_\_ range
  - \_\_\_\_\_ coordinate plane
  - \_\_\_\_\_ horizontal axis
  - \_\_\_\_\_ vertical axis
  - \_\_\_\_\_ ordered pair
  - \_\_\_\_\_ origin
  - \_\_\_\_\_ quadrant
2. \_\_\_\_\_ Understand what a function is and define a function by using tables and graphs
3. \_\_\_\_\_ Identify the domain and range of a function

**G. Linear Equations**

1. \_\_\_\_\_ Use appropriate algebraic vocabulary:
- \_\_\_\_\_ linear equation
  - \_\_\_\_\_ slope
  - \_\_\_\_\_ x and y intercepts
  - \_\_\_\_\_ slope-intercept form of an equation

- 2. \_\_\_\_\_ Identify a linear equation
- 3. \_\_\_\_\_ Understand and use the slope-intercept method of graphing a linear equation
- 4. \_\_\_\_\_ Understand and use the x and y intercept method of graphing a linear equation
- 5. \_\_\_\_\_ Determine the slope of a line when given the graph of the line
- 6. \_\_\_\_\_ Determine the slope of a line algebraically using the slope formula when given two points
- 7. \_\_\_\_\_ Determine the equation of a line when given:
  - \_\_\_\_\_ the slope and the y-intercept
  - \_\_\_\_\_ the slope and one point on the line
  - \_\_\_\_\_ two points on the line

**H. Systems of Linear Equations**

- 1. \_\_\_\_\_ Solve systems of linear equations in two variables by using:
  - \_\_\_\_\_ graphs
  - \_\_\_\_\_ linear combinations
  - \_\_\_\_\_ substitution method
- 2. \_\_\_\_\_ Understand that solution sets of systems of linear equations can result in:
  - \_\_\_\_\_ a single ordered pair (intersecting lines)
  - \_\_\_\_\_ the empty set (parallel lines)
  - \_\_\_\_\_ infinitely many ordered pairs (coincident lines)
- 3. \_\_\_\_\_ Understand the relationship between:
  - \_\_\_\_\_ parallel lines (same slope)
  - \_\_\_\_\_ perpendicular lines (slopes with negative reciprocals)

**I. Inequalities**

- 1. \_\_\_\_\_ Solve and graph inequalities in one variable on a number line
- 2. \_\_\_\_\_ Solve and graph combined inequalities involving both “and” / “or” situations
- 3. \_\_\_\_\_ Solve and graph absolute value equations
- 4. \_\_\_\_\_ Solve and graph absolute value inequalities involving both “and” / “or” situations
- 5. \_\_\_\_\_ Solve and graph linear inequalities in two variables
- 6. \_\_\_\_\_ Solve and graph systems of linear inequalities by graphing

**J. Rational and Irrational Numbers**

- 1. \_\_\_\_\_ Express rational numbers as decimals or fractions
- 2. \_\_\_\_\_ Find square roots of numbers that have rational square roots

**A. Solving Equations and Problems**

- 1. \_\_\_\_\_ Solve multiple variable equations for a specific variable (literal equations)
- 2. \_\_\_\_\_ Solve equations and problems with variables on both sides
- 3. \_\_\_\_\_ Solve real-life application problems including the following types:
  - \_\_\_\_\_ age problems (including those involving age now, age in the past, and age in the future)
  - \_\_\_\_\_ percent problems
  - \_\_\_\_\_ consecutive multiples
  - \_\_\_\_\_ rate-time-distance problems:
    - \_\_\_\_\_ motion in the same direction
    - \_\_\_\_\_ motion in opposite directions
    - \_\_\_\_\_ round trip problems
  - \_\_\_\_\_ angle measures
  - \_\_\_\_\_ problems that do not have a solution

**B. Polynomials**

- 1. \_\_\_\_\_ Use appropriate algebraic vocabulary:
  - \_\_\_\_\_ monomial, binomial, trinomial, polynomial
  - \_\_\_\_\_ degree of a variable in a monomial
  - \_\_\_\_\_ degree of a monomial
  - \_\_\_\_\_ degree of a constant term
  - \_\_\_\_\_ degree of a polynomial
- 2. \_\_\_\_\_ Multiply monomials using the rules of exponents to include:
  - \_\_\_\_\_ raising a power to a given power
  - \_\_\_\_\_ raising a product to a given power
- 3. \_\_\_\_\_ Find products in the following ways:
  - \_\_\_\_\_ multiply a polynomial by a monomial
  - \_\_\_\_\_ multiply two binomials (using FOIL or similar method)
  - \_\_\_\_\_ multiply a polynomial by a binomial

**C. Factoring Polynomials**

- 1. \_\_\_\_\_ Find quotients and factors as follows:
  - \_\_\_\_\_ divide polynomials by monomials
  - \_\_\_\_\_ find the monomial factor (GCF) of a polynomial
- 2. \_\_\_\_\_ Use factoring patterns as follows:
  - \_\_\_\_\_ difference of two perfect squares
  - \_\_\_\_\_ perfect square trinomials
  - \_\_\_\_\_ factor by grouping terms
  - \_\_\_\_\_ apply factoring patterns for  $x^2 + bx + c$ , where  $c$  is positive / negative
  - \_\_\_\_\_ apply factoring patterns for  $ax^2 + bx + c$ , where  $c$  is positive / negative
- 3. \_\_\_\_\_ Use factoring in solving polynomial equations
- 4. \_\_\_\_\_ Solve application problems by writing and factoring quadratic equations

**D. Rational Expressions and Equations**

- 1. \_\_\_\_\_ Simplify rational expressions
- 2. \_\_\_\_\_ Multiply rational expressions
- 3. \_\_\_\_\_ Divide rational expressions
- 4. \_\_\_\_\_ Add and subtract rational expressions with like denominators
- 5. \_\_\_\_\_ Add and subtract rational expressions with unlike denominators
- 6. \_\_\_\_\_ Solve equations involving rational expressions
- 7. \_\_\_\_\_ Evaluate exponential expressions containing negative and zero exponents
- 8. \_\_\_\_\_ Understand, interpret, and apply scientific notation

**E. Applying Rational Expressions**

- 1. \_\_\_\_\_ Solve problems involving percents and decimals:
  - \_\_\_\_\_ percent of change
  - \_\_\_\_\_ mixture problems

**F. Linear Equations**

- 1. \_\_\_\_\_ Use appropriate algebraic vocabulary:
  - \_\_\_\_\_ linear equation
  - \_\_\_\_\_ slope
  - \_\_\_\_\_ x and y intercepts
  - \_\_\_\_\_ slope-intercept form of an equation
  - \_\_\_\_\_ standard / general form of an equation
- 2. \_\_\_\_\_ Identify a linear equation
- 3. \_\_\_\_\_ Differentiate between linear equations written in standard / general form and those written in slope-intercept form
- 4. \_\_\_\_\_ Transform linear equations from one form to another
- 5. \_\_\_\_\_ Understand and use the x and y intercept method of graphing a linear equation
- 6. \_\_\_\_\_ Determine the midpoint of a line segment
- 7. \_\_\_\_\_ Determine the distance between two points

**G. Systems of Linear Equations**

- 1. \_\_\_\_\_ Solve real-life application problems using systems of linear equations:
  - \_\_\_\_\_ wind and water current problems
  - \_\_\_\_\_ other types of applicable problems

**H. Rational and Irrational Numbers**

- 1. \_\_\_\_\_ Master the first 20 squares, the first 6 cubes, and the first 3 fifths
- 2. \_\_\_\_\_ Simplify radicals

- 3. \_\_\_\_\_ Work with problems containing radical expressions in the following ways:
  - \_\_\_\_\_simplify products and quotients of radicals
  - \_\_\_\_\_simplify sums and differences of radicals
  - \_\_\_\_\_multiply binomials containing square-root radicals
  - \_\_\_\_\_rationalize binomial denominators
  - \_\_\_\_\_solve radical equations
- 4. \_\_\_\_\_ Use the Pythagorean Theorem to solve geometric problems

**I. Quadratic Functions**

- 1. \_\_\_\_\_ Solve quadratic equations by finding square roots
- 2. \_\_\_\_\_ Solve quadratic equations by factoring and using the zero product property
- 3. \_\_\_\_\_ Solve quadratic equations by using the quadratic formula
- 4. \_\_\_\_\_ Solve application problems by writing and factoring quadratic equations

**A. Review of Basic Algebraic Concepts**

- 1. \_\_\_\_\_ Identify, distinguish among, compare, order, and use various subsets of the real number system:
  - \_\_\_\_\_ natural numbers
  - \_\_\_\_\_ whole numbers
  - \_\_\_\_\_ integers
  - \_\_\_\_\_ rational numbers
  - \_\_\_\_\_ irrational numbers
  - \_\_\_\_\_ real numbers
- 2. \_\_\_\_\_ Understand basic algebraic properties and use them efficiently to simplify algebraic expressions:
  - \_\_\_\_\_ reflexive, symmetric, and transitive properties
  - \_\_\_\_\_ associative properties
  - \_\_\_\_\_ commutative properties
  - \_\_\_\_\_ closure properties
  - \_\_\_\_\_ identity properties
  - \_\_\_\_\_ property of reciprocals
  - \_\_\_\_\_ property of opposites
  - \_\_\_\_\_ property of opposites of a sum
  - \_\_\_\_\_ multiplicative and additive properties of equalities and inequalities
- 3. \_\_\_\_\_ Apply the order of operations to simplify and evaluate expressions with and without variables and grouping symbols involving:
  - \_\_\_\_\_ fractions
  - \_\_\_\_\_ decimals
  - \_\_\_\_\_ negatives
  - \_\_\_\_\_ absolute value
  - \_\_\_\_\_ exponents

**B. Solving Equations and Problems**

- 1. \_\_\_\_\_ Use appropriate algebraic vocabulary:
  - \_\_\_\_\_ equation
  - \_\_\_\_\_ solve
  - \_\_\_\_\_ like (similar) terms
  - \_\_\_\_\_ combine like terms
  - \_\_\_\_\_ replacement set
  - \_\_\_\_\_ solution set
- 2. \_\_\_\_\_ Translate verbal statements into algebraic expressions / equations and vice versa
- 3. \_\_\_\_\_ Solve equations in one variable by applying real number properties
- 4. \_\_\_\_\_ Solve multiple variable equations for a specific variable (literal equations)
- 5. \_\_\_\_\_ Solve equations and problems with variables on both sides

6. \_\_\_\_\_ Solve real-life application problems including the following types:
- \_\_\_\_\_ multi-step problems
  - \_\_\_\_\_ age problems (including those involving age now, age in the past, and age in the future)
  - \_\_\_\_\_ percent problems
  - \_\_\_\_\_ consecutive integers / multiples
  - \_\_\_\_\_ rate-time-distance problems:
    - \_\_\_\_\_ motion in the same direction
    - \_\_\_\_\_ motion in opposite directions
    - \_\_\_\_\_ round trip problems
  - \_\_\_\_\_ area / perimeter / angle measures
  - \_\_\_\_\_ problems that do not have a solution

**C. Polynomials**

1. \_\_\_\_\_ Use appropriate algebraic vocabulary:
- \_\_\_\_\_ monomial, binomial, trinomial, polynomial
  - \_\_\_\_\_ degree of a variable in a monomial
  - \_\_\_\_\_ degree of a monomial
  - \_\_\_\_\_ degree of a constant term
  - \_\_\_\_\_ degree of a polynomial
2. \_\_\_\_\_ Write a polynomial in ascending / descending order of a specified variable
3. \_\_\_\_\_ Add and subtract polynomials
4. \_\_\_\_\_ Multiply monomials using the rules of exponents to include:
- \_\_\_\_\_ raising a power to a given power
  - \_\_\_\_\_ raising a product to a given power
5. \_\_\_\_\_ Find products in the following ways:
- \_\_\_\_\_ multiply a polynomial by a monomial
  - \_\_\_\_\_ multiply two binomials (using FOIL or similar method)
  - \_\_\_\_\_ multiply a polynomial by a binomial
6. \_\_\_\_\_ Solve problems using direct and indirect variation
7. \_\_\_\_\_ Divide polynomials using long division and synthetic division
8. \_\_\_\_\_ Use the remainder and factor theorems to find factors of polynomials
9. \_\_\_\_\_ Find rational roots of a polynomial

**D. Factoring Polynomials**

1. \_\_\_\_\_ Find quotients and factors as follows:
- \_\_\_\_\_ find the GCF of several integers
  - \_\_\_\_\_ simplify quotients of monomials
  - \_\_\_\_\_ divide polynomials by monomials
  - \_\_\_\_\_ find the monomial factor (GCF) of a polynomial
2. \_\_\_\_\_ Factor the following types of polynomials:
- \_\_\_\_\_ difference of two perfect squares
  - \_\_\_\_\_ perfect square trinomials
  - \_\_\_\_\_ factoring by grouping terms
  - \_\_\_\_\_ apply factoring patterns for  $x^2 + bx + c$ , where  $c$  is positive / negative
  - \_\_\_\_\_ apply factoring patterns for  $ax^2 + bx + c$ , where  $c$  is positive / negative

- 3. \_\_\_\_\_ Use factoring in solving polynomial equations
- 4. \_\_\_\_\_ Solve application problems by writing and factoring quadratic equations
- 5. \_\_\_\_\_ Solve polynomial equations and polynomial functions; identify roots, zeros, and multiples of each
- 6. \_\_\_\_\_ Solve real life applications involving polynomials
- 7. \_\_\_\_\_ Solve polynomial inequalities

**E. Rational Expressions and Equations**

- 1. \_\_\_\_\_ Simplify rational expressions
- 2. \_\_\_\_\_ Multiply rational expressions
- 3. \_\_\_\_\_ Divide rational expressions
- 4. \_\_\_\_\_ Add and subtract rational expressions with like denominators
- 5. \_\_\_\_\_ Add and subtract rational expressions with unlike denominators
- 6. \_\_\_\_\_ Graph rational functions
- 7. \_\_\_\_\_ Simplify complex fractions
- 8. \_\_\_\_\_ Evaluate exponential expressions containing negative and zero exponents
- 9. \_\_\_\_\_ Find the domain and range of rational functions
- 10. \_\_\_\_\_ Solve equations and inequalities having fractional coefficients
- 11. \_\_\_\_\_ Solve fractional equations
- 12. \_\_\_\_\_ Solve real-life equations and identify those which have no solution

**F. Introduction to Functions**

- 1. \_\_\_\_\_ Use appropriate algebraic vocabulary:
  - \_\_\_\_\_ relation
  - \_\_\_\_\_ function
  - \_\_\_\_\_ domain
  - \_\_\_\_\_ range
- 2. \_\_\_\_\_ Understand what a function is and define a function by using tables and graphs
- 3. \_\_\_\_\_ Identify the domain and range of a function
- 4. \_\_\_\_\_ Use the vertical line test to determine if a graph is a function
- 5. \_\_\_\_\_ Find the value of the function given the domain
- 6. \_\_\_\_\_ Graph a linear function on a coordinate plane

**G. Linear Equations**

- 1. \_\_\_\_\_ Use appropriate algebraic vocabulary:
  - \_\_\_\_\_ linear equation
  - \_\_\_\_\_ slope
  - \_\_\_\_\_ x and y intercepts
  - \_\_\_\_\_ slope-intercept form of an equation
  - \_\_\_\_\_ standard / general form of an equation
- 2. \_\_\_\_\_ Identify a linear equation
- 3. \_\_\_\_\_ Differentiate between linear equations written in standard / general form and those written in slope-intercept form
- 4. \_\_\_\_\_ Transform linear equations from one form to another

- 5. \_\_\_\_\_ Understand and use the slope-intercept method of graphing a linear equation
- 6. \_\_\_\_\_ Understand and use the x and y intercept method of graphing a linear equation
- 7. \_\_\_\_\_ Determine the slope of a line when given the graph of the line
- 8. \_\_\_\_\_ Determine the slope of a line algebraically using the slope formula when given two points
- 9. \_\_\_\_\_ Determine the equation of a line when given:
  - \_\_\_\_\_ the slope and the y-intercept
  - \_\_\_\_\_ the slope and one point on the line
  - \_\_\_\_\_ two points on the line
- 10. \_\_\_\_\_ Determine the midpoint of a line segment
- 11. \_\_\_\_\_ Determine the distance between two points

**H. Systems of Linear Equations**

- 1. \_\_\_\_\_ Solve systems of linear equations in two variables by using:
  - \_\_\_\_\_ graphs
  - \_\_\_\_\_ linear combinations
  - \_\_\_\_\_ substitution method
- 2. \_\_\_\_\_ Understand that solution sets of systems of linear equations can result in:
  - \_\_\_\_\_ a single ordered pair (intersecting lines)
  - \_\_\_\_\_ the empty set (parallel lines)
  - \_\_\_\_\_ infinitely many ordered pairs (coincident lines)
- 3. \_\_\_\_\_ Graph linear equations in two variable on a coordinate plane using:
  - \_\_\_\_\_ x- and y- intercepts
  - \_\_\_\_\_ slope and y- intercept
  - \_\_\_\_\_ coordinate points
- 4. \_\_\_\_\_ Solve for the slope of a line and the equation of a line using:
  - \_\_\_\_\_ slope formula
  - \_\_\_\_\_ slope-intercept form
- 5. \_\_\_\_\_ Solve real-life application problems using systems of linear equations:
  - \_\_\_\_\_ wind and water current problems
  - \_\_\_\_\_ other types of applicable problems

**I. Inequalities**

- 1. \_\_\_\_\_ Solve and graph inequalities in one variable on a number line
- 2. \_\_\_\_\_ Solve and graph combined inequalities involving both “and” / “or” situations
- 3. \_\_\_\_\_ Solve and graph absolute value equations
- 4. \_\_\_\_\_ Solve and graph absolute value inequalities involving both “and” / “or” situations
- 5. \_\_\_\_\_ Solve and graph linear inequalities in two variables
- 6. \_\_\_\_\_ Solve and graph systems of linear inequalities by graphing

**J. Rational and Irrational Numbers**

- 1. \_\_\_\_\_ Express rational numbers as decimals or fractions
- 2. \_\_\_\_\_ Find square roots of numbers that have rational square roots
- 3. \_\_\_\_\_ Simplify radicals
- 4. \_\_\_\_\_ Work with problems containing radical expressions in the following way
  - \_\_\_\_\_ simplify products and quotients of radicals
  - \_\_\_\_\_ simplify sums and differences of radicals
  - \_\_\_\_\_ multiply binomials containing square-root radicals
  - \_\_\_\_\_ rationalize binomial denominators
  - \_\_\_\_\_ solve radical equations

**K. Quadratic Functions**

- 1. \_\_\_\_\_ Solve quadratic equations by completing the square
- 2. \_\_\_\_\_ Solve quadratic equations by using the quadratic formula
- 3. \_\_\_\_\_ Find the determinant to determine the nature of its roots
- 4. \_\_\_\_\_ Graph quadratic equations and their transformations

**L. Complex Numbers**

- 1. \_\_\_\_\_ Identify different types of complex numbers
- 2. \_\_\_\_\_ Simplify square roots of negative numbers
- 3. \_\_\_\_\_ Add, subtract, multiply, and divide complex numbers

**M. Conic Sections**

- 1. \_\_\_\_\_ Find the distance between any two points
- 2. \_\_\_\_\_ Find the midpoint of a line segment joining any two points
- 3. \_\_\_\_\_ Find the center, radius, and equation of a circle
- 4. \_\_\_\_\_ Understand the relationship between the focus, directrix, vertex, and axis of a parabola and the equation of a parabola
- 5. \_\_\_\_\_ Find the equation of an ellipse and a hyperbola

**N. Trigonometric Functions**

- 1. \_\_\_\_\_ Find degree and radian measures of a angle
- 2. \_\_\_\_\_ Find sine, cosine, tangent, and reciprocal functions of an acute triangle
- 3. \_\_\_\_\_ Find trigonometric functions of general angles

**A. Basic Concepts**

- 1. \_\_\_\_\_ Recognize the characteristics of points, lines, planes, segments, and rays
- 2. \_\_\_\_\_ Use the distance formula to measure distances on a line or a coordinate plane
- 3. \_\_\_\_\_ Know the basic classifications of angles
- 4. \_\_\_\_\_ Measure segments and angles
- 5. \_\_\_\_\_ Recognize the characteristics of vertical, complementary, supplementary, and adjacent angles
- 6. \_\_\_\_\_ Use protractor to measure angles
- 7. \_\_\_\_\_ Use a ruler to measure line segments
- 8. \_\_\_\_\_ Use constructions to form geometric shapes with compass and straight edge
- 9. \_\_\_\_\_ Use a compass to measure relative lengths
- 10. \_\_\_\_\_ Observe a pattern, and then find a general rule based on the pattern
- 11. \_\_\_\_\_ Use models to develop conjecture
- 12. \_\_\_\_\_ Participate in cooperative learning
- 13. \_\_\_\_\_ Draw and label figures and diagrams

**B. Reasoning and Proofs**

- 1. \_\_\_\_\_ Identify the following different forms of a conditional statement:
  - \_\_\_\_\_ conditional
  - \_\_\_\_\_ hypothesis
  - \_\_\_\_\_ conclusion
  - \_\_\_\_\_ if-then
  - \_\_\_\_\_ counterexample
  - \_\_\_\_\_ converse
  - \_\_\_\_\_ inverse
  - \_\_\_\_\_ contrapositive
- 2. \_\_\_\_\_ Recognize and use definitions and biconditional statements
- 3. \_\_\_\_\_ Use symbolic notation to represent the following logical statements:
  - \_\_\_\_\_ equivalent statements
  - \_\_\_\_\_ logical argument
  - \_\_\_\_\_ inductive and deductive reasoning
  - \_\_\_\_\_ Law of Syllogism and Detachment
- 4. \_\_\_\_\_ Use the following properties efficiently:
  - \_\_\_\_\_ properties of equality
  - \_\_\_\_\_ transitive, symmetric, and reflexive properties
  - \_\_\_\_\_ distributive property
  - \_\_\_\_\_ substitution
- 5. \_\_\_\_\_ Use proofs to justify statements about congruent segments
- 6. \_\_\_\_\_ Use angle congruence properties to prove properties about special pairs of angles
- 7. \_\_\_\_\_ Use accurate definitions of all terms

**C. Perpendicular and Parallel Lines**

- 1. \_\_\_\_\_ Identify relationship between lines and angles formed when parallel lines are cut by a transversal
- 2. \_\_\_\_\_ Prove results involving the following:
  - \_\_\_\_\_ parallel lines
  - \_\_\_\_\_ perpendicular lines
  - \_\_\_\_\_ parallel lines cut by a transversal
- 3. \_\_\_\_\_ Construct parallel lines using a straightedge and compass
- 4. \_\_\_\_\_ Find slope, slope formula, and slope-intercept form of an equation
- 5. \_\_\_\_\_ Use slope to identify perpendicular lines in a coordinate plane

**D. Polygons**

- 1. \_\_\_\_\_ Classify polygons using angle measures
- 2. \_\_\_\_\_ Summarize the properties of polygons and parallelograms in correct order (for example: use Venn Diagrams or charts illustrating points, lines, and planes)
- 3. \_\_\_\_\_ Identify congruent figures
- 4. \_\_\_\_\_ Prove triangles are congruent
- 5. \_\_\_\_\_ Find the sum of the interior and exterior angles of any polygon
- 6. \_\_\_\_\_ Identify and know when to use SSS, SAS, ASA, AAS and HL congruence postulates

**E. Properties of Triangles**

- 1. \_\_\_\_\_ Know the special properties of perpendicular bisectors
- 2. \_\_\_\_\_ Use the properties of perpendicular bisectors and angle bisectors in a triangle
- 3. \_\_\_\_\_ Use the properties of medians and altitudes in a triangle
- 4. \_\_\_\_\_ Identify the mid-segments of a triangle and know their properties
- 5. \_\_\_\_\_ Use greatest, least, and exterior angle inequality to determine which side is the longest of shortest in a triangle
- 6. \_\_\_\_\_ Know the Hinge Theorem

**F. Quadrilaterals**

- 1. \_\_\_\_\_ Identify, name, and describe the different types of polygons
- 2. \_\_\_\_\_ Find the sum of the measures of the interior angles of a quadrilateral
- 3. \_\_\_\_\_ Know the special properties of parallelograms
- 4. \_\_\_\_\_ Prove that quadrilaterals are parallelograms
- 5. \_\_\_\_\_ Use properties of rhombuses, rectangles, and squares
- 6. \_\_\_\_\_ Use the properties of trapezoids and kites
- 7. \_\_\_\_\_ Prove that a quadrilateral is a rhombus or a trapezoid
- 8. \_\_\_\_\_ Recognize the difference between perimeter and area and find the areas of different quadrilaterals

**G. Transformations**

- 1. \_\_\_\_\_ Identify transformations in a coordinate plane
- 2. \_\_\_\_\_ Identify relationships between reflections and line symmetry
- 3. \_\_\_\_\_ Identify rotations in a plane
- 4. \_\_\_\_\_ Identify and use translations in a plane

5. \_\_\_\_\_ Identify glide reflections

**H. Similarity**

1. \_\_\_\_\_ Simplify proportions and use them to solve various types of problems:
- \_\_\_\_\_ ratios
  - \_\_\_\_\_ proportions
  - \_\_\_\_\_ means
  - \_\_\_\_\_ extremes
  - \_\_\_\_\_ cross-products
  - \_\_\_\_\_ reciprocals
2. \_\_\_\_\_ Solve geometric mean problems
3. \_\_\_\_\_ Use properties of proportions to identify similar figures
4. \_\_\_\_\_ Use SSS and SAS similarity theorems to prove that two triangles are similar
5. \_\_\_\_\_ Use proportionality theorems to calculate segment lengths
6. \_\_\_\_\_ Identify dilations

**I. Special Right Triangles**

1. \_\_\_\_\_ Solve problems involving similar right triangles and the geometric mean
2. \_\_\_\_\_ Use the Pythagorean Theorem to solve real-life problems
3. \_\_\_\_\_ Use side lengths to classify triangles by their angle measure
4. \_\_\_\_\_ Use the converse of the Pythagorean theorem to prove right triangles
5. \_\_\_\_\_ Find side lengths of special right triangles. (45-45-90 triangle and 30-60-90 triangle)
6. \_\_\_\_\_ Find trigonometric functions (If this is not completed in Geometry, this must be done in the Trigonometry curriculum.)
7. \_\_\_\_\_ Use right triangles to solve real-life problems
8. \_\_\_\_\_ Find the magnitude and direction of a vector (Complete if time permits.)
9. \_\_\_\_\_ Add vectors (Complete if time permits.)

**J. Circles**

1. \_\_\_\_\_ Know the segments and lines related to a circle
2. \_\_\_\_\_ Use properties of a tangent to a circle
3. \_\_\_\_\_ Use properties of arcs in a circle
4. \_\_\_\_\_ Recognize properties of inscribed angles and know how to use them to solve problems
5. \_\_\_\_\_ Use the angles formed by tangents and chords to solve problems
6. \_\_\_\_\_ Find the lengths of segments of chords, tangents, and secants
7. \_\_\_\_\_ Know how to write the equation of a circle and use the equation and its graph to solve problems
8. \_\_\_\_\_ Draw the locus of points that satisfy a given condition or two or more conditions (Complete if time permits.)

**K. Area of Polygons and Circles**

1. \_\_\_\_\_ Find the measure of interior and exterior angles in polygons and use these to solve problems
2. \_\_\_\_\_ Find the area of an equilateral triangle and other regular polygons

- 3. \_\_\_\_\_ Recognize the relationship between perimeters and areas of similar figures
- 4. \_\_\_\_\_ Find the circumference of a circle and the length of a circular arc
- 5. \_\_\_\_\_ Find the area of circles and sectors of circles in order to solve real-life problems
- 6. \_\_\_\_\_ Find a geometric probability (Complete if time permits.)

**L. Quadratic Functions**

- 1. \_\_\_\_\_ Solve quadratic equations by finding square roots
- 2. \_\_\_\_\_ Solve quadratic equations by factoring and using the zero product property
- 3. \_\_\_\_\_ Solve quadratic equations by using the quadratic formula
- 4. \_\_\_\_\_ Solve application problems by writing and factoring quadratic equations

**A. Algebra Concepts**

- 1. \_\_\_\_\_ Recognize monomials and polynomials, and add, subtract, multiply, and divide polynomials
- 2. \_\_\_\_\_ Review methods for factoring polynomials
- 3. \_\_\_\_\_ Review how to reduce, multiply, divide, add, and subtract rational expressions
- 4. \_\_\_\_\_ Simplify complex fractions
- 5. \_\_\_\_\_ Solve rational equations and inequalities
- 6. \_\_\_\_\_ Review evaluating square roots and rational exponents

**B. Polynomials**

- 1. \_\_\_\_\_ Solve quadratic equations by factoring, completing the square, and the quadratic formula
- 2. \_\_\_\_\_ Solve problems involving quadratic equations
- 3. \_\_\_\_\_ Find all zeros of a polynomial function

**C. Graphing**

- 1. \_\_\_\_\_ Locate x- and y- intercepts
- 2. \_\_\_\_\_ Write the equation of a line in slope-intercept form, point slope form, or general form
- 3. \_\_\_\_\_ Write the standard form of the equation of a circle, graph a circle, and find the center and radius of a circle
- 4. \_\_\_\_\_ Draw and interpret scatter diagrams
- 5. \_\_\_\_\_ Distinguish between linear and nonlinear relations
- 6. \_\_\_\_\_ Use a calculator to find the line of best fit
- 7. \_\_\_\_\_ Identify the graph of a function
- 8. \_\_\_\_\_ Graph the following functions:
  - \_\_\_\_\_ rational
  - \_\_\_\_\_ polynomial
  - \_\_\_\_\_ root
  - \_\_\_\_\_ exponential
  - \_\_\_\_\_ logarithmic

**D. Functions**

- 1. \_\_\_\_\_ Study linear, polynomial, exponential, and logarithmic functions
- 2. \_\_\_\_\_ Identify the domain and range of a relation
- 3. \_\_\_\_\_ Model relations using diagrams, graphs, and set notation
- 4. \_\_\_\_\_ Identify the range, domain, and intercepts given the graph of a function
- 5. \_\_\_\_\_ Find the value of a function given the domain
- 6. \_\_\_\_\_ Graph linear functions on a coordinate plane
- 7. \_\_\_\_\_ Graph the following functions:
  - \_\_\_\_\_ piecewise
  - \_\_\_\_\_ constant
  - \_\_\_\_\_ identity
  - \_\_\_\_\_ quadratic
  - \_\_\_\_\_ cube square root
  - \_\_\_\_\_ reciprocal

- \_\_\_\_\_ absolute value
- 8. \_\_\_\_\_ Graph functions using vertical, horizontal, reflections, compression, and stretches of a function
- 9. \_\_\_\_\_ Describe the transformation applied to a basic function

**E. Logarithmic Functions**

- 1. \_\_\_\_\_ Change exponential expressions to logarithmic expressions
- 2. \_\_\_\_\_ Change logarithmic expressions to exponential expressions
- 3. \_\_\_\_\_ Evaluate, determine the domain, and graph logarithmic functions
- 4. \_\_\_\_\_ Solve problems using direct and indirect variation
- 5. \_\_\_\_\_ Solve logarithmic equations using properties of logarithms
- 6. \_\_\_\_\_ Solve logarithmic and exponential equations using a graphing utility

**F. Trigonometry**

- 1. \_\_\_\_\_ Identify the following:
  - \_\_\_\_\_ period
  - \_\_\_\_\_ amplitude
  - \_\_\_\_\_ phase shift
  - \_\_\_\_\_ vertical shift
- 2. \_\_\_\_\_ Master sine, cosine, and tangent values for multiples of 0;  $\frac{\pi}{6}$  (30°),  $\frac{\pi}{4}$  (45°),  $\frac{\pi}{3}$  (60°),  $\frac{\pi}{2}$  (90°),  $\pi$  (180°),  $\frac{3\pi}{2}$  (270°) and multiples of the same
- 3. \_\_\_\_\_ Define and use circular trigonometric functions
- 4. \_\_\_\_\_ Define and use trigonometric function of right triangle
- 5. \_\_\_\_\_ Compute the values of trigonometric functions of angles
- 6. \_\_\_\_\_ Graph trig functions and their transformations
- 7. \_\_\_\_\_ Graph sinusoidal functions and find an equation for a sinusoidal graph
- 8. \_\_\_\_\_ Evaluate inverse trig function
- 9. \_\_\_\_\_ Prove trigonometric identities
- 10. \_\_\_\_\_ Use law of sines and cosines to solve triangle and applied problems
- 11. \_\_\_\_\_ Solve simple harmonic motion

**G. Vectors**

- 1. \_\_\_\_\_ Graph vectors
- 2. \_\_\_\_\_ Find a position vector
- 3. \_\_\_\_\_ Add, subtract, and find a scalar product and the magnitude of a vector
- 4. \_\_\_\_\_ Find a vector from its direction and magnitude
- 5. \_\_\_\_\_ Use vectors in navigational problems
- 6. \_\_\_\_\_ Add and subtract rational expressions

**H. Conics**

- 1. \_\_\_\_\_ Identify conic sections
- 2. \_\_\_\_\_ Discuss and graph conics
- 3. \_\_\_\_\_ Recognize and analyze conic sections equations given in general form

**A. Algebra Concepts**

- 1. \_\_\_\_\_ Review process for factoring polynomials
- 2. \_\_\_\_\_ Review how to find domain and range
- 3. \_\_\_\_\_ Review how to solve linear inequalities
- 4. \_\_\_\_\_ Write solutions in set and interval notation
- 5. \_\_\_\_\_ Check solutions through equations
- 6. \_\_\_\_\_ Use patterns for exponents
- 7. \_\_\_\_\_ Emphasize the importance of using the correct unit of measurement
- 8. \_\_\_\_\_ Evaluate / use area and volume
- 9. \_\_\_\_\_ Solve rate problems
- 10. \_\_\_\_\_ Create deductive proofs
- 11. \_\_\_\_\_ Use inductive reasoning
- 12. \_\_\_\_\_ Analyze general / standard forms for equations

**B. Functions and Their Graphs**

- 1. \_\_\_\_\_ Graph polynomial functions, trig functions, exponential functions, logarithmic functions, conic sections, rational functions, and special functions
- 2. \_\_\_\_\_ Graph polynomials after algebraically analyzing all aspects (x- and y-intercept, turns, symmetry, end behavior, etc.)
- 3. \_\_\_\_\_ Develop a connection between factors, zeroes, x-intercepts, and solutions to  $f(x) = 0$
- 4. \_\_\_\_\_ Review translations and combinations of functions
- 5. \_\_\_\_\_ Apply vertical and horizontal line test
- 6. \_\_\_\_\_ Determine equations from graphs
- 7. \_\_\_\_\_ Develop rules for graphing functions

**C. Polynomial Functions**

- 1. \_\_\_\_\_ Graph polynomial functions of a higher degree using the leading coefficients test, Descartes' rule of signs, and finding the zeroes of the functions
- 2. \_\_\_\_\_ Graph polynomial functions using the Intermediate Value Theorem
- 3. \_\_\_\_\_ Graph composite and inverse functions
- 4. \_\_\_\_\_ Use synthetic and long division
- 5. \_\_\_\_\_ Review complex numbers and how to find complex zeroes of a polynomial function
- 6. \_\_\_\_\_ Analyze polynomial functions and root functions
- 7. \_\_\_\_\_ Perform arithmetic operations, composition, and inversion of functions

**D. Rational Functions**

- 1. \_\_\_\_\_ Solve inequalities (linear, absolute value, polynomial, and rational)
- 2. \_\_\_\_\_ Graph inequalities (linear, absolute value, polynomial, and rational)
- 3. \_\_\_\_\_ Graph rational functions
- 4. \_\_\_\_\_ Identify vertical, horizontal, and slant asymptotes
- 5. \_\_\_\_\_ Identify the range, domain, and intercepts
- 6. \_\_\_\_\_ Analyze rational functions
- 7. \_\_\_\_\_ Introduce limits
- 8. \_\_\_\_\_ Perform partial fraction decomposition

**E. Exponential and Logarithmic Functions**

- 1. \_\_\_\_\_ Graph exponential and logarithmic functions
- 2. \_\_\_\_\_ Analyze exponential and logarithmic functions
- 3. \_\_\_\_\_ Evaluate logarithms, exponentials, and radicals
- 4. \_\_\_\_\_ Evaluate, determine the domain, and graph logarithmic functions
- 5. \_\_\_\_\_ Use laws of exponents / logarithms
- 6. \_\_\_\_\_ Use patterns for exponents and logarithms
- 7. \_\_\_\_\_ Use zeros of equations applying exponents, radicals, and logarithms to estimate
- 8. \_\_\_\_\_ Perform composition and inversion of functions
- 9. \_\_\_\_\_ Evaluate angular / linear velocity
- 10. \_\_\_\_\_ Solve exponential growth and decay problems
- 11. \_\_\_\_\_ Create and use normal distribution graphs

**F. Trigonometry**

- 1. \_\_\_\_\_ Define degree and radian measure
- 2. \_\_\_\_\_ Convert between degree and radian measure
- 3. \_\_\_\_\_ Define trig functions using the unit circle, right triangles, and trig functions of any angle
- 4. \_\_\_\_\_ Recognize chords and arcs of circles
- 5. \_\_\_\_\_ Know trigonometric function values for multiples of 0,  $\frac{\pi}{6}$  (30°),  $\frac{\pi}{4}$  (45°),  $\frac{\pi}{3}$  (60°),  $\frac{\pi}{2}$  (90°),  $\pi$  (180°),  $\frac{3\pi}{2}$  (270°) and multiples of the same
- 6. \_\_\_\_\_ Use 30° – 60° – 90° and 45° – 45° – 90° triangles to derive those values
- 7. \_\_\_\_\_ Prove trig identities
- 8. \_\_\_\_\_ Graph sine, cosine, tangent and other trigonometric functions
- 9. \_\_\_\_\_ Define and graph inverse trig functions
- 10. \_\_\_\_\_ Perform compositions of functions
- 11. \_\_\_\_\_ Solve trig equations
- 12. \_\_\_\_\_ Manipulate fundamental identities, sum and difference formulas, multiple angle formulas, and product and sum formulas
- 13. \_\_\_\_\_ Use approximate decimals for trig functions
- 14. \_\_\_\_\_ Use law of sines and cosines
- 15. \_\_\_\_\_ Apply central angle theorem
- 16. \_\_\_\_\_ Solve clock problems
- 17. \_\_\_\_\_ Solve problems involving bearings
- 18. \_\_\_\_\_ Apply Heron's Formula

**G. Vectors**

- 1. \_\_\_\_\_ Calculate vector magnitude
- 2. \_\_\_\_\_ Use vectors and rotations
- 3. \_\_\_\_\_ Add, subtract, and find a scalar product and the magnitude of a vector
- 4. \_\_\_\_\_ Find a vector from its direction and magnitude

- 5. \_\_\_\_\_ Solve vector problems

**H. Statistics and Probability**

- 1. \_\_\_\_\_ Introduce and evaluate factorials
- 2. \_\_\_\_\_ Use theories of combination and permutation
- 3. \_\_\_\_\_ Use normal distribution graphs

**I. Analytical Geometry**

- 1. \_\_\_\_\_ Graph conic sections
- 2. \_\_\_\_\_ Analyze conic sections
- 3. \_\_\_\_\_ Solve conic section problems
- 4. \_\_\_\_\_ Apply Pascal's Theorem
- 5. \_\_\_\_\_ Write the standard form of the equation of a circle, graph a circle, and find the center and radius of a circle
- 6. \_\_\_\_\_ Solve polar coordinates, polar equations, and parametric equations
- 7. \_\_\_\_\_ Graph polar coordinates, polar equations, and parametric equations

**J. Sequences and Matrices**

- 1. \_\_\_\_\_ Use matrices
- 2. \_\_\_\_\_ Analyze systems of equations (linear and nonlinear) in two or more variables
- 3. \_\_\_\_\_ Recognize arithmetic / geometric sequences and series
- 4. \_\_\_\_\_ Use the Binomial Theorem
- 5. \_\_\_\_\_ Use summation notation

**\*Adapted from the AP Calculus (AB) syllabus****I. Functions, Graphs, and Limits****A. Analysis of Graphs**

- 1. \_\_\_\_\_ Use technology to produce graphs of functions
- 2. \_\_\_\_\_ Understand the interplay between the geometric and analytic information
- 3. \_\_\_\_\_ Use calculus both to predict and to explain the observed local and global behavior of a function

**B. Limits of Functions (including one-sided limits)**

- 1. \_\_\_\_\_ Develop an intuitive understanding of the limiting process
- 2. \_\_\_\_\_ Calculate limits using algebra
- 3. \_\_\_\_\_ Estimate limits from graphs or tables of data

**C. Asymptotic and Unbounded Behavior**

- 1. \_\_\_\_\_ Develop an understanding of asymptotes in terms of graphical behavior
- 2. \_\_\_\_\_ Describe asymptotic behavior in terms of limits involving infinity
- 3. \_\_\_\_\_ Compare relative magnitudes of functions and their rates of change to include contrasting exponential growth, polynomial growth, and logarithmic growth

**D. Continuity as a Property of Functions**

- 1. \_\_\_\_\_ Develop an intuitive understanding of continuity (The function values can be made as close as desired by taking sufficiently close values of the domain.)
- 2. \_\_\_\_\_ Develop an understanding of continuity in terms of limits
- 3. \_\_\_\_\_ Develop a geometric understanding of graphs of continuous functions including the Intermediate Value Theorem and Extreme Value Theorem

**II. Derivatives****A. Concept of the Derivative**

- 1. \_\_\_\_\_ Present a derivative graphically, numerically, and analytically
- 2. \_\_\_\_\_ Interpret a derivative as an instantaneous rate of change
- 3. \_\_\_\_\_ Define a derivative as the limit of the difference quotient
- 4. \_\_\_\_\_ Determine the relationship between differentiability and continuity

**B. Derivative at a Point**

- 1. \_\_\_\_\_ Provide examples of the slope of a curve at a point, including points at which there are vertical tangents and points at which there are no tangents
- 2. \_\_\_\_\_ Provide examples of a tangent line to a curve at a point and local linear approximation
- 3. \_\_\_\_\_ Describe instantaneous rate of change as the limit of average rate of change
- 4. \_\_\_\_\_ Approximate rate of change from graphs and tables of values

**C. Derivative as a Function**

- 1. \_\_\_\_\_ Understand the corresponding characteristics of graphs of  $f$  and  $f'$
- 2. \_\_\_\_\_ Understand the relationship between the increasing and decreasing behavior of  $f$  and the sign of  $f'$
- 3. \_\_\_\_\_ Understand the Mean Value Theorem and its geometric consequences
- 4. \_\_\_\_\_ Solve equations involving derivatives
- 5. \_\_\_\_\_ Translate verbal descriptions into equations involving derivatives and vice versa

**D. Second Derivatives**

- 1. \_\_\_\_\_ Understand the corresponding characteristics of the graphs of  $f$ ,  $f'$ , and  $f''$
- 2. \_\_\_\_\_ Understand the relationship between the concavity of  $f$  and the sign of  $f''$
- 3. \_\_\_\_\_ Describe points of inflection as places where concavity changes

**E. Applications of Derivatives**

- 1. \_\_\_\_\_ Analyze curves, including the notions of monotonicity and concavity
- 2. \_\_\_\_\_ Understand optimization, both absolute (global) and relative (local) extrema
- 3. \_\_\_\_\_ Model rates of change, including related rates problems
- 4. \_\_\_\_\_ Use implicit differentiation to find the derivative of an inverse function
- 5. \_\_\_\_\_ Interpret the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration
- 6. \_\_\_\_\_ Understand the geometric interpretation of differential equations via slope fields and the relationship between slope fields and solution curves for differential

**F. Computation of Derivatives**

- 1. \_\_\_\_\_ Demonstrate knowledge of the derivatives of basic functions:
  - power functions
  - exponential functions
  - logarithmic functions
  - trigonometric functions
  - inverse trigonometric functions
- 2. \_\_\_\_\_ Understand and use the basic rules for the derivative of sums, products, and quotients of functions
- 3. \_\_\_\_\_ Understand chain rule and implicit differentiation

**II. Integrals****A. Interpretations and Properties of Definite Integrals**

- 1. \_\_\_\_\_ Interpret a definite integral as a limit of Riemann sums
- 2. \_\_\_\_\_ Interpret a definite integral of the rate of change of a quantity over an interval interpreted as the change of the quantity over the interval:

$$\int_a^b f'(x)dx = f(b) - f(a).$$

3. \_\_\_\_\_ Understand and use the basic properties of definite integrals, including additivity and linearity

**B. Applications of Integrals**

1. \_\_\_\_\_ Use appropriate integrals in a variety of applications to model physical, biological, or economic situations
2. \_\_\_\_\_ Use the integral of a rate of change to give accumulated change
3. \_\_\_\_\_ Use the method of setting up an approximating Riemann sum and representing its limit as a definite integral
4. \_\_\_\_\_ Specific applications should include:
- finding the area of a region
  - finding the volume of a solid with known cross sections
  - finding the average value of a function
  - finding the distance traveled by a particle along a line

**C. Fundamental Theorem of Calculus**

1. \_\_\_\_\_ Use the Fundamental Theorem to evaluate definite integrals
2. \_\_\_\_\_ Use the Fundamental Theorem to represent a particular antiderivative and the analytical and graphical analysis of functions so defined

**D. Techniques of Antidifferentiation**

1. \_\_\_\_\_ Use antiderivatives following directly from derivatives of basic functions
2. \_\_\_\_\_ Use antiderivatives by substituting variables (including change of limits for definite integrals)

**E. Applications of Antidifferentiation**

1. \_\_\_\_\_ Find specific antiderivatives using initial conditions, including applications to motion along a line
2. \_\_\_\_\_ Solve separable differential equations and use them in modeling. In particular, study the equation  $y' = ky$  and exponential growth

**F. Numerical Approximations to Definite Integrals**

1. \_\_\_\_\_ Use Riemann sums (using left, right, and midpoint evaluation points) and trapezoidal sums to approximate definite integrals of functions represented algebraically, graphically, and by tables of values

**A. Summarizing Data with Frequency Tables**

- 1. \_\_\_\_\_ Organize or normalize data into a frequency table or relative distribution table
- 2. \_\_\_\_\_ Construct a joint frequency contingency table from two categorical variables
- 3. \_\_\_\_\_ Construct a frequency polygon and a frequency curve from a frequency (or relative frequency) distribution
- 4. \_\_\_\_\_ Construct an objective given a relative cumulative frequency distribution

**B. Pictures of Data**

- 1. \_\_\_\_\_ Develop methods of displaying numerical data in a organized form
- 2. \_\_\_\_\_ Construct a histogram from a frequency distribution
- 3. \_\_\_\_\_ Distinguish between a histogram and a stem-and-leaf diagram
- 4. \_\_\_\_\_ Construct a bar graph from given data
- 5. \_\_\_\_\_ Construct a circle graph from given data
- 6. \_\_\_\_\_ Identify distortions (illustrations) in graphs or picture charts
- 7. \_\_\_\_\_ Plot points on a scattergram when given a bivariate distribution

**C. Measures of Center**

- 1. \_\_\_\_\_ Compute the mean, median, and mode for a set of numbers
- 2. \_\_\_\_\_ Describe common characteristics of the mean, median, and mode
- 3. \_\_\_\_\_ Compute harmonic and geometric means for a set of data
- 4. \_\_\_\_\_ Locate the relative positions of the mean, median, and mode on a skewed frequency distribution
- 5. \_\_\_\_\_ Describe how measures of dispersion differ from measures of central tendency
- 6. \_\_\_\_\_ Determine an appropriate measure of central tendency for data scaled on nominal, ordinal, interval, and ratio levels
- 7. \_\_\_\_\_ Explain why the mean is influenced by extreme values in a distribution while the median is relatively unaffected by extreme values

**D. Measure of Variation**

- 1. \_\_\_\_\_ Calculate the standard deviation
- 2. \_\_\_\_\_ Interpret the variance
- 3. \_\_\_\_\_ Interpret the mean deviation
- 4. \_\_\_\_\_ Distinguish among definitions of the range of a set of data
- 5. \_\_\_\_\_ Interpret the standard deviation from a given value of the variance for a variable
- 6. \_\_\_\_\_ Understand and use the 5-number summary including:
  - the minimum value
  - the first quartile
  - the median, or second quartile
  - the third quartile
  - the maximum value
- 7. \_\_\_\_\_ Compute the sum of the squares of the deviation scores
- 8. \_\_\_\_\_ Distinguish between “real” and “apparent” class intervals

- 9. \_\_\_\_\_ Interpret the meaning of an individual standard score relative to the distribution of concern
- 10. \_\_\_\_\_ Describe characteristics of the normal curve

**E. Measures of Position**

- 1. \_\_\_\_\_ Describe Z-score and T-score numerical distributions in terms of the mean and standard deviation
- 2. \_\_\_\_\_ Transfer raw scores into corresponding standard Z-scores
- 3. \_\_\_\_\_ Convert a set of Z-scores into a distribution of standard scores with any given mean and standard deviation
- 4. \_\_\_\_\_ Given a set of Z-scores, use characteristics of the normal curve to convert the Z-scores into percentile equivalents
- 5. \_\_\_\_\_ Given a percentile score, use the characteristics of the normal curve to transform the percentile to a standard Z-score
- 6. \_\_\_\_\_ Convert a set of Z-scores into a distribution of T-scores

**F. General Concepts**

- 1. \_\_\_\_\_ Define characteristics for levels of numerical scaling of numbers
- 2. \_\_\_\_\_ Use calculator / computer to compute

**Sample Lesson**  
**Kindergarten****Making Patterns**

**Objective:** The student will identify, create, copy, and extend patterns using objects and pictures.

**Materials:**

- chalk and chalkboard
- triangle and square blocks (or any 2 shapes)
- paper
- crayons

**Procedure:**

1. Draw a pattern on the chalkboard using triangles and squares.
2. Have children describe the pattern using the names of the shapes.
3. Have students name the shape(s) that would come next to continue the pattern.
4. Repeat with another pattern.
5. Have children create their own patterns using the triangles and squares.
6. Draw and color the pattern on paper.
7. Repeat the activity using different shapes.
8. As an extension, students exchange papers and have a partner extend the pattern.

**Assessment:**

- Teacher observations
- Pattern papers

**Resource:** [mathforum.org](http://mathforum.org)

Sample Lesson  
Grade 1

## Odd and Even Numbers

**Objectives:**

- To represent even and odd numbers concretely as pairs and left over ones.
- To identify even and odd numbers to 50.

**Materials:**

- Unifix Cubes
- Odd and Even mats, 1 for each student and 1 transparency
- Number cards 1-50
- Missing Mittens by Stuart J. Murphy

**Procedure:**

1. Advise students that today they will learn to identify odd and even numbers.
2. Ask children what comes in pairs.
3. Lead children to see that *pair* means two. (mittens, gloves, shoes, earrings, shoe laces)
4. Read children Missing Mittens by Stuart J. Murphy
5. As you read, ask children if they can predict what will come next in the story, where they think the missing mittens are, and what they notice about the number of mittens.
6. Pass out odd/even mats and unifix cubes.
7. Ask students to put 4 unifix cubes in front of them and make pairs.
8. Ask,
  - Were you able to make pairs?
  - Were there any left over?
9. Model making pairs using the overhead.
10. Explain that since there are pairs with none left over, 4 is an **even** number.
11. Then ask students to pull out 7 unifix cubes and make pairs.
12. Model on overhead and explain that since one cube is left over after making pairs, 7 is an **odd** number.
13. Continue with all the numbers to 10.
14. Write on the board in two separate columns: odd                      even
15. Place the number cards 1-10 on the board and ask volunteers to come to the board and place the number under the correct heading.
16. When all the cards are in place, ask students if they see a pattern in the odd and even numbers.
17. Lead students to recognize that even numbers end with digits 0, 2, 4, 6, 8 and odd numbers end with digits 1, 3, 5, 7, and 9.

18. Remind students that a number is even if no cubes are left over and odd if one cube is left over.
19. Repeat step #15 with larger numbers.

**Assessment:**

1. Ask students to explain how they know a number is even or odd.
2. Call out numbers to students and have them model on their place value mats.
3. Walk around and observe who can make pairs to identify even and odd numbers.
4. In a copybook or on a separate piece of paper, write a series of numbers. For example: 11, 14, 16, 17, 20, 22, 33, 39, 45, 18, 50
5. In their copybook or on the paper, have children fold the paper in half and set up 2 columns, odd and even, and write the numbers under the correct heading.
6. Collect and check.

**Internet site for odd and even numbers practice or center:**

[www.softschools.com/math/games/odd\\_even\\_number\\_game.jsp](http://www.softschools.com/math/games/odd_even_number_game.jsp)

Sample Lesson  
Grade 2

## Estimating, Counting, and Sorting

**Objectives:**

- Practice estimating, counting, and sorting.
- Write and solve math problems.
- Explore and appreciate the literature book, “The M & M’s Brand Chocolate Candies Counting Book” by Barbara Barbieri McGrath.

**Materials:**

- The children’s book “The M and M’s Brand Chocolate Candies Counting Book.”
- Pencils and paper
- Small bags of M and M’s candy (one for every two students)
- Internet access

**Procedure:**

1. Read “The M & M Brand Chocolate Candies Counting Book” to the children.
2. Discuss the concepts of estimation, simple addition, subtraction, forming sets, and color recognition mentioned in the book.
3. Distribute one small bag of M & M’s to each pair of children.
4. Have each group estimate “how many” M & M’s are in the bag and write their findings down on their paper.
5. The children will now open their bag, and take a real count of “how many” M & M’s there are in the bag.
6. The students will talk with their partner to see if how close they were to their estimate.
7. Have the students count how many of each color there are in the bag of M & M’s, and record their findings.
8. Discuss as a class:
  - Did all the bags have the same number of M & M’s?
  - Did all the bags have the same number of each color?
9. Send some children to the board to write addition and subtraction sentences, using the numbers recorded from the different colors of M & M’s.
10. The students can continue to practice these concepts at this website: [www.visualmathlearning.com](http://www.visualmathlearning.com). Click “Practice Exercises” and do the various games such as “Switcharoo Circle.”

**Assessment:**

- The teacher will observe the oral responses of the children.
- As one student from each group writes a number sentence at the board, students from the other groups can check to see if it is correct.

Sample Lesson  
Grade 3

## Multiplication Facts

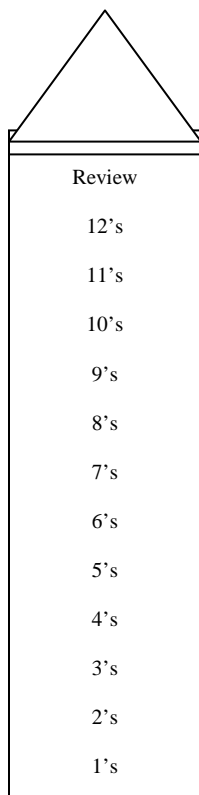
**Objective:** The students will practice and master multiplication facts.

**Procedure:**

1. Create a rocket ship, separating into 12 segments. One segment each for the 1's, 2's, 3's, 4's, 5's, 6's, 7's, 8's, 9's, 10's, 11's, 12's, and review. (ex. see rocket below)
2. Create an astronaut for each student. (you can find several in your clipart)
3. Make copies of 25 problems for each level. This website <http://www.math-drills.com> has worksheets of 100 problems for each level. You can cut the worksheets into 4 parts, creating 4 small sheets of 25 problems each.
4. Separate levels into files or envelopes.
5. Each day the students take a sheet depending on their level.
6. Students have 1 minute to finish 25 problems.
7. If they score 100%, they move up to the next level.

**Assessment:** Scores on each level and reaching the review level of the rocket ship

Rocket example



Sample Lesson  
Grade 4

## Angles

**Objective:** The students will determine the number of degrees for each angle of each pattern block by using the right angle of the square as a reference.

**Introduction:** Have the students examine the pattern blocks and discuss the definition of the various shapes. Stress that the square has four right angles (90).

**Materials:**

- Pattern blocks
- Pencil and paper

**Procedure:**

1. Have the students work individually with his or her own set of pattern blocks.
2. Have the student make a chart to record their data: the shape, the number of angles and the degree of the angles.
3. Have the student write a brief description of how he/she determined the angle.
4. Have the students measure their angle to check their accuracy and then record the measurement on their chart.

**Assessment:** The students would turn in their data chart with their recorded data, Measurements, and the description of their strategy.

**Source:**

Teaching Children Mathematics. December, 1995. Vol 2. #4. Reston: VA. NCTM.

Sample Lesson  
Grade 5

## Ratios

**Objective:** Students will use a ratio to describe a relationship between two numbers.

**Materials:**

- Colored chips
- Pencil and paper

**Procedure:**

1. Review what students know about fractions. Give each student a handful of colored chips. Have each student write down the number of chips of each color. Have students write down the fraction of chips of each color. Discuss the role of the numerator (describes part) and the denominator (describes whole – or total number of chips).
2. Ask all girls to stand. Tally the number of girls on the board. Ask boys to stand. Tally the number of boys on the board. Represent the number of girls and boys as fractions of the whole group. Introduce the idea of ratio. (*What if we want to compare the number of girls to boys? Could we just say 11 to 13... Can we compare the number of boys to girls? Let's see what will happen if we have 13 to 11...*)
3. Have the students work individually with his/her own set of colored chips.
4. Have the student lineup chips on his/her desk, according to color. (One color should be lined up above the other color. A pencil may be used to separate the two colors and to represent the fraction bar.)
5. Discuss the definition of ratio (describes the relationship between two numbers). Compare ratios to fractions. (Similarities should include: they look alike, they can both be reduced. Differences should include: fractions tell part-to-whole relationship, while ratios tell part-to-part relationship, we read them differently when reading aloud, ratios cannot be represented as a mixed number.)
6. Have students read the ratio of colored chips on his/her desk aloud, reducing if possible. Have the students write down the ratio.
7. Have students change desks and write down the ratio on another desk. Repeat until students grasp concept.

**Assessment:** Students will be able to describe the ratio of boys to girls and girls to boys in the class (without reverting to a mixed number).

## Math Websites

[www.Math.about.com](http://www.Math.about.com)

A website with something for everyone—lesson plan ideas, online games and links, all ages and levels.

[www.AtoZteacherstuff.com](http://www.AtoZteacherstuff.com)

Teacher-created site designed to help teachers find online resources more quickly and easily. Find lesson plans, thematic units, teacher tips, discussion forums for teachers, downloadable teaching materials & eBooks, printable worksheets and blacklines, emergent reader books, themes, and more.

[www.teachers.net/](http://www.teachers.net/)

Lesson plans, links, webchats, and numerous other resources for the educator

[www.edhelper.com](http://www.edhelper.com)

Create worksheets and design lesson plans using their worksheets and other information—grade levels from Pre-K to high school

[www.visualmathlearning.com](http://www.visualmathlearning.com)

A variety of resources are available to help educators and trainers learn about visual learning and Inspiration<sup>®</sup>, Kidspiration<sup>®</sup> and the new InspireData<sup>™</sup>.

[www.brainpopjr.com](http://www.brainpopjr.com)

BrainPOP Jr. provides educational movies and homework help for K-3 students. Each animated movie has quizzes, games, vocabulary, and activities for kids. BrainPOP Jr. is a great resource for teachers and homeschools, offering lesson plans and lesson ideas that develop critical thinking and inquiry skills.

[www.mathforum.org/teachers/elem/](http://www.mathforum.org/teachers/elem/)

Just about anything you need to teach math at any age level.

[www.eding.k12.mn.us/creekvalley.com](http://www.eding.k12.mn.us/creekvalley.com)

Assortment

[www.aaamath.com/](http://www.aaamath.com/)

Assortment

[www.guernsey.net/~sgibbs/roman.html](http://www.guernsey.net/~sgibbs/roman.html)

Roman Numeral conversions

<http://illuminations.nctm.org/LessonDetail.aspx?ID=L406>

Geometric shapes

[www.sesameworkshop.org/sesamestreet/games/flash.php?contentId=110740](http://www.sesameworkshop.org/sesamestreet/games/flash.php?contentId=110740)

Sorting PreK- 1 or 2

[www.teachrkids.com/](http://www.teachrkids.com/)

Assortment

[www.geocities.com/EnchantedForest/Tower/1217/math1.html](http://www.geocities.com/EnchantedForest/Tower/1217/math1.html)

Assortment

[www.shodor.org/interactivate/activities/tessellate/?version=1.6.0\\_05&browser=MSIE&vendor=Sun\\_Microsystems\\_Inc.](http://www.shodor.org/interactivate/activities/tessellate/?version=1.6.0_05&browser=MSIE&vendor=Sun_Microsystems_Inc.)

Tessellations

[cemc2.math.uwaterloo.ca/mathfrog/english/kidz/order.shtml](http://cemc2.math.uwaterloo.ca/mathfrog/english/kidz/order.shtml)

Order of operations

[school.discoveryeducation.com/searchresults.cfm?N=0&Nty=1&Ntk=all&blnPublic=1&Ntt=math](http://school.discoveryeducation.com/searchresults.cfm?N=0&Nty=1&Ntk=all&blnPublic=1&Ntt=math)

Assortment

[www.stccs.org/education/components/docmgr/default.php?sectiondetailid=324&catfilter=44](http://www.stccs.org/education/components/docmgr/default.php?sectiondetailid=324&catfilter=44)

Addition, subtraction, multiplication and division practice worksheets

[www.math-drills.com](http://www.math-drills.com)

Practice math skills

[A+ Math.com](http://A+Math.com)

Practice math skills

[Dude's Dilemma.com](http://Dude's Dilemma.com)

Practice math skills

[Math Skills Builder.com](http://Math Skills Builder.com)

Practice math skills

[Spacey Math.com](http://Spacey Math.com)

Practice math skills

[Rainforest Math.com](http://Rainforest Math.com)

Practice math skills

[www.harcourtschool.com/menus/math\\_advantage.html](http://www.harcourtschool.com/menus/math_advantage.html)

Concept Definitions across grade levels

[www.mathgoodies.com/lessons/vol1/perimeter.html](http://www.mathgoodies.com/lessons/vol1/perimeter.html)

Geometry website

[www.iit.edu/~smile/ma9517.html](http://www.iit.edu/~smile/ma9517.html)

Introduction to volume

[www.sdcoe.k12.ca.us/score/actbank/sjournal.htm](http://www.sdcoe.k12.ca.us/score/actbank/sjournal.htm)

Journaling

[www.nhusd.k12.ca.us/ALVE/ace/MATH/Math\\_Puzzles.html](http://www.nhusd.k12.ca.us/ALVE/ace/MATH/Math_Puzzles.html)

Math Puzzles

[aaamath.com/](http://aaamath.com/)

Measurement

[library.thinkquest.org/3804/](http://library.thinkquest.org/3804/)

Metric Matters

[www.dositey.com/math34.htm](http://www.dositey.com/math34.htm)

Math worksheets for 4th grade

[www.homeschoolmath.net/worksheets/grade\\_4.php](http://www.homeschoolmath.net/worksheets/grade_4.php)

More math worksheets for 4th grade

[www.berghuis.co.nz/abiator/maths/mcindex.html](http://www.berghuis.co.nz/abiator/maths/mcindex.html)

Place value and problem solving

[jc-schools.net/terranova-res.htm](http://jc-schools.net/terranova-res.htm)

Terra Nova practice skills

[www.blountk12.org/LearningLinks/terranova.htm](http://www.blountk12.org/LearningLinks/terranova.htm)

Terra Nova information and practice

[www.thelearningpage.org/fun\\_sites/CappsG\\_TerraNova.htm](http://www.thelearningpage.org/fun_sites/CappsG_TerraNova.htm)

Terra Nova math practice

[www.iit.edu/~smile/ma9315.html](http://www.iit.edu/~smile/ma9315.html)

What's my area- a lesson plan for teachers

[www.harcourtschool.com/menus/math\\_advantage.html](http://www.harcourtschool.com/menus/math_advantage.html)

Concept Definitions across grade levels

[www.mathgoodies.com/lessons/vol1/perimeter.html](http://www.mathgoodies.com/lessons/vol1/perimeter.html)

Geometry website

[www.lessonplanspage.com/Math45.htm](http://www.lessonplanspage.com/Math45.htm)

Great math lessons (various skills)

[www.iit.edu/~smile/ma9517.html](http://www.iit.edu/~smile/ma9517.html)

Introduction to volume

[www.learningplanet.com/](http://www.learningplanet.com/)

Learning Planet

[www.scholastic.com/](http://www.scholastic.com/)

Scholastic

[www.sheppardsoftware.com/web\\_games.htm](http://www.sheppardsoftware.com/web_games.htm)

State Games

[www.ecokids.ca/pub/index.cfm](http://www.ecokids.ca/pub/index.cfm)

Eco Kids

[yucky.discovery.com/noflash/fun\\_n\\_games/category\\_icky.html](http://yucky.discovery.com/noflash/fun_n_games/category_icky.html)

Discovery Kids Yucky Lab Activities

[www.brainpop.com/](http://www.brainpop.com/)

Brain Pop

[www.funbrain.com/](http://www.funbrain.com/)

Funbrain.com

[www.learningplanet.com/act/mayhem/](http://www.learningplanet.com/act/mayhem/)

Math Mayhem

[www.visualfractions.com/](http://www.visualfractions.com/)

Visual Fractions – Online Visual Fraction Tutorial

[nces.ed.gov/nceskids/index.asp](http://nces.ed.gov/nceskids/index.asp)

National Center for Education Statistics

[www.coolmath4kids.com/](http://www.coolmath4kids.com/)

Cool Math 4 Kids

[nces.ed.gov/nceskids/createagraph/](http://nces.ed.gov/nceskids/createagraph/)

Create a graph

[www.multiplication.com/interactive/quickflash/flash/index.html](http://www.multiplication.com/interactive/quickflash/flash/index.html)

Multiplication Tables Practice

[www.coolmath-games.com/lemonade/](http://www.coolmath-games.com/lemonade/)

Lemonade Stand

[www.eduplace.com/math/brain/](http://www.eduplace.com/math/brain/)

Brain Teasers

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**Additional Resources for 4th Grade Teachers**

**Books**

4th Grade Math Practice (Scholastic) (Paperback)- by [Terry Cooper](#) (Editor)

[Math Strategies You Can Count On: Tools & Activities To Build Math Appreciation, Understanding & Skills](#) by Char Forsten

[Math Dictionary for Kids: The Essential Guide to Math Terms, Strategies, and Tables](#) by Theresa R. Fitzgerald