

## Number/Computation

### MIDDLE SCHOOL MATHEMATICS EXIT PERFORMANCE STANDARD 1:

Student will consistently and accurately apply number sense and order relationships in problem solving situations to perform estimations and/or calculations involving different kinds and forms of rational numbers (fractions, decimals, percents, integers, exponents, square roots, ratios, proportions, etc.) with and without calculators and will communicate the reasoning used in solving these problems.

*Based on Kentucky's Core Content for Mathematics Assessment, the Kentucky Program of Studies, and Academic Expectations: 1.5-1.9 Mathematical Communication & Reasoning, 1.16 Technology, 2.7 Number, 2.8 Procedures, 2.11 Change, 2.12 Structure; Goal 5 Think & Solve Problems; & Goal 6 Connect & Integrate Knowledge*

### 6<sup>th</sup> Grade Number/Computation Standards

- \* **NC6.1** Show number sense by explaining, demonstrating, and modeling positional value of fractions and decimals (place value, number line).
- \* **NC6.2** Understand and apply number theory concepts to solve problems (factors, primes, multiples, divisibility).
- \* **NC6.3** Use models and real-world investigations to develop operations (+,-,x,/) for fractions and decimals.
- \* **NC6.4** Compute using estimation or mental math when method is appropriate (e.g. add  $\frac{1}{2} + \frac{5}{6}$  mentally or on paper but may opt to add  $\frac{13}{24} + \frac{57}{68}$  on a calculator).

### Skills, Concepts & Relationships

- \* Use mental math: computation/estimation skills (clustering/front end/break apart/rounding/compatible numbers) (G1 ch1)
- Develop order of operations with whole numbers (x,/,+,-) (24 Game) (G1 ch1)
- \* Determine place value of large and small numbers (expanded notation) (G1 ch2.1, 3,5)
- \* Read, write, identify, & round decimals to the 10,000ths (place value, 10x10 grids, base 10 blocks) (G1 ch3) (BP1)
- \* Locate & plot decimals to the 10,000ths on number line (G1 ch3) (BP1)
- \* Use a 4-function calculator (+,-,x,/) to solve problems with large numbers, fractions, and decimals in problem solving (supplement) (BP1)
- Develop and use Commutative, Associative, Distributive, and Identity properties (zero and one) (G1 ch4 & supplement)
- \*\* Review multiplying 3-digit by 2-digit whole numbers in real-world problems (estimate reasonable products, then check with or without a calculator) (G1 ch4)
- \* Determine the effect that multiplying by a decimal has on the product (10x10 grids, base 10 blocks) (G1 ch4) (BP1)
- Introduce positive exponents (G1 ch4)
- \* Recognize, use & understand square numbers (G1 ch4 & supplement) (CS) (PT)
- Introduce square roots of perfect squares through 169 & calculator use to compute square roots (G1 ch4 & supplement)
- \*\* Review division with 2-digit whole number divisors in real world problems (estimate reasonable quotients then check with or without a calculator) (G1 ch5)
- Introduce/determine the effect dividing by a decimal (to the 100ths) has on the quotient (10x10 grids, base 10 blocks) (G1 ch5) (BP1)
- \*\* Review generating equivalent fractions, writing fractions in the simplest form, determining equal ratios, and changing improper fractions to mixed numbers (G1 ch1,6&10)(BP1)
- \* Find factors and the Greatest Common Factor-GCF (use divisibility rules) (G1 ch6, PT)
- \* Find multiples and the Least Common Multiple-LCM (use multiplication tables) (G1 ch6)(PT)
- \* Find prime factorization (primes, composites) (tree model, repeated addition, etc.) (G1 ch6)(PT)
- Develop converting fractions/mixed numbers to repeating/terminating decimals using a calculator (G1 ch6) (BP1)
- Develop comparing and ordering rational numbers (whole numbers, fractions, decimals, integers) using relations of equality and inequality (<>=, order on a number line) (G1 ch6) (BP1)
- \* Add & subtract commonly encountered (cooking, stock market, ruler, etc.) fractions with and without common denominators (add  $\frac{1}{2} + \frac{5}{6}$  mentally or on paper but may opt to add  $\frac{13}{24} + \frac{57}{68}$  on a calculator) (tangrams, pattern blocks, fraction strips) (G1 ch7) (BP1)
- Introduce adding & subtracting commonly encountered (cooking, stock market, ruler, etc.) mixed numbers (estimate reasonable sums or differences then check with or without calculator) (G1 ch7) (BP1)
- \* Use models to solve real world problems using fractions & decimals (10x10 grids, base 10 blocks, tangrams, pattern blocks, fraction circles, fraction strips, geoboards, etc.) (G1 ch7,8) (BP1)
- Develop determining the effect multiplying or dividing commonly encountered fractions less than one or mixed numbers greater than one have on the product or quotient (tangrams, pattern blocks, fraction strips, fractions circles, geoboards, etc.) (G1 ch8) (BP1)
- Introduce basic concept of percent (one out of one hundred) (one hundred bead circles, 10x10 grids) (G1 ch10) (BP1)
- Introduce integers and their opposites (number line, thermometer, loss - gain, etc.) (G1 ch12)

**G1--Glencoe Course 1; Connected Math: PT--Prime Time, BP1--Bits & Pieces I, CS--Covering & Surrounding**

## Geometry/Measurement

**MIDDLE SCHOOL MATHEMATICS EXIT PERFORMANCE STANDARD 2:**

Student will apply properties of measurement (perimeter and area of triangles, quadrilaterals, circles, polygons, and irregular shapes; volume and surface area of prisms and cylinders; weight; temperature, etc.) and will use geometric concepts, properties and relationships (proportionality of similar figures, sum of triangle measures equals 180 degrees, transformations in the coordinate plane, etc.) in problem solving situations and communicate the reasoning used in solving these problems.

*Based on Kentucky's Core Content for Mathematics Assessment, the Kentucky Program of Studies, and Academic Expectations: 1.5-1.9 Mathematical Communication & Reasoning, 1.16 Technology, 2.8 Procedures, 2.9 Space and Dimensionality, 2.10 Measurement, 2.11 Change, 2.12 Structure; Goal 5 Think & Solve Problems; & Goal 6 Connect & Integrate Knowledge*

**6<sup>th</sup> Grade Geometry/Measurement Standards**

- \* **GM6.1** Determine whether estimation or accurate measurement is appropriate for a task and select the appropriate standard or non-standard tools to use.
- \* **GM6.2** Recognize & use symmetry, including sketching plane figures with multiple lines of symmetry.
- \* **GM6.3** Use metric & customary tools to measure length, perimeter, area, weight, and temperature.
- \* **GM6.4** Recognize and classify line segments, rays, planes, points, special quadrilaterals, special triangles, and regular polygons.

**Skills, Concepts & Relationships**

- \*\* Review basic geometric terms: point, line, line segment, ray, plane (SD)
- \* Read measurement tools: ruler, scale, etc. (G1 ch3.3) (CS)
- \* Measure length in Metric units to the nearest mm (G1 ch3.3) (CS)
- \*\* Review calculating perimeter of regular and irregular polygons (G1 ch3.10&4.6) (CS Inv1&2)
- \* Define circles and their terms: center, radius, diameter, chord (G1 ch4.9) (SD)
- \* Use Metric units to measure mass and capacity (liters, grams, ml) (G1 ch5.5)
- \* Convert Metric units to Metric units (kilo, hecto, deka, basic unit, deci, cent, milli) (G1 ch5.6)
- \* Recognize relationships in constant perimeter and area problems (G1 ch6.2) (CS Inv3&4)
- \* Measure length in U.S. Customary units to the nearest 16th of an inch (G1 ch6.7)
- \* Convert U.S. Customary units to U.S. Customary units (inch to feet to yard, fl. oz. to cup to pint to quarts to gallons, etc.) (G1 ch8.8)
- \* Use U.S. Customary units to measure mass & capacity (oz., lb., ton, tsp., fl. oz., cup, etc.) (G1 ch8.8)
- \*\* Review defining angles & their terms: vertex, side, degree, ray (G1 ch9.1) (SD)
- \* Use a protractor or angle ruler to measure and draw angles (G1 ch9.1) (SD)
- \*\* Classify angles: acute, obtuse, right, straight (G1 ch9.1) (SD)
- Develop the following relationships: the sum of measures of the angles of a triangle equals 180 degrees, and sum of measure of the angles of a quadrilateral equals 360 degrees (tear edges to form straight line-180, or circle 360)(supplement) (SD Inv4)
- \*\* Review characteristics of lines: parallel, perpendicular (G1 ch9.5&supplement)
- \* Classify polygons; special quadrilaterals: square, rectangle, rhombus, trapezoid, parallelogram; special triangles: acute, right, obtuse, scalene, isosceles, equilateral (pattern blocks, tangrams, polystrips, alphashapes) (G1 ch9.5&supplement) (SD)
- \* Create and use Venn Diagrams to solve problems (G1 ch9.6)
- \* Sketch multiple lines of symmetry (use MIRA, patty paper)(G1 ch9.7) (SD) (RM Inv3)
- \* Slide figures in a plane (translations) (G1 ch9.8) (SD)
- \* Tile a figure or pattern across a plane (tesselations) (G1 ch9) (SD Inv4) (CS)
- \*\* Review finding area of squares, rectangles, and triangles (use pentominoes, tangrams, color tiles, graph paper, etc.) (G1 ch4.6,11.1&11.2) (CS Inv1-6)
- Develop finding area of irregular shapes (over-estimate, under-estimate, use graph paper) (G1 ch11.1) (CS Inv1&2)
- \* Define geometric solids and their terms: cubes, rectangular and triangular prisms, cylinders, cones, pyramids, spheres, bases, vertices, edges, faces, etc. (G1 ch11.4&supplement)

**G1--Glencoe Course 1; Connected Math: SD--Shapes and Designs, CS--Covering & Surrounding Inv1-6, RM--Ruins of Montarek**

**Probability/Statistics**

**MIDDLE SCHOOL MATHEMATICS EXIT PERFORMANCE STANDARD 3:**

Student will use data collection & analysis, graphing (multiple line and bar graphs, circle graphs, stem and leaf plots, box and whisker plots, etc.), statistics (mean, median, mode, range, outliers, quartiles, etc.), and experimental & theoretical probabilities to solve real world problems and communicate the reasoning used in solving these problems.

*Based on Kentucky's Core Content for Mathematics Assessment, the Kentucky Program of Studies, and Academic Expectations: 1.5-1.9 Mathematical Communication & Reasoning, 1.16 Technology, 2.7 Number, 2.8 Procedures, 2.11 Change, 2.12 Structure, 2.13 Probability & Statistics; Goal 5 Think & Solve Problems; & Goal 6 Integrate Knowledge*

### 6<sup>th</sup> Grade Probability/Statistics Standards

\* **PS6.1** Collect, compile, compare, and display data (line graph, bar graph, line plot) to interpret situations.

\* **PS6.2** Apply range and measures of central tendency (mean, median, mode) to solve real life problems.

### Skills, Concepts & Relationships

- \* Organize data into tables and construct graphs of data (G1 ch2) (DA)
- \* Construct and interpret: tables, charts, pictographs, bar graphs, line graphs, line plots (G1 ch2&supplement) (DA)
  - Develop interpreting relationship between tables and graphs (G1 ch2.3) (DA)
- \* Choose appropriate scales and intervals when making graphs (G1 ch2.4) (DA)
- \* Make predictions and draw conclusions from data and graphs of data (G1 ch2.6&2.8) (DA)
- \* Select an appropriate graph to represent given data (supplement) (DA)
- \* Gather, organize, and interpret large sets of data (supplement) (DA)
- \* Apply mean, median, mode and range to solve problems (G1 ch2.4&2.7) (DA)
  - Introduce organizing information on a spreadsheet and making appropriate computer generated graphs.(G1 ch2.3&4.5)
  - Introduce accessing information from electronic sources (internet, CD Rom, etc.) (supplement)
  - Introduce basic circle graphs (use 360 bead circles, angle rulers) (G1 ch11.3) (DA)
- \*\* Review conducting simple probability experiments (games of chance, fair games) (spinners, number cubes, cards, coins, counters, etc.)(G1 ch14) (HL)
  - Develop using fractions and decimals to describe the probability of an event (0=impossible and 1=certain) (G1 ch14) (HL)

**G1--Glencoe Course 1; Connected Math: DA--Data About Us, HL--How Likely Is It?**

## Algebraic Ideas

### **MIDDLE SCHOOL MATHEMATICS EXIT PERFORMANCE STANDARD 4:**

Student will discover, explore, describe, and generalize patterns (linear, exponential and simple quadratic), represent and analyze algebraic relationships using tables, graphs in the coordinate plane, variables, expressions and equations in problem solving situations and communicate the reasoning used in solving these problems.

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### 6<sup>th</sup> Grade Algebraic Ideas Standards

- \* **AI6.1** Recognize, create, and continue geometric and numeric patterns (give an informal description for the continuance of the pattern and/or generalize patterns through a verbal rule).
- \* **AI6.2** Solve one-step equations informally with concrete and/or pictorial methods.

#### Skills, Concepts & Relationships

- Develop the concepts of variables, expressions, and equations (G1 ch1.7)
- \* Solve problems involving simple formulas ( $A=lw$ ,  $P=2l+2w$ ) (G1 ch4.7)
- Explore number patterns on the calculator using the constant key (G1, ch6)
- \* Use diagrams and or manipulatives to recognize, create, continue and generalize patterns (Pattern Block Trains) (G1 ch9.6,13.4&supplement) (CS Inv3&4) (SD Inv4) (RM Inv3)
- Develop coordinate graphing (4 quadrants, x/y coordinates, plot ordered pairs) (G1 ch12.8) (DA Inv4)
- \* Solve one-step algebraic equations using addition, subtraction, multiplication, & division with whole numbers (balance scale, open sentences, "Hands-On" equations, algebra tiles, cups & counters) (G1 ch13.1&13.2)
- \* Use input-output tables and function machines to generalize number patterns (G1 ch13.4)
- Introduce using spreadsheet formulas to represent patterns (G1 ch13.4)

**G1--Glencoe Course 1; Connected Math: SD--Shapes and Designs Inv4, CS--Covering and Surrounding Inv3&4, RM--Ruins of Montarek Inv3, DA—Data About Us Inv4**

## Number/Computation

### MIDDLE SCHOOL MATHEMATICS EXIT PERFORMANCE STANDARD 1:

**Student will consistently and accurately apply number sense and order relationships in problem solving situations to perform estimations and/or calculations involving different kinds and forms of rational numbers (fractions, decimals, percents, integers, exponents, square roots, ratios, proportions, etc.) with and without calculators and will communicate the reasoning used in solving these problems.**

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### 7<sup>th</sup> Grade Number/Computation Standards

- \* **NC7.1 Show number sense by modeling, communicating and applying multiple representations and equivalent relationships of real numbers (fractions, decimals, percents, integers, pi, etc.)**
- \* **NC7.2 Use models and real world investigations to read, write, compare, order, and apply operations for computation involving fractions, decimals, percents and ratios.**
- \* **NC7.3 Use order of operations including ( )'s to solve problems with rational numbers (fractions, decimals, percents, integers).**
- \* **NC7.4 Apply ratios, percents, and proportional reasoning to solve problems dealing with rates, scaling (scale factor), similarity and a constant change factor.**

### Skills, Concepts & Relationships

- \* Use estimation to determine the reasonableness of answers (G2 ch1) (DU) (CP)
- \* Use order of operations with ( )'s (G2 ch1)
- \* Round to the required or appropriate degree of precision (G2 ch2.2&2.8)
- \* Determine the effect multiplying or dividing by a decimal has on the product or quotient (10x10 grids, base 10 blocks) (estimate reasonable answers then check with or without a calculator) (G2 ch2.7) (BP2)
  - Explore exponents (cubic numbers: 1, 8, 27, 64, 125) (G2 ch1,2, 9&10)
  - Introduce scientific notation (G2 ch2&7) (DU Inv4)
- \*\* Review applications of fraction and decimal computation in real world situations (G2 ch2&5) (BP2 Inv1&6) (DU)
- \*\* Review divisibility rules (G2 ch4&5)
- \* Convert fractions/mixed numbers to repeating/terminating decimals (G2 ch4.7)
- \* Add & subtract commonly encountered (cooking, stock market, ruler, etc.) fractions and mixed numbers with and without common denominators (estimate sums and differences then check with or without a calculator) (tangrams, pattern blocks, fraction circles, geoboards) (G2 ch5.3&5.4) (BP2 Inv3&4)
- \* Determine the effect multiplying or dividing by commonly encountered fractions less than one or mixed numbers greater than one have on the product or quotient (tangrams, pattern blocks, fraction circles, geoboards, etc.) (G2 ch5.5,5.9&5.10) (BP2 Inv5)
  - Develop recognizing and using properties: Commutative, Associative, Distributive, Inverse, and Identity of zero and one (G2 ch5)
  - Explore an approximation of pi as an example of an irrational number (G2 ch5.7&9.8)
- \* Determine the opposite of an integer (absolute value, number line, positive-negative, have money-owe money, etc.) (G2 ch7) (AN Inv1)
- \* Add & subtract integers (integer chips, number line, algeblock mat, etc.) (G2 ch7) (AN Inv1&2)
  - Develop multiplying & dividing integers (look for patterns) (G2 ch7) (AN Inv3&4)
  - Develop finding and approximating square roots using a calculator (recognize perfect squares to 169) (G2 ch9.1&9.2)
- \* Compare, order, and convert among decimals, fractions, and percents (10x10 grids, base 10 blocks, etc.) (G2 ch11) (BP2)
- \* Recognize and define ratio, proportion, and percent (10x10 grids, base 10 blocks)(G2 ch11) (CP) (BP2)
- \* Apply ratios and proportional reasoning to solve problems dealing with rates, scaling, similarity and a constant change factor (G2 ch11.2-11.5) (CP Inv6)
- \* Solve percent problems using proportions (G2 ch12.4) (CP) (BP2)
- \* Determine percent of change in real world problems (G2 ch12.7) (BP2)
- \* Calculate sale price, simple interest, discounts and commission (G2 ch12.8&12.9) (CP) (BP2)
  - Develop use of calculators to explore exponents (G2 ch1), order of operations (G2 ch1), reciprocal (inverse) key, number patterns (G2 ch4.3), pi key (G2 ch5), square roots (G2 ch9), and scientific notation (G2 ch2&7)
  - Develop use of a spreadsheet to perform calculations (G2 ch1.9,4.1&12.9)

**G2--Glencoe Course 2; Connected Math: BP2--Bits & Pieces II, CP--Comparing & Scaling, AN--Accentuate the Negative, DU--Data Around Us**

## Geometry/Measurement

### MIDDLE SCHOOL MATHEMATICS EXIT PERFORMANCE STANDARD 2:

Student will apply properties of measurement (perimeter and area of triangles, quadrilaterals, circles, polygons, and irregular shapes; volume and surface area of prisms and cylinders; weight; temperature, etc.) and will use geometric concepts, properties and relationships (proportionality of similar figures, sum of triangle measures equals 180 degrees, transformations in the coordinate plane, etc.) in problem solving situations and communicate the reasoning used in solving these problems.

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#### 7<sup>th</sup> Grade Geometry/Measurement Standards

- \* **GM7.1** Describe, draw, classify, and analyze regular and irregular two-dimensional figures; recognize translations & reflections; and recognize proportional relationships in similar figures.
- \* **GM7.2** Apply the concepts of perimeter and area to two-dimensional shapes: using the formula for the area of rectangles, determine and use formulas for perimeter and area of triangles, parallelograms and trapezoids; determine the area and perimeter of irregular shapes by subdivision using manipulatives; and determine with manipulatives formulas for circumference and area of circles to apply in problem situations.
- \* **GM7.3** Recognize the following relationships: the sum of measures of the angles of a triangle equals 180 degrees, and the sum of measures of the angles of a quadrilateral equals 360 degrees.

#### Skills, Concepts & Relationships

- \*\* Review basic geometric terms: point, line, line segment, ray, plane (supplement)
- \*\* Review conversions within the same measurement system(G2 ch2.9&6.6)
- \* Matching congruent figures and parts of figures (G2 ch8.1) (SD)
  - Introduce angle pair classification: supplementary, complementary, etc. (supplement)
- \* Classify polygons; special quadrilaterals: square, rectangle, rhombus, trapezoid, parallelogram; special triangles: acute, right, obtuse, scalene, isosceles, equilateral (G2 ch8.2,8.3) (SD)
- \* Use a compass and an angle ruler (G2 ch8.2,8.4) (SD)
  - Introduce performing simple constructions (construct congruent lines and angles, angle bisectors, perpendicular bisector of a segment, circle with given radius, perpendicular line through a point on or off a given line, construct regular polygons,etc.) (compass, patty paper)(G2 ch8)
- \* Recognize the following relationships: the sum of measures of the angles of a triangle is 180 degrees and that the sum of the measures of the angles of a quadrilateral is 360 degrees (tear edges to form straight line-180, or circle-360) (G2 ch8.2) (SD Inv4)
- \* Translate and reflect figures (slide, flip) (MIRA, patty paper)(G2 ch8.7&8.8) (CS)
- \* Find perimeter and area of special triangles and special quadrilaterals (color tiles, graph paper)(G2 ch9)(CS Inv5&6)
- \* Determine and use formulas for area of triangles, parallelograms, and trapezoids and recognize how they are related to the formula for the area of a rectangle (geoboards, graph paper) (G2 ch9.7)(CS Inv5&6)
- \* Find area of regular and irregular shapes (over-estimate, under-estimate, use graph paper) (G2 ch9.6)(CS Inv2)
- \* Determine circle measurements (circumference, area, radius, diameter) and relationships among them (develop formulas through investigations with string, graph paper, etc.) (G2 ch5.7&9.8) (CS Inv7)
- \* Use square units correctly (G2 ch9) (CS)
  - Introduce volume and surface area of cubes, prisms, and cylinders(cubes, pentomino “open-top boxes”, nets, isometric dot paper drawings) (G2 ch10) (FW Inv1&2)
- \*\*Review geometric solids and their terms: base, vertices, edges, faces, cubes, rectangular prisms, triangular prisms, cylinders, cones, pyramids, and spheres (G2 ch10&supplement) (FW)
- \* Recognize measures of similar figures have equal ratios (expand, contract) (G2 11.4) (SS Inv2&3)

**G2--Glencoe Course 2; Connected Math: SS--Stretching & Shrinking Inv2&3, CS—Covering & Surrounding Inv5-7, SD--Shapes & Designs, FW--Filling & Wrapping Inv1&2**

## Probability/Statistics

**MIDDLE SCHOOL MATHEMATICS EXIT PERFORMANCE STANDARD 3:**

Student will use data collection & analysis, graphing (multiple line and bar graphs, circle graphs, stem and leaf plots, box and whisker plots, etc.), statistics (mean, median, mode, range, outliers, quartiles, etc.), and experimental & theoretical probabilities to solve real world problems and communicate the reasoning used in solving these problems.

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**7<sup>th</sup> Grade Probability/Statistics Standards**

- \* **PS7.1** Collect, compile, compare and display data (multiple line graph, double bar graph, line plot, stem and leaf plot, circle graph, histogram) to analyze and interpret situations.
- \* **PS7.2** Make predictions and evaluate conclusions based on statistical analysis (misleading statistics & graphs).
- \* **PS7.3** Determine probabilities by constructing sample space and conducting probability experiments.

**Skills, Concepts & Relationships**

- Develop organizing information on a spreadsheet and making appropriate computer generated graphs (G2 ch1.9)
- \*\* Review choosing appropriate scales and intervals when graphing (G2 ch3.3)
- \*\* Review applications of measures of central tendency (G2 ch3.5&3.7)
- \* Recognize misleading representations of statistics (validity/bias) (G2 ch3.8)
- Develop outliers effect on mean and median (dispersion/variance) (G2 ch3.4)
- \* Construct and interpret: line plots, stem and leaf plots, multiple line graphs, double bar graphs, circle graphs, histograms (G2 ch3.4,3.6,12.6&supplement) (WD Inv1-4)
- Develop accessing information from a database (G2 ch3.2)
- \* Construct tree diagrams and area models to analyze theoretical probability (G2 ch9.9&13.1) (WD Inv1-4)
- \* Recognize and use the Fundamental Counting Principle (multiply number of choices for each item to get total possible outcomes) (G2 ch13.3)
- \* Determine theoretical and experimental probability (G2 ch13.3) (WD Inv1-4)
- \* Express probability as a fraction, decimal and percent (G2 ch13&supplement) (WD1-4)
- \* Determine probability by designing and conducting experiments (spinners, number cubes, cards, coins, counters, etc.) (G2 ch13.4&supplement) (WD Inv1-4)
- \* Predict and draw conclusions from experiments and statistics (fair and unfair games)(G2 ch13.1&13.5) (WD Inv1-4)
- \* Design a statistical study to investigate a problem, conduct the study and interpret and communicate the outcomes (supplement)
- Introduce Law of Large Numbers (more experimental trials should get closer to theoretical probability) (supplement) (WD Inv1-4)
- \* Gather, organize, represent, analyze, and interpret large sets of data (G2 ch13.5 & supplement)
- \* Determine the probability of two independent events (G2 13.6) (WD Inv1-4)
- Introduce graphing calculator for line graphs and histograms (supplement)
- Develop sampling techniques (supplement)
- Introduce box and whisker plots (supplement)

**G2--Glencoe Course 2; Connected Math: WD—What Do You Expect? Inv. 1-4**

**Algebraic Ideas**

**MIDDLE SCHOOL MATHEMATICS EXIT PERFORMANCE STANDARD 4:**

Student will discover, explore, describe, and generalize patterns (linear, exponential and simple quadratic), represent and analyze algebraic relationships using tables, graphs in the coordinate plane, variables, expressions and equations in problem solving situations and communicate the reasoning used in solving these problems.

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### 7<sup>th</sup> Grade Algebraic Ideas Standards

\* **AI7.1** Recognize, create, continue and generalize numeric and geometric patterns by giving the rule for any term in the pattern.

\* **AI7.2** Solve one-step equations with whole numbers, and simple decimals, fractions and percents using concrete, pictorial, and abstract methods (variables).

\* **AI7.3** Translate from concrete, pictorial and verbal expressions to algebraic expressions and vice versa.

### Skills, Concepts & Relationships

\* Recognize, define, and use the concepts of variables, expressions, and equations (open sentences, cups and counters, balance scale, "Hands-On" equations, etc.) (G2 ch1.8,6.4&6.5) (VP)

- Develop simplifying expressions (combining like terms) (G2 ch1.8&7.7) (MS)

\* Recognize number patterns (sequences, square numbers, triangular numbers, etc.) (G2 ch4.3) (VP) (MS)

\* Solve one-step equations with simple fractions, decimals, and percents using models and symbolically (balance scale, open sentences, algebra tiles, cups and counters, "Hands-On equations, algeblocks, etc.) (G2 ch6.1,6.2&6.3) (MS Inv4)

- Introduce solving simple two-step equations with both models and symbols (balance scale, open sentences, algebra tiles, cups and counters, etc.) (G2 ch6.3&14.2) (MS Inv4)

\* Graph using the Cartesian coordinate system (4-quadrants, x/y coordinates, plot ordered pairs) (G2 ch7.3) (VP) (MS) (SS Inv2&3) (AN Inv5)

- Introduce graphing calculator to represent linear patterns (use "table" or "list" to make scatterplots, positive or negative correlations) (G2 ch1.8&ch7.3) (VP Inv5)

- Introduce patterns in Pascal's Triangle (G2 ch7.6&supplement)

\* Solve problems involving formulas ( $A=\pi r^2$ ,  $A=1/2bh$ ) (G2 ch9)

- Develop using spreadsheet formulas to represent patterns (G2 ch12.9) (VP Inv3&4)

\* Generalize patterns by determining the rule for any term in linear patterns (G2 ch14.5) (VP)

- Develop representing and interpreting relationships among narrative, tables, graphs, verbal rules, and equations (G2 ch14.4&14.5) (VP)

**G2--Glencoe Course 2; Connected Math: VP—Variables & Patterns Inv1-5, MS—Moving Straight Ahead Inv1-5, SS--Stretching & Shrinking Inv2&3, AN--Accentuate the Negative Inv5**

## Number/Computation

### MIDDLE SCHOOL MATHEMATICS EXIT PERFORMANCE STANDARD 1:

Student will consistently and accurately apply number sense and order relationships in problem solving situations to perform estimations and/or calculations involving different kinds and forms of rational numbers (fractions, decimals, percents, integers, exponents, square roots, ratios, proportions, etc.) with and without calculators and will communicate the reasoning used in solving these problems.

*Based on Kentucky's Core Content for Mathematics Assessment, the Kentucky Program of Studies, and Academic Expectations: 1.5-1.9 Mathematical Communication & Reasoning, 1.16 Technology, 2.7 Number, 2.8 Procedures, 2.11 Change, 2.12 Structure; Goal 5 Think & Solve Problems; & Goal 6 Connect & Integrate Knowledge*

### 8<sup>th</sup> Grade Number/Computation Standards

- \* **NC8.1** Show number sense by interpreting, modeling and using appropriate mathematical notation ( $\%$ ,  $!$ ,  $/$ ,  $\pi$ , square roots, exponents, scientific notation) for real numbers and by comparing and contrasting various subsets of the real number system (counting numbers, whole numbers, integers, rational numbers, irrational numbers).
- \* **NC8.2** Use order of operations including ( )'s and exponents, and properties (commutative, associative, distributive, inverse, identity, equality) to solve problems with rational numbers (fractions, decimals, percents, & integers).

### Skills, Concepts & Relationships

- \* Use order of operations with ( )'s and exponents (G3 ch2)(GP ch1.2&4.2)(SI Inv1)
- \* Determine absolute value (number line) (G3 ch3) (GP ch2.1-2.3)
- \*\* Review adding & subtracting integers (integer chips, number line, algeblock mats) (G3 ch3)(GP ch2.4-2.5)
- \* Multiply & divide integers (look for patterns) (G3 ch3)(GP ch2.7-2.8)
- \* Determine scientific notation (G3 ch6.11)(GP ch6.9)
- Introduce negative exponents (G3 ch6.11)(GP ch4.9)
- \* Recognize, use, & apply properties (commutative, associative, distributive, inverse, identity, equality) to solve problems with fractions, decimals, percents, integers, using algebraic equations (G3 ch7)(GP ch1.4-1.5,5.3)(SI Inv1-3)
- Develop the concept of infinite progressions (arithmetic & geometric sequences) (G3 ch7.6)(GP5.9&6.8)
- \* Find and approximate square roots using a calculator (recognize perfect squares to 169)(G3 ch8) (GP ch13.1)(LP Inv1-5)
- \* Show number sense by comparing and contrasting various subsets of the real number system (counting numbers, whole numbers, integers, rationals, irrationals) (G3 ch8.3) (GP ch13.3)
- \*\* Review applications of fraction, decimal, and percent computations in real world situations (G3 ch7&10) (GP ch5,6&9) (CP)
- \*\* Review using percents to calculate sale price, discounts, simple interest, and commission (G3 ch10&supplement) (GP ch9&supplement) (CP)
- Introduce compound interest with a graphing calculator (Banker's rule of 72) (supplement)
- \* Solve percent problems using proportions and equations (G3 ch10) (GP ch9)
- \* Find percent one number is of another, and find number when percent is known (G3 ch10) (GP ch9) (CP)
- \* Find an approximation for pi as an example of an irrational number (G3 ch12) (GP ch12.2)
- \* Determine number relationships in Pascal's Triangle, Fibonacci Sequence & the Golden Ratio (G3 ch7,9&13) (GP ch2.6,5,9,9.1,14.2,&15) (LP)
- \* Use calculators to solve problems with exponents, order of operations, reciprocals (inverse), pi, square roots, and number patterns & sequences. (Caution: different calculators handle order of operations differently) (SI)
- Develop use of spreadsheets to perform calculations (G3 ch3.5,9.3,10.9&10.10) (GP ch4.8,5.3&9.9)

**G3--Glencoe Course 3, GP--Glencoe Pre-Algebra; Connected Math: SI—Say It With Symbols, LP—Looking For Pythagoras, CP--Comparing and Scaling**

## Geometry/Measurement

## **MIDDLE SCHOOL MATHEMATICS EXIT PERFORMANCE STANDARD 2:**

**Student will apply properties of measurement (perimeter and area of triangles, quadrilaterals, circles, polygons, and irregular shapes; volume and surface area of prisms and cylinders; weight; temperature, etc.) and will use geometric concepts, properties and relationships (proportionality of similar figures, sum of triangle measures equals 180 degrees, transformations in the coordinate plane, etc.) in problem solving situations and communicate the reasoning used in solving these problems.**

*Based on Kentucky's Core Content for Mathematics Assessment, the Kentucky Program of Studies, and Academic Expectations: 1.5-1.9 Mathematical Communication & Reasoning, 1.16 Technology, 2.8 Procedures, 2.9 Space and Dimensionality, 2.10 Measurement, 2.11 Change, 2.12 Structure; Goal 5 Think & Solve Problems; & Goal 6 Connect & Integrate Knowledge*

### **8<sup>th</sup> Grade Geometry/Measurement Standards**

- \* **GM8.1** Classify, analyze, and draw visual representations (scale drawings, isometric dot paper drawings, etc.) of two-dimensional and three-dimensional figures.
- \* **GM8.2** Recognize, describe, and draw transformations in a four-quadrant coordinate plane.
- \* **GM8.3** Determine and apply the formulas for volume and surface area of prisms and cylinders.
- \* **GM8.4** Determine and apply the Pythagorean Theorem.

### **Skills, Concepts & Relationships**

- \* Classify angles and angle pairs: adjacent, vertical, corresponding, interior, exterior, complementary, supplementary, etc. (G3 ch2.3&supplement) (GP ch11.3&supplement)
- Develop proving triangle similarity and congruence (SSS,SAS,ASA) (G3 ch5.6) (GP ch11.5-11.7) (SS Inv5)
- \* Generate, describe and analyze transformations: translations (slide), reflections (flip), rotations (turn), and dilations (expand & contract) in the coordinate plane (MIRA, patty paper)(G3 ch5.6,9.8,11.8-11.10)(GP 11.8-11.9)(KH)
- Develop performing simple constructions (construct congruent lines and angles, angle bisectors, perpendicular bisector of a segment, circle with given radius, perpendicular line through a point on or off a given line, construct regular polygons,etc.) (compass, patty paper) (G3 ch5) (GP ch11)
- \* Determine and use the Pythagorean Theorem (geoboards, tangrams, graph paper)(G3 ch8.5&8.6)(GP ch 13.4)(LP Inv3&4)
- \* Calculate indirect measurement (height of flagpole, mirror method, etc.) with similar triangles (G3 ch9.6)(GP 11.6) (SS Inv4&5)
- \* Construct scale representations of 2D and 3D objects using proportional reasoning about similar figures (G3 ch9.7)(GP ch12.8) (SS Inv4) (FW Inv6)
- Introduce right triangle ratios (tangent, sine, and cosine) (G3 ch9.9&9.10)(GP ch13.5-13.6)
- \*\* Review development of formulas for perimeter (circumference) & areas of circles, triangles, trapezoids, parallelograms, etc. (geoboards, graph paper, etc.) (G3 ch12.1)(GP ch7.4,12.1-12.2)(FW Inv3-5)
- \*\* Review classifying geometric solids and their terms: base, vertices, edges, faces, prisms, pyramids, cylinders, cones, & spheres) (G3 ch12&supplement) (GP ch12&supplement) (FW Inv3-5)
- Introduce 5 regular platonic solids: tetrahedron (4 equilateral triangles), cube (6 squares), octahedron (8 equilateral triangles), dodecahedron (10 regular pentagons), and icosahedron (20 equilateral triangles) (supplement)
- Introduce investigations of counting techniques with various paths (networks, circuits, Euler's formula:  $F+V-E=2$ , etc.) (supplement) (CC Inv3)
- \* Visualize and draw different representations of 3D geometric figures (multilink cubes, isometric dot paper) (G3 ch12.3) (GP ch12&supplement) (FW) (RM Inv4)
- \* Derive and apply formulas for surface area and volume of prisms and cylinders (cubes, pentomino "open-top boxes", nets) (G3 ch12) (GP ch12)(FW Inv3-5) (SI Inv5)
- Introduce volume and surface area of pyramids and cones (G3 ch12) (GP ch12)(FW Inv3-5) (SI Inv5)
- \* Use cubic units correctly (G3 ch12) (GP ch12) (FW Inv3-5)

**G3--Glencoe Course 3, GP--Glencoe Pre-Algebra; Connected Math: FW—Filling & Wrapping Inv3-5, LP—Looking for Pythagoras Inv3&4, KH—Kaleidoscopes, Hubcaps, & Mirrors Inv1-4, CC—Clever Counting Inv3, SS--Stretching & Shrinking Inv4&5, SI--Say It With Symbols Inv5, RM--Ruins of Montarek Inv4**

## **Probability/Statistics**

**MIDDLE SCHOOL MATHEMATICS EXIT PERFORMANCE STANDARD 3:**

Student will use data collection & analysis, graphing (multiple line and bar graphs, circle graphs, stem and leaf plots, box and whisker plots, etc.), statistics (mean, median, mode, range, outliers, quartiles, etc.), and experimental & theoretical probabilities to solve real world problems and communicate the reasoning used in solving these problems.

*Based on Kentucky's Core Content for Mathematics Assessment, the Kentucky Program of Studies, and Academic Expectations: 1.5-1.9 Mathematical Communication & Reasoning, 1.16 Technology, 2.7 Number, 2.8 Procedures, 2.11 Change, 2.12 Structure, 2.13 Probability & Statistics; Goal 5 Think & Solve Problems; & Goal 6 Integrate Knowledge*

**8<sup>th</sup> Grade Probability/Statistics Standards**

\* **PS8.1** Collect, compile, interpret, compare, and display data (histogram, stem and leaf plot, box and whisker plot, scatterplot, etc.) to analyze, interpret, and support real-life situations.

\* **PS8.2** Analyze odds and probabilities (experimental and theoretical) to make decisions involving real-world situations.

**Skills, Concepts & Relationships**

\* Organize information on a spreadsheet and make appropriate computer generated graphs (G3 ch1.8,4.5,13.7) (GP ch4.8&9.9)

\* Access information from a database (G3 ch4.1) (GP supplement)

\* Construct and interpret: histograms, line plots, stem and leaf plots, circle graphs, box and whisker plots, scatterplots (G3 ch4) (GP ch8.2,10&11.2)(SP)

\* Determine outliers effect on mean and median (G3 ch 4) (GP ch10&supplement) (SP)

- Develop concepts of dispersion and variance (quartile, interquartile, range, clusters, gaps, outliers) (G3 ch4) (GP ch10) (SP)

\* Evaluate misleading graphs and statistics (G3 ch4.9) (GP ch10.4) (SP)

- Develop graphing calculator skills: enter data into a list; determine statistics: mean, median, mode, quartiles; make a stat plot: box and whisker plot, histogram, scatterplot; collect, analyze, and represent data (G3 4.6-4.7&supplement) (GP ch6.6,8.2,9.3,10.2,10.3,10.8,10.9)

\* Recognize and use the Fundamental Counting Principle (multiply number of choices for each item to get total possible outcomes) (G3 ch13.1) (GP ch10.5)

- Introduce and explore permutations and combinations (factorials) (G3 ch13.3) (GP ch10.6) (CC)

\* Determine the probability of independent and dependent (conditional) events (G3 ch13.5) (GP ch9.3,10.9&10.10) (WD Inv4-7)

\* Construct tree diagrams and area models to analyze theoretical probability (G3 ch13) (GP ch10.5&12.3) (WD Inv3)

\* Use Pascal's triangle to determine theoretical probability of binomial situations (G3 ch13.4) (WD Inv7)

\* Make predictions, draw conclusions, and verify results from statistical and probability experiments (G3 ch13.6&supplement) (GP ch9.6&10.8)(WD Inv5-7)

\* Analyze situations (games of chance, board games, basketball shooter) to make predictions using knowledge of probability (supplement) (WD Inv6&final project)

\* Recognize the Law of Large Numbers (more experimental trials should get closer to theoretical probability) (supplement) (WD Inv5-7)

\* Design a statistical study to investigate a problem, conduct the study and interpret and communicate the outcomes (supplement) (SP)

\* Differentiate "odds" and "probability" (analyze gambling: horse races) (G3 supplement) (GP ch10.7)

\* Use appropriate sampling techniques (supplement) (SP Inv3)

**G3--Glencoe Course 3, GP--Glencoe Pre-Algebra; Connected Math: SP—Samples & Populations, WD—What Do You Expect? Inv3-7, CC-Clever Counting**

**Algebraic Ideas**

**MIDDLE SCHOOL MATHEMATICS EXIT PERFORMANCE STANDARD 4:**

**Student will discover, explore, describe, and generalize patterns (linear, exponential and simple quadratic), represent and analyze algebraic relationships using tables, graphs in the coordinate plane, variables, expressions and equations in problem solving situations and communicate the reasoning used in solving these problems.**

*Based on Kentucky's Core Content for Mathematics Assessment, the Kentucky Program of Studies, and Academic Expectations: 1.5-1.9 Mathematical Communication & Reasoning, 1.16 Technology, 2.7 Number, 2.8 Procedures, 2.9 Space and Dimensionality, 2.11 Change, 2.12 Structure; Goal 5 Think & Solve Problems; & Goal 6 Connect & Integrate Knowledge*

### 8<sup>th</sup> Grade Algebraic Ideas Standards

- \* **AI8.1** Recognize, create, continue and generalize patterns (linear, exponential, and simple quadratic) by giving the rule for the  $n$ th term and defend the generalization.
- \* **AI8.2** Solve two-step equations with fractions, decimals, percents and integers using concrete, pictorial and abstract methods (variables).
- \* **AI8.3** Recognize and analyze algebraic relationships (functions) using tables, graphs in the coordinate plane, variables, expressions and equations in problem solving situations.

### Skills, Concepts & Relationships

- \* Simplify algebraic expressions (combining like terms) (algebra tiles, cups & counters, etc.) (G3 ch14.1-14.2) (GP ch1.5,2.4-2.5) (SI Inv1-4) (MS Inv4)
- \* Solve linear equations using concrete, informal and formal methods (inverse operations) (balance scale, open sentences, algebra tiles, algeblocks, cups and counters, algeblocks) (G3 ch2.3,2.4,&11.4) (GP ch1.6,1.8,3,5.6,6.7)(SI Inv1-4) (MS Inv4)
- \* Solve two-step equations (balance scale, open sentences, algebra tiles, algeblocks, cups and counters, algeblocks) (G3 ch2.7) (GP ch7.2-7.3)(SI Inv2-4) (MS Inv4)
- Develop solving equations with variables on both sides (balance scale, open sentences, algebra tiles, algeblocks, cups and counters) (G3 supplement) (GP ch7.5)(SI Inv2-4)
- \* Graph inequalities with one variable on a number line (G3 ch2.10) (GP ch1.9,3.6-3.7)
- Introduce writing and solving simple inequalities (positive coefficients only) (G3 ch2.10)(GP ch3.6-3.7,5.7,6.7,7.6-7.7)
- \* Use variables and graphs to describe numerical patterns to the  $n$ th term in linear, exponential and simple quadratic patterns (painted cube problem) (G3 ch11.1&11.2) (GP ch5.9&6.8) (MS)(TM)(GG)(FF)
- Investigate non-linear relationships with concrete and informal methods (simple quadratic and exponential) (G3 ch11.2&11.7) (GP ch8.3B) (TM)(GG)(FF)
- \* Represent situations with tables, graphs, and equations, and recognize the interrelationship of these (how change in one variable affects change in another variable) (G3 ch11.2) (GP ch8.1-8.4)(MS)(TM)(SI)
- Introduce the concept of slope and the equation of a line ( $y=mx+b$  where  $m$ =rise/run and  $b$ =y-intercept) (G3 ch11.4&11.8) (GP ch8.6-8.7&11.3)(MS Inv5)(TM Inv1)(LP Inv6)
- \* Graph a line on a coordinate grid (graphing calculator, table of values) (G3 ch11.4) (GP ch8.3-8.4&8.7)(MS Inv3&6)(TM Inv1)
- \* Solve problems involving formulas with substitutions ( $V=\pi r^2h$ ,  $SA=6s^2$ ) (G3 ch12) (GPch7&12)
- Develop graphing calculator skills: linear equations, enter function in "Y=" form, set and evaluate table, window, trace, zoom, make scatterplots, positive or negative correlation; and evaluate expressions (G3 ch2.1,11.4&supplement) (GP ch8.2-8.4&8.7)(TM) (MS Inv3)
- Develop using spreadsheets formulas to represent patterns (G3 ch7.5&7.7) (GP ch4.8) (supplement)

**G3--Glencoe Course 3, GP--Glencoe Pre-Algebra; Connected Math: MS--Moving Straight Ahead, TM—Thinking With Mathematical Models, SI—Say It With Symbols, LP—Looking For Pythagoras, GG—Growing, Growing, Growing, FF—Frogs, Fleas, & Painted Cubes**