

## Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

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## Pre-Algebra 1 & II Overview

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### The Number System

- Know that there are numbers that are not rational, and approximate them by rational numbers. NS.1 NS.2

### Expressions and Equations

- Work with radicals and integer exponents. EE.1 EE.2 EE.3 EE.4
- Understand the connections between proportional relationships, lines, and linear equations. EE.5 EE.6
- Analyze and solve linear equations and pairs of simultaneous linear equations. EE.7 EE.8

### Functions

- Define, evaluate, and compare functions. F.1 F.2 F.3
- Use functions to model relationships between quantities. F.4 F.5

### Geometry

- Understand congruence and similarity using physical models, transparencies, or geometry software. G.1 G.2 G.3. G.4 G.5
- Understand and apply the Pythagorean Theorem. G.6 G.7 G.8
- Solve real-world and mathematical problems involving volume of cylinders, cones and spheres. G.9

### Statistics and Probability

- Investigate patterns of association in bivariate data. SP.1 SP.2 SP.3 SP.4

## DOMAIN: The Number System

**SUPPORTING CLUSTER:** Know that there are numbers that are not rational, and approximate them by rational numbers. NS.1 NS.2

Supporting. Standard: Grade 8.NS.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

Supporting Standard: Grade 8.NS.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g.,  $x^2$ ). For example, by truncating the decimal expansion of  $\sqrt{2}$ , show that  $\sqrt{2}$  is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.

## DOMAIN: Expressions and Equations

**MAJOR CLUSTER:** Work with radicals and integer exponents. EE.1 EE.2 EE.3 EE.4

Major Standard: Grade 8.EE.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example,  $3^2 \times 3^{-5} = 3^{-3} = \frac{1}{3^3} = \frac{1}{27}$ .

Major Standard: Grade 8.EE.2 Use square root and cube root symbols to represent solutions to equations of the form  $x^2 = p$  and  $x^3 = p$ , where  $p$  is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that  $\sqrt{2}$  is irrational.

Major Standard: Grade 8.EE.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as  $3 \times 10^8$  and the population of the world as  $7 \times 10^9$ , and determine that the world population is more than 20 times larger.

Major Standard: Grade 8.EE.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

**MAJOR CLUSTER:** Understand the connections between proportional relationships, lines, and linear equations. EE.5 EE.6

Major Standard: Grade 8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.

Major Standard: Grade 8.EE.6 Use similar triangles to explain why the slope  $m$  is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation  $y = mx$  for a line through the origin and the equation  $y = mx + b$  for a line intercepting the vertical axis at  $b$ .

**MAJOR CLUSTER:** Analyze and solve linear equations and pairs of simultaneous linear equations. EE.7 EE.8

Major Standard: Grade 8.EE.7 Solve linear equations in one variable. a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form  $x = a$ ,  $a = a$ , or  $a = b$  results (where  $a$  and  $b$  are different numbers). b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Major Standard: Grade 8.EE.8 Analyze and solve pairs of simultaneous linear equations. a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example,  $3x + 2y = 5$  and  $3x + 2y = 6$  have no solution because  $3x + 2y$  cannot simultaneously be 5 and 6. c. Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.

## DOMAIN: Functions

### **MAJOR CLUSTER:** Define, evaluate, and compare functions. F.1 F.2 F.3

Major Standard: Grade 8.F.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (Function notation is not required in Grade 8.)

Major Standard: Grade 8.F.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.

Major Standard: Grade 8.F.3 Interpret the equation  $y = mx + b$  as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function  $A = s^2$  giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.

### **MAJOR CLUSTER:** Use functions to model relationships between quantities. F.4 F.5

Major Standard: Grade 8.F.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values..

Major Standard: Grade 8.F.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

## DOMAIN: Geometry

**MAJOR CLUSTER:** Understand congruence and similarity using physical models, transparencies, or geometry software. G.1 G.2 G.3. G.4 G.5

Major Standard: Grade 8.G.1 Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines.

Major Standard: Grade 8.G.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

Major Standard: Grade 8.G.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

Major Standard: Grade 8.G.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

Major Standard: Grade 8.G.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.

**MAJOR CLUSTER:** Understand and apply the Pythagorean Theorem. G.6 G.7 G.8

Major Standard: Grade 8.G.6 Explain a proof of the Pythagorean Theorem and its converse

Major Standard: Grade 8.G.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

Major Standard: Grade 8.G.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

**ADDITIONAL CLUSTER:** Solve real-world and mathematical problems involving volume of cylinders, cones and spheres. G.9

Additional Standard: Grade 8.G.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

## DOMAIN: Statistics and Probability

### **SUPPORTING CLUSTER:** Investigate patterns of association in bivariate data. SP.1 SP.2 SP.3 SP.4

Supporting Standard: Grade 8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

Supporting Standard: Grade 8.SP.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

Supporting Standard: Grade 8.SP.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height

Supporting Standard: Grade 8.SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

# 2018-2019 PRE-ALGEBRA CURRICULUM MAP

## UNIT 1 FRACTION SENSE: (~16 days includes teaching/ quizzes/review/test)

- Divisibility rules (discuss perfect squares and cubes for students to study)
- Prime factorization , GCF, LCM
- Simplifying fractions
- Adding, subtracting, multiplying, and dividing fractions with variables
- Classifying Rational and Irrational Numbers
- Benchmark Square Roots, Perfect squares, and Cube roots
- Fraction, decimal, percent equivalencies-memorization of benchmark quantities

$$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{10}, \frac{1}{20}, \frac{1}{25}, \frac{1}{50}, \frac{1}{100}$$

KEY CONCEPTS: Classifying Rational & Irrational Numbers

\*Purposeful assessment to identify struggling students in need of intervention

## UNIT 2 NUMBER SENSE: (~20 days includes teaching/ quizzes/review/test)

- Ordering on a number line and comparing rational (include absolute value) and irrational numbers with  $<$ ,  $>$ , and  $=$ , revisit often
- Adding, subtracting, multiplying, & dividing integers

Purposeful assessment to identify struggling students in need of intervention mid concept with simple calculator

- Order of operations and evaluating expressions with exponents, error analysis (mention function notation)
- Exponents/scientific notation
  - Exponents review positive, negative, and zero
  - Exponents Rules (multiply, divide, power to power)
  - Perfect squares and cubes, benchmark square roots and cube roots, estimating square roots
  - Basic Scientific Notation and application
  - Application of multiply and divide scientific notation
- Calculator techniques- fraction input, simplifying fractions, fraction to decimal conversion, mixed number to improper, positive to negative, exponent (mention fractional), scientific notation, parenthesis, square root, cubed root, rounding

KEY CONCEPTS: Integers rules & Application of Scientific Notation

## QUARTER 1 FINAL ON SKYWARD/ GRADECAM

## UNIT 3 EQUATIONS: (17 days includes teaching/ quizzes/review/test)

- Equation Translation (vocab: sum, quotient, difference, is, etc.)
- Simplifying expressions by combining like terms (revisited throughout)
- Distributive property
- 2-step equations
  - Testing solutions
- Multi-step equations
  - Testing solutions

- Variables on both sides
  - One-solution, no solution, infinitely many solutions
- Solve for missing angles/ variables with complementary, supplementary, and vertical angles
- Word Problems (throughout also)

KEY CONCEPTS: Application of solving equations & Identifying/Explaining one solution, no solution, infinitely many solutions

**UNIT 4 INEQUALITIES:** (9 days includes teaching/ quiz/review/test)

- Solving and Graphing Inequalities
  - Graph on a student created number line
  - Two-step with negative rule
  - Multi-step with negative rule
  - Application problems

**UNIT 5 LINEAR FUNCTIONS & GRAPHING:** (25 days includes teaching/ quizzes/review/test)

- The Coordinate Plane
  - Vocabulary
  - Plotting points (Cartesian cartoon)
  - Distance between two points
- Function Tables
  - Make a table and graph
    - Linear (line, constant)
    - Quadratic (parabola, u-shape)
    - Absolute Value (reflected line, v shape)

Assess for intervention

- Characteristics of graphs
  - Slope/rate of change
    - 4 types of slope
    - Graph, equation, table
  - Slope –intercept form  $y = mx + b$ 
    - Solving for y
  - horizontal ( $y = c$ ) and vertical lines ( $x = c$ ) where  $c =$  an integer
  - graphing practice
  - intercepts/standard form (strategy for systems, not required)
  - writing equations looking at a graph in slope intercept form
- Application of linear functions
  - Interpretation of graphs of linear functions (ex. what does the slope mean)

KEY CONCEPTS: Identifying and explaining elements of linear functions including slope/rate of change and the y-intercept graphically and in real world problems. Writing an equation from a graph or real life situation.

**SEMESTER 1 COMPREHENSIVE FINAL ON SKYWARD/ GRADECAM \*may be in the middle of unit 5**

## UNIT 6 PYTHAGOREAN THEOREM: (5 days includes teaching/ quiz)

- Pythagorean theorem
  - Proofs
  - Converse-when given three lengths, do they create a right triangle
  - Distance formula (if time)
  - Application questions

## UNIT 7 GRAPHING SYSTEMS: (8 days includes teaching/ quiz/review/test)

- Graphing Systems
  - Testing solutions (required for practice)
  - One-solution (intersect at one point), no solution (parallel), infinitely many solutions
  - Creating a system, given one line, a point or a slope (see SBAC examples)

## UNIT 8 SYSTEMS ALGEBRAICALLY: (12 days includes teaching/ quiz/review/test)

- Solving Systems Algebraically
  - Substitution (review both sides & distribute)
  - Elimination
  - One-solution, no solution, infinitely many solutions
  - Testing solutions
  - Word Problems

KEY CONCEPT: Create a system graphically and algebraically given different characteristics- ex. a solution (ordered pair); a line and solution; no solution system; infinitely many solutions

## UNIT 9 TRANSFORMATIONS: (8 days includes teaching/ quiz)

- Translations (notation)
- Reflections
  - Over either axis or a given line (highlight the line  $x = -2$ )
- Rotations
  - Congruency
- Dilations
  - Similarity
- Multiple Transformations

## UNIT 10 GEOMETRY & STATISTICS: (14 days includes teaching/ quizzes/review/test)

- Angles Vocabulary and notation: ex-  $m\angle 1$
- Angle pair relationships
  - Vertical, complementary, supplementary (finding angles and using equations)

Parallel lines and transversals

- Missing angles in polygons
  - Interior angles  $(n - 2)(180)$
  - Exterior angles of triangles (see SBAC example)

## QUARTER 3 FINAL ON SKYWARD/ GRADECAM \*DID'NT DO '17-'18 BECAUSE OF SBAC

### Geometric space figures

- Review Circles- vocab, area/circumference practice and equation work
- Memorize Cylinder, Cone and Sphere Volume Formulas
- Volume- cones, cylinder, spheres (practice and equation work)
- Application problems (SBAC Silo)
- Two way tables
  - Fill in missing information
  - Determine Percentages from relative frequencies
- Scatter plots-trend lines, line of best fit, and prediction
  - Review of finding slope between points, y-intercept, writing an equation (circle point conversation)

KEY CONCEPTS: Understanding and application of angle relationships, finding volume or missing measurements given a 3-dimensional figure including real life situations.

## **UNIT 11 ALGEBRA PREP:** (18 days includes teaching/ quizzes/review/test) \*may change due to SBAC

- Linear Functions
  - Convert from Slope-Intercept form to Standard Form
  - Transforming Literal Equations
  - Point-Slope Form
- Solving Equations
  - Multi step
  - Transforming Literal Equations
  - Inequalities(multi, divide by negative)
- Option to choose a short Math Project if needed

## SEMESTER 2 COMPREHENSIVE FINAL ON SKYWARD/ GRADECAM

**\*Missing CCSS for 8<sup>th</sup> Grade Math in the map:**

**-Changing repeating decimals to fractions (8.NS.A.1)**

**-Estimating Square Roots (8.NS.A.2)**

**-Congruence and Similarity (8.G.A)**

**-3-D Pythagorean Theorem (8.G.B.7)**