Elizabethtown Area School District
8th Grade Algebraic Concepts
Curriculum Guide

Unit 0: Review of Integers

Unit 1: Rational and Irrational Numbers

Essential Questions:

- **What are different ways to represent numbers?**
- **How is representing numbers in different ways beneficial for problem-solving?**

Fractions-Decimals-Percents

Exponents

Perfect Squares, Square Roots, and Cubes

Compare and Order Rational and Irrational Numbers

Unit 2: Radicals and Integer Exponents

Essential Questions:

- **How do mathematical operations relate to each other?**
- **How is simplifying expressions with integer exponents useful?**
- **Why is generating equivalent expressions worthwhile?**
- **How do I determine the best numerical representation for a situation?**

Unit 3: Proportions, Linear Equations, and Systems of Linear Equations

Essential Questions:

- **What is meant by equality when solving equations?**
- **How are solutions for systems of equations located/found?**
- **How is slope calculated?**

1-2 step Equations, Distributive Property, and Combine Like Terms

Solving Multi-step Equations

Use Right Triangles to Show Slope on a Graph

Graph Proportional Relationships and Interpret Rate of Change as Slope

Write Equations

Solve Systems of Equations

Unit 4: Functions

Essential Questions:

- **How are patterns of change related to the behavior of functions?**
- **What is the difference between linear and non-linear functions?**
- **What do the different types of slope look like?**

Define Functions

Linear vs. Non-linear Functions

Determine Rate of Change for Functions

Tests to Determine if a Relations is a Function

Unit 5: Analyze and Interpret Bivariate Data

Essential Questions:

- **How can we use patterns in math to show different associations?**
- **Whey is it important to create a line of best fit and how can it be used?**

Construct and Interpret a Two-way Table

Construct and Interpret Scatter Plot

Identify Line of Best Fit

Interpreting Slope and Intercept

Unit 6: Geometry

Essential Questions:

- **How can "space" be defined through numbers and measurement?**
- **How do axioms and theorems help us understand relationships with and between geometric figures and concepts?**

Find volume of cylinders, cones, and spheres

Describe the sequence of transformations using coordinates and exhibit the congruence between them

Apply the Pythagorean Theorem and its converse to triangles and to find the distance between two points``

Grade/Course: Grade 8/Algebraic Concepts - Analyze and Interpret Bivariate Data 4-26-14

Standards for Mathematical Practice:

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

Big Idea:

Multiple representations of data help us understand relationships between quantities.
Line of best fit shows trends of data.

Pennsylvania Core Standards:

2.4.8.B.1 Analyze and/or interpret bivariate data displayed in multiple representations.
2.4.8.B.2 Understand that patterns of association can be seen in bivariate data utilizing frequencies.

Essential Questions:

- How can we use patterns in math to show different associations?
- Why is it important to create a line of best fit and how can it be used?

Understandings: Students will understand THAT . . .

- Scatter plots and two-way tables show an association between two different quantities and are different representations to summarize data.
- Multiple representations of data help us understand relationships between quantities.
- Line of best fit shows trends in data.

Knowledge:

Vocabulary: scatter plot

- Slope, intercepts, linear equations
- Patterns of correlation: linear, nonlinear, positive, negative, clustering, outliers
- Coordinate plane

Skills:

- Construct and interpret scatter plots.
- Identify line of best fit.
- Construct and interpret a two-way table.
- Interpreting slope and intercept.

Grade/Course: Grade 8/Algebraic Concepts - Functions 4-26-14

Standards for Mathematical Practice:

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

Big Idea:

A function can model a linear or non-linear relationship between two quantities.
A function can be represented in different ways that state the same relationship.

Pennsylvania Core Standards:

2.2.8.C.1 Define, evaluate and compare functions.
2.2.8.C.2 Use concepts of functions to model relationships between quantities.

Essential Questions:

- How are patterns of change related to the behavior of functions?
- What are the similarities and differences between linear and non-linear functions?
- What do the different types of slope look like and why?

Understandings: Students will understand THAT . . .

- y=mx+b provides information needed to graph a linear equation.
- A function can model a linear or non-linear relationship between two quantities.
- A function can be represented in different ways that state the same relationship (graph, table, description).

Knowledge:

Vocabulary: rate of change, function, relation, domain, range, linear, x-intercept, y-intercept

- Plotting points
- Slope
- Solving equations

Skills:

- Linear vs. non-linear function
- Determine rate of change
- Determine if a relation is a function

Grade/Course: Grade 8/Algebraic Concepts - Geometry 4-26-14

Standards for Mathematical Practice:

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

Big Idea:

The Pythagorean Theorem distinguishes between right triangles and non-right triangles.
Volume is the "space" inside a figure.

Pennsylvania Core Standards:

2.3.8.A.1 Apply the concepts of volume of cylinders, cones and spheres to solve real world and mathematical problems.
2.3.8.A.2 Understand and apply congruence, similarity and geometric transformations using various tools.
2.3.8.A.3 Understand and apply the Pythagorean Theorem to solve problems.

Essential Questions:

- How can "space" be defined through numbers and measurement?
- How do axioms and theorems help us understand relationships with and between geometric figures and concepts?

Understandings: Students will understand THAT . . .

- Volume is the "space" inside a figure.
- Angle measures are preserved in rotations, reflections and translations.
- The Pythagorean Theorem is a pattern used to find missing sides of right triangles.
- The Pythagorean Theorem distinguishes between right triangles and non-right triangles.

Knowledge:

Vocabulary: volume, surface area, cylinder, cone, sphere, polyhedron, prism, rotation, reflection, translation, transformation, axiom, theorem

- Formulas for volume of cylinders, cones, spheres
- Volume and surface area of cubes and prisms
- Meaning of dilation, translation, rotation, reflection
- What is the Pythagorean Theorem is and

Skills:

- Find volume of cylinders, cones and spheres.
- Describe a sequence of transformations using coordinates and exhibiting the congruence between them.
- Apply the Pythagorean Theorem and its converse to right triangles and distances between two points.

its converse?	

Grade/Course: Grade 8/Algebraic Concepts – Proportions, Linear Equations and Systems of Linear Equations 4-26-14

Standards for Mathematical Practice:

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

Big Idea:

Equations can have a range of solutions, and a System of Equations is two or more equations with a solution that is written as an ordered pairl
Slope is more than the steepness of a line.

Pennsylvania Core Standards:

2.2.8.B.2 Understand the connections between proportional relationships, lines, and linear equations.
2.2.8.B.3 Analyze and solve linear equations and pairs of simultaneous linear equations.

Essential Questions:

- What is meant by equality when solving equations?
- What does a solution to a system of equations mean?
- What is slope?

Understandings: Students will understand THAT . . .

- Equations can have a range of solutions (for example: one solution, no solution, infinite solutions, etc.).
- The intersection point satisfies both equations simultaneously in a system (written as an ordered pair).
- Slope is the same between any two distinct points on a line in the coordinate plane.

Knowledge:

Vocabulary: equation, distributive property, like terms, inverse operations, solution, system of equations, solution of a system, ordered pair, slope, coordinate plane, x-axis, y-axis, quadrants, origin, slope-intercept form, rate, ratio, unit rate, proportion

- Solve one and two step equations
- Plotting points
- The coordinate plane

Skills:

- Solve multi-step equations
- Write equations
- Solve systems
- Use right triangles to show slope is the same between two points.
- Graph proportional relationships, interpreting unit rate as slope.

Grade/Course: Grade 8/Algebraic Concepts – Radicals and Integer Exponents 4-26-14

Standards for Mathematical Practice:

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

Big Idea:

Mathematical situations can be represented abstractly using variables, expressions, and equations.
The use of equivalent numbers and expressions can simplify problem-solving and calculating.

Pennsylvania Core Standards:

2.2.8.B.1 Apply concepts of radicals and integer exponents to generate equivalent expressions.

Essential Questions:

- How do mathematical operations relate to each other?
- How is simplifying expressions with integer exponents useful?
- Why is generating equivalent expressions worthwhile?
- How do I determine the best numerical representation for a situation?

Understandings: Students will understand THAT . . .

- There is an inverse to every operation including square roots and cube roots.
- Basic operations can be performed on numbers written in any form (including scientific notation).
- Properties of numbers allow us to generate equivalent numerical expressions (w/o calc).

Knowledge:

Vocabulary: Exponent, base, squared, cubed, reciprocal

Skills:

- Rules for multiplying, dividing powers with same base.
- Eliminate negative exponents by writing the reciprocal.
- Use square roots, cube roots to represent solutions to equations.
- Perform operations with numbers expressed in scientific notation.

Grade/Course: Grade 8/Algebraic Concepts – Rational and Irrational Numbers 4-26-14

Standards for Mathematical Practice:

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

Big Idea:

The set of real numbers is infinite and each real number can be classified as a rational or irrational number.
The use of equivalent numbers can simplify problem-solving and calculating.

Pennsylvania Core Standards:

2.1.8.E.1 Distinguish between rational and irrational numbers using their properties.
2.1.8.E.4 Estimate irrational numbers by comparing them to rational numbers.

Essential Questions:

- What are different ways to represent numbers?
- How is representing numbers in different ways beneficial for problem-solving?
- Compare and contrast rational and irrational numbers.

Understandings: Students will understand THAT . . .

- Numbers can be written in multiple ways and still have the same value.
- Rational numbers include integers, fractions, decimals, and percents.
- Irrational numbers include non-repeating decimals.
- There is a relationship between the sets of rational and irrational numbers.

Knowledge:

Vocabulary: square roots, integers, rational numbers, irrationals numbers, exponent, base, absolute value, cube roots

- Perfect squares: 1-144
- Cubes: 1-125
- Convert between fractions, decimals, percents

Skills:

- Evaluate a square root and determine if we can simplify the square roots.
- Compare and order rational and irrational numbers on a number line.
- Know and apply exponents.