Unit A - *Tools for Algebra*

Overview

The unit starts with an investigation of unit analysis and formula application. Then the unit moves on to a review of fraction operations and estimation techniques with instruction on the use of calculators in word problems. Similar practices are applied to decimal operations, estimation and problem solving. Fraction, decimal and percent conversions are reviewed for application in problem solving based on direct variation, similar polygons and percents.

21st Century Capacities: Decision Making

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP1 Make sense of problems and persevere in solving them
MP2 Reason abstractly and quantitatively
MP5 Use appropriate tools strategically
MP6 Attend to precision

CCSS.MATH.CONTENT.HSN.Q.A.1
Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

CCSS.MATH.CONTENT.HSF.LE.A.1.B
Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

CCSS.MATH.CONTENT.HSN.Q.A.2
Define appropriate quantities for the purpose of descriptive modeling.

CCSS.MATH.CONTENT.HSN.Q.A.3
Choose a level of accuracy appropriate to limitations on

Transfer:

Students will be able to independently use their learning in new situations to...

1. Model relationships among quantities. (Decision Making)
2. Demonstrate fluency with math facts, computation and concepts.

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. Mathematicians apply the mathematics they know to solve problems occurring in everyday life.
2. Mathematicians identify relevant tools, strategies, relationships, and/or information in order to draw conclusions.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. How does what we measure affect how we measure?
B. How can I use labels to communicate?
C. What does the solution tell me?

Acquisition:

Students will know…

1. Units of measure can be translated to

Students will be skilled at…

1. Using unit analysis to convert units

measurement when reporting quantities. CCSS.MATH.CONTENT.HSG.MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).* CCSS.MATH.CONTENT.HSA.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.* CCSS.MATH.CONTENT.HSA.SSE.A.1.A Interpret parts of an expression, such as terms, factors, and coefficients. CCSS.MATH.CONTENT.HSA.SSE.A.1.B Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P*. CCSS.MATH.CONTENT.HSA.SSE.A.2 Use the structure of an expression to identify ways to rewrite it. CCSS.MATH.CONTENT.HSA.SSE.B.3.C Use the properties of exponents to transform expressions for exponential functions. CCSS.MATH.CONTENT.HSA.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. CCSS.MATH.CONTENT.HSG.SRT.B.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	useful forms 2. Formulas are useful tools for describing properties 3. Using different units 4. The order of operations (GEMS) 5. How to convert between fraction, decimal, and percent 6. How to calculate tax, tip, and discount 7. The difference between estimation and approximation 8. How to estimate tax or tip without a calculator 9. Corresponding parts of similar polygons are proportionate 10. Vocabulary: Unit Analysis, Distance - Time Function, Unit of Measure, Estimation vs. Approximation, Direct Variation,	2. Comparing units or rates given in different units 3. Writing the units within a formula to ensure a correct answer 4. Choosing an appropriate unit of measure for a given situation 5. Comparing and contrast results of graphing the same scenario with different units 6. Using a formula following the correct order of operations 7. Determining the missing lengths in similar shapes. 8. Determining missing values in a proportional relation.

Unit B - *Operations on Signed Numbers*

Overview

Students will apply negative numbers to explain real world events. Students integrate problem solving and skill building that extends from positive numbers in Unit A to properties of integers and rational numbers in Unit B. Students develop a portfolio and track stocks to see the impact of positive and negative growth on assets. Students will examine short versus long term asset choices to determine which are best for their college and retirement savings.

21st Century Capacities: Decision Making

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP1 Make sense of problems and persevere in solving them
MP3 Construct viable arguments and critique the reasoning of others
MP4 Model with Mathematics
MP5 Use appropriate tools strategically

CC.7.NS.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram:
CC.7.NS.1a Describe situations in which opposite quantities combine to make 0. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.
CC.7.NS.1b Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of

Transfer:

Students will be able to independently use their learning in new situations to...

1. Demonstrate fluency with math facts, computation and concepts.
2. Justify reasoning using clear and appropriate mathematical language. (Decision Making)

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. Manipulating equations/expressions or objects can create order and establish relationships.
2. Mathematicians use appropriate tools to make reaching solutions more efficient, accessible and accurate.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. How can I use symbols to communicate?
B. How can I explain this mathematically?
C. How can change be described?

Acquisition:

Students will know…

1. The relative magnitude of signed integers
2. The meaning of absolute value

Students will be skilled at…

1. Computing the mean of a given set of integers
2. Comparing and ordering integers

rational numbers by describing real-world contexts. **CC.7.NS.1c** Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. **CC.7.NS.1d** Apply properties of operations as strategies to add and subtract rational numbers. **CC.7.NS.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers: **CC.7.NS.2a** Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (-1)(-1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts. **CC.7.NS.2b** Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts. **CC.7.NS.2c** Apply properties of operations as strategies to multiply and divide rational numbers. **CC.7.NS.3** Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.) **CC.7.EE.1** Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	3. Vocabulary: integers, opposites, absolute value, distributive property, commutative property	3. Simplifying opposites and absolute values 4. Adding/subtracting integers and rational numbers 5. Evaluating expressions with integers and rational numbers 6. Multiplying and Dividing Integers and rational numbers 7. Working with exponents on signed numbers 8. Simplifying expressions with like terms 9. Applying the distributive property to word problems and area models.

Unit C - *Exponents and Roots*

Overview

Students will explore the meaning of exponents and the rules for multiplying and dividing numbers in exponential form. Operations are extended to include negative exponents. A review of scientific notation with both negative and positive powers of 10 is included, with references to content in Integrated Science. Students solve expressions involving several steps with numbers in exponent form. Students investigate the square roots and explore their connection to rational exponents. Students apply square roots to solve missing lengths of right triangle using the pythagorean theorem. Students are challenged to apply principles of exponents and square roots to approximate the volume of a lean-to shelter.

21st Century Capacities: Analyzing

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 1 Make sense of problems and persevere in solving them
MP4 Model with Mathematics
MP5 Use appropriate tools strategically

CCSS.MATH.CONTENT.HSN.Q.A.3
Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

CCSS.MATH.CONTENT.HSA.SSE.A.2
Use the structure of an expression to identify ways to rewrite it.

CCSS.MATH.CONTENT.HSA.SSE.B.3
Choose and produce an equivalent form of an

Transfer:

Students will be able to independently use their learning in new situations to...

1. Apply familiar mathematical concepts to a new problem or apply a new concept to rework a familiar problem. (Analyzing)
2. Justify reasoning using clear and appropriate mathematical language. (Analyzing)

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. Mathematicians understand numbers, ways of representing numbers, relationships among numbers, and number systems
2. Mathematicians use visualization, spatial reasoning, and geometric modeling to solve problems

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. How do operations relate to one another?
B. How can I simplify my problem?
C. How does my knowledge of geometry apply to mathematical operations?

expression to reveal and explain properties of the quantity represented by the expression.* CCSS.MATH.CONTENT.HSA.SSE.B.3.C Use the properties of exponents to transform expressions for exponential functions CCSS.MATH.CONTENT.HSG.SRT.B.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. CCSS.MATH.CONTENT.HSG.GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. CCSS.MATH.CONTENT.HSG.MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).	***Acquisition:***	
	Students will know… 1. That exponents represent repeated multiplication 2. The rules of exponents, including multiplying and dividing powers with the same base, zero and negative exponents, how rational exponents relate to square roots 3. How to simplify expressions including exponents 4. That positive numbers have two real roots and one principal square root 5. That radicals are precise values and rounded approximations lose precision 6. The pythagorean theorem and its converse 7. Vocabulary: exponent, base, index, radical, pythagorean theorem, approximate	*Students will be skilled at…* 1. Simplifying expressions with exponents 2. Writing numbers in exponential form 3. Approximating square roots 4. Solving for missing sides in right triangles 5. Identifying whether a triangle is a right triangle given the lengths of its sides.

Unit D - *Exploring Functions*

Overview

This unit explores functions, which are expressed as expressions, tables and graphs. Students review the properties of equality and inequality so that they are able to manipulate equations and inequalities to solve for missing inputs and outputs. Students review the coordinate plane, graphing points, and linear functions. During the Unit D PBA, students analyze multiple linear functions as profit models prior to deciding the best deal for a club fundraiser given multiple parameters.

21st Century Capacities: Analyzing

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP1 Make sense sense of problems and persevere in solving them
MP2 Reason abstractly and quantitatively
MP3 Construct viable arguments and critique the reasoning of others
MP4 Model with Mathematics

CCSS.MATH.CONTENT.HSA.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.
CCSS.MATH.CONTENT.HSA.SSE.A.1.A Interpret parts of an expression, such as terms, factors, and coefficients.
CCSS.MATH.CONTENT.HSA.SSE.A.1.B Interpret complicated expressions by viewing one or more of their parts as a single entity.
CCSS.MATH.CONTENT.HSA.CED.A.1 Create equations and inequalities in one variable and use them to solve problems.
CCSS.MATH.CONTENT.HSA.CED.A.2 Create equations in two or more variables to represent

Transfer:

Students will be able to independently use their learning in new situations to...

1. Manipulate equations/expressions or objects to create order and establish relationships. (Analyzing)
2. Represent and interpret patterns in numbers, data and objects. (Analyzing)
3. Justify reasoning using clear and appropriate mathematical language.

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. Mathematicians identify relevant tools, strategies, relationships, and/or information in order to draw conclusions.
2. Mathematicians apply the mathematics they know to solve problems occurring in everyday life.
3. Mathematicians create or use models to examine, describe, solve and/or make predictions.
4. Mathematicians use models to represent and make meaning of quantitative relationships.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. How do expressions relate to tables and graphs?
B. How can I use symbols of inequality or equality to model relationships?
C. How can I use math to make decisions?

relationships between quantities; graph equations on coordinate axes with labels and scales. CCSS.MATH.CONTENT.HSA.CED.A.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. CCSS.MATH.CONTENT.HSA.REI.A.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. CCSS.MATH.CONTENT.HSA.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. CCSS.MATH.CONTENT.HSA.REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). CCSS.MATH.CONTENT.HSF.IF.B.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. CCSS.MATH.CONTENT.HSF.IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. CCSS.MATH.CONTENT.HSF.BF.A.1 Write a function that describes a relationship between two quantities.	***Acquisition:***	
	Students will know… 1. How to clear denominators in an equation using the multiplication property of equality 2. How to solve basic rate problems 3. How to graph inequalities in one variable 4. How to write an inequality based on a graph 5. How to graph points in the coordinate plane 6. How to graph horizontal and vertical lines 7. How to find slopes of lines 8. That slope give the rate of change 9. Vocabulary: inverse operations, equation, equivalent equations, inverse operations, solution of an equation, least common denominator, rate, inequality, graph of an inequality, equivalent inequalities, coordinate plane, linear equation, slope, direct variation, coordinate plane, y-axis, x-axis, origin, quadrants ,ordered pair, x-coordinate, y-coordinate, horizontal line, vertical line, x-intercept, y-intercept, slope-intercept form, direct variation, constant of variation	*Students will be skilled at…* 1. Identifying a solution to an equation 2. Solving one-step equations and inequalities 3. Solving two-step equations and inequalities 4. Solving basic rate problems 5. Translating between language and algebraic expressions 6. Graphing points and lines in slope-intercept form on the coordinate plane. 7. Graphing horizontal and vertical lines 8. Solving direct variation problems by graphing or algebraically.