Curriculum Map: Common Core Math 6

Course: CORE MATH 6 Subtopic: General

Grade(s): None specified

Course Description:	Students in Common Core Math 6 formalize and extend the math they learned in the elementary grades. Units of study focus primarily on mathematical problem solving using The Number System, Ratios and Proportional Relationships, Expressions and Equations, Geometry and Statistics and probability. Students learn the essential skills for success in today's world, such as critical thinking, problem solving, communication and collaboration.
Course Textbooks, Workbooks, Materials Citations:	Bailey, Rhonda. Glencoe Mathematics: Mathematics Applications and Concepts Course 1. New York: Glencoe/McGraw-Hill, 2004. Print
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Date of Last Revision to this Curriculum Map:	June 21, 2013

Unit: Unit 1: Standards for Mathematical Practice

Unit/Module Description:	The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problems solving, reasoning and proof, communication, representation and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report Adding It Up: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently, and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).
Unit/Module Big Ideas:	1. Mathematically proficient students at all levels are able to meet success at mathematics.
Unit/Module Essential Questions:	1. How do we make sense of problems and persevere in solving them? 2. How do we reason abstractly and quantitatively? 3. How do we construct viable arguments and critique the reasoning of others? 4. How do we model with mathematics? 5. How do we use appropriate tools strategically? 6. How do we attend to precision? 7. How do we look for and make use of structure? 8. How do we look for and express regularity in repeated reasoning?
Unit/Module Student Learning Outcomes:	1. Explain the meaning of a problem. 2. Look for entry points to the solution of a problem. 3. Analyze givens, constraints, relationships, and goals of a problem. 4. Make conjectures about the form and meaning of a solution. 5. Plan a solution pathway rather than simply jumping into a solution attempt. 6. Monitor and evaluate progress in problem solving and change course if necessary. 7. Explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. 8. Check answers to problems using a different method, and determine if it makes sense. 9. Understand the approaches of others to solving complex problems and identify correspondences between different approaches. 10. Make sense of quantities and their relationships in problem situations. 11. Decontextualize problems. (abstract a given situation and represent it symbolically and manipulate the representing symbols.) 12. Contextualize problems. (pause as needed during the manipulation process in order to probe into the referents for the symbols involved.) 13. Create a coherent representation of the problem at hand. 14. Consider the units involved in solving a problem.

15. Attend to the meaning of quantities.
16. Know and be flexible in using different properties of operations and objects.
17. Understand and use stated assumptions, definitions, and previously established results in constructing arguments.
18. Make conjectures and build a logical progression of statements to explore the truth of their conjectures.
19. Analyze situations by breaking them into cases, and can recognize and use counterexamples.
20. Justify conclusions.
21. Communicate conclusions and respond to the arguments about them.
22. Reason inductively and make arguments about data.
23. Compare the effectiveness of two plausible arguments.
24. Distinguish correct logic or reasoning form that which is flawed.
25. Listen or read the arguments of others.
26. Decide whether arguments of others make sense.
27. Ask useful questions to clarify or improve the arguments.
28. Apply known mathematics to solve problems arising in everyday life, society, and the workplace.
29. Make assumptions and approximations to simplify a complicated situation.
30. Apply knowledge of mathematics to solve problems.
31. Identify important quantities in a practical situation.
32. Map relationships using diagrams, two-way tables, graphs, flowcharts and formulas.
33. Analyze relationships mathematically to draw conclusions.
34. Interpret mathematical results in the context of the situation.
35. Reflect on whether results make sense.
36. Consider the available tools when solving a mathematical problem.
37. Become sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful.
38. Recognize both the insight to be gained and their limitations.
39. Identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems.
40. Use technological tools to explore and deepen their understanding of concepts.
41. Communicate precisely to others.
42. Use clear definitions in discussion with others and in their own reasoning.
43. State the meaning of the symbols chosen, including using the equal sign consistently and appropriately.
44. Specify units of measures.
45. Label axes to clarify the correspondence with quantities in a problem.
46. Calculate accurately and efficiently.
47. Express numerical answers with a degree of precision appropriate for the problem context.
48. Look closely to discern a pattern or structure.
49. Recognize the significance of an existing line in a geometric figure.
50. Use the strategy of drawing an auxiliary line for solving problems.
51. Notice if calculations are repeated.
52. Look for general methods and for shortcuts.
53. Maintain oversight of the process as they work to solve a problem while attending to the details.
54. Evaluate the reasonableness of their intermediate results.

Unit/Module Notes: Taken from the Common Core State Standards for Mathematics by Common Core State Standards Initiative.

Lesson Topic: Core Lesson 1: Make sense of problems and persevere in solving them.

Core Lesson/Topic Description: Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondence between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problem and identify correspondences between different approaches.

Core Lesson/Topic Big Ideas: 1. Mathematically proficient students at all levels are able to meet success at mathematics.

Core Lesson/Topic Essential Questions:	1. How do we make sense of problems and persevere in solving them?
Core Lesson/Topic Student Learning Outcomes:	1. Explain the meaning of a problem. 2. Look for entry points to the solution of a problem. 3. Analyze givens, constraints, relationships, and goals of a problem. 4. Make conjectures about the form and meaning of a solution. 5. Plan a solution pathway rather than simply jumping into a solution attempt. 6. Monitor and evaluate progress in problem solving and change course if necessary. 7. Explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. 8. Check answers to problems using a different method, and determine if it makes sense. 9. Understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Lesson Topic: Core Lesson 2: Reason abstractly and quantitatively.

Core Lesson/Topic Description:	Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize-to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents- and ability to contectualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to computer them; and knowing and flexibly using different properties of operations and objects.
Core Lesson/Topic Big Ideas:	1. Mathematically proficient students at all levels are able to meet success at mathematics.
Core Lesson/Topic Essential Questions:	1. How do we reason abstractly and quantitatively?
Core Lesson/Topic Student Learning Outcomes:	1. Make sense of quantities and their relationships in problem situations. 2. Decontextualize problems. (abstract a given situation and represent it symbolically and manipulate the representing symbols.) 3. Contextualize problems. (pause as needed during the manipulation process in order to probe into the referents for the symbols involved.) 4. Create a coherent representation of the problem at hand. 5. Consider the units involved in solving a problem. 6. Attend to the meaning of quantities. 7. Know and be flexible in using different properties of operations and objects.

Lesson Topic: Core Lesson 3: Construct viable arguments and critique the reasoning of others.

Core Lesson/Topic Description:	Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and-if there is a flaw in an argument-explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are mot generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
Core Lesson/Topic Big Ideas:	1. Mathematically proficient students at all levels are able to meet success at mathematics.
Core	

Lesson/Topic Essential Questions:	1. How do we construct viable arguments and critique the reasoning of others?
Core Lesson/Topic Student Learning Outcomes:	1. Understand and use stated assumptions, definitions, and previously established results in constructing arguments. 2. Make conjectures and build a logical progression of statements to explore the truth of their conjectures. 3. Analyze situations by breaking them into cases, and can recognize and use counterexamples. 4. Justify conclusions. 5. Communicate conclusions and respond to the arguments about them. 6. Reason inductively and make arguments about data. 7. Compare the effectiveness of two plausible arguments. 8. Distinguish correct logic or reasoning form that which is flawed. 9. Listen or read the arguments of others. 10. Decide whether arguments of others make sense. 11. Ask useful questions to clarify or improve the arguments.

Lesson Topic: Core Lesson 4: Model with mathematics.

Core Lesson/Topic Description:	Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
Core Lesson/Topic Big Ideas:	1. Mathematically proficient students at all levels are able to meet success at mathematics.
Core Lesson/Topic Essential Questions:	1. How do we model with mathematics?
Core Lesson/Topic Student Learning Outcomes:	1. Apply known mathematics to solve problems arising in everyday life, society, and the workplace. 2. Make assumptions and approximations to simplify a complicated situation. 3. Apply knowledge of mathematics to solve problems. 4. Identify important quantities in a practical situation. 5. Map relationships using diagrams, two-way tables, graphs, flowcharts and formulas. 6. Analyze relationships mathematically to draw conclusions. 7. Interpret mathematical results in the context of the situation. 8. Reflect on whether results make sense.

Lesson Topic: Core Lesson 5: Use appropriate tools strategically.

Core Lesson/Topic Description:	Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.
Core Lesson/Topic Big Ideas:	1. Mathematically proficient students at all levels are able to meet success at mathematics.

Core Lesson/Topic Essential Questions:	1. How do we use appropriate tools strategically?
Core Lesson/Topic Student Learning Outcomes:	1. Consider the available tools when solving a mathematical problem. 2. Become sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful. 3. Recognize both the insight to be gained and their limitations. 4. Identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. 5. Use technological tools to explore and deepen their understanding of concepts.

Lesson Topic: Core Lesson 6: Attend to precision.

Core Lesson/Topic Description:	Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measures, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
Core Lesson/Topic Big Ideas:	1. Mathematically proficient students at all levels are able to meet success at mathematics.
Core Lesson/Topic Essential Questions:	1. How do we attend to precision?
Core Lesson/Topic Student Learning Outcomes:	1. Communicate precisely to others. 2. Use clear definitions in discussion with others and in their own reasoning. 3. State the meaning of the symbols chosen, including using the equal sign consistently and appropriately. 4. Specify units of measures. 5. Label axes to clarify the correspondence with quantities in a problem. 6. Calculate accurately and efficiently. 7. Express numerical answers with a degree of precision appropriate for the problem context.

Lesson Topic: Core Lesson 7: Look for and make use of structure.

Core Lesson/Topic Description:	Mathematically proficient students look closely to discern a patter or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 x 8 equals the well remembered 7 x 5 + 7 x 3, in preparation for learning about the distributive property. In the expression x^2 + 9x + 14, older students can see the 14 as 2 x 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
Core Lesson/Topic Big Ideas:	1. Mathematically proficient students at all levels are able to meet success at mathematics.
Core Lesson/Topic Essential Questions:	1. How do we look for and make use of structure?
Core Lesson/Topic Student Learning	1. Look closely to discern a pattern or structure. 2. Recognize the significance of an existing line in a geometric figure. 3. Use the strategy of drawing an auxiliary line for solving problems.

Outcomes:

Lesson Topic: Core Lesson 8: Look for and express regularity in repeated reasoning.

Core Lesson/Topic Description:	Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancels when expanding $(x -1)(x + 1)$, $(x - 1)(x^2 + x +1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.
Core Lesson/Topic Big Ideas:	1. Mathematically proficient students at all levels are able to meet success at mathematics.
Core Lesson/Topic Essential Questions:	1. How do we look for and express regularity in repeated reasoning?
Core Lesson/Topic Student Learning Outcomes:	1. Notice if calculations are repeated. 2. Look for general methods and for shortcuts. 3. Maintain oversight of the process as they work to solve a problem while attending to the details. 4. Evaluate the reasonableness of their intermediate results.

Unit: Unit 2: The Number System

Unit/Module Description:	Students apply and extend previous understandings of multiplication and division to divide fractions by fractions. Students compute fluently with multi-digit numbers and find common factors and multiples. Students apply and extend previous understandings of numbers to the system of rational numbers.
Unit/Module Big Ideas:	1. Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms. 2. Numerical quantities and calculations can be estimated by using numbers that are close to the actual values, but easier to compute. 3. Patterns exhibit relationships that can be extended, described, and generalized. 4. Measures can be estimated by using known referents. 5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values and locations on the number line and coordinate plane.
Unit/Module Essential Questions:	1. How does the understanding of situations that require multiplying or dividing and an understanding of the inverse relationship between multiplication and division help us to solve problems involving fractions and decimals in a real world context? 2. How are fractions, decimals, percents, and ratios related and used to represent real world situations including those dealing with proportionality?
Unit/Module Key Terminology & Definitions :	1. Quotient- the number obtained by dividing one quantity by another. 2. Simplest Form- the form of a fraction when the GCF of the numerator and denominator is 1. The fraction is in simplest form because the GCF of 3 and 4 is 1. 3. Reciprocal- Any two numbers whose product is 1. Since $\frac{5}{6} \times \frac{6}{5} = 1$, $\frac{5}{6}$ and $\frac{6}{5}$ are reciprocals. 4. Greatest Common Factor- the greatest of the common factors of two or more numbers. The GCF of 24 and 30 is 6. 5. Factor- two or more numbers that are multiplied together to form a product. 6. Prime Number- a whole number that has exactly two factors, 1 and the number itself. 7. Composite Number- a number greater than 1 with more than two factors. 8. Least Common Multiple- the least of the common multiples of two or more numbers; the LCM of 2 and 3 is 6. 9. Multiple- the product of a number and any whole number. 10. Prime Factorization- a composite number expressed as a product of prime numbers. 11. Distributive Property- To multiply a sum by a number, multiply each addend of the sum by

the number outside the parentheses.
12. Opposites- two numbers with same distance from zero with opposite signs.
13. Coordinate plane- a plane formed by two intersecting and perpendicular number lines used to help locate the position of any point.
14. Negative Integers- any integer that is less than zero.
15. Positive Integers- any integer greater than zero.

Unit/Module Student Learning Outcomes:

Concepts:
1. Understand real-world and mathematical problems involving division of fractions.
2. Know how to compute with multi-digit numbers using the four arithmetic operations with or without a calculator.
3. Understand number theory concepts (specifically, factors and multiples).
4. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values and locations on the number line and coordinate plane.
5. Understand ordering and absolute value of rational numbers.

Competencies:
1. Interpret and compute quotients of fractions (including mixed numbers), and solve word problems involving division of fractions by fractions.

2. Solve problems involving operations (+, –, ×, and ÷) with whole numbers, decimals (through thousandths), straight computation, or word problems.

3. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12.

4. Apply the distributive property to express a sum of two whole numbers, 1 through 100, with a common factor as a multiple of a sum of two whole numbers with no common factor.

4. Represent quantities in real-world contexts using positive and negative numbers, explaining the meaning of 0 in each situation (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge).

5. Determine the opposite of a number and recognize that the opposite of the opposite of a number is the number itself (e.g., –(–3) = 3; 0 is its own opposite).

6. Locate and plot integers and other rational numbers on a horizontal or vertical number line;locate and plot pairs of integers and other rational numbers on a coordinate plane.

7. Write, interpret, and explain statements of order for rational numbers in real-world contexts.

8. Interpret the absolute value of a rational number as its distance from 0 on the number line and as a magnitude for a positive or negative quantity in a real-world situation.

9. Solve real-world and mathematical problems by plotting points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

STANDARDS

STATE: PA Common Core Anchors and Eligible Content (May 2012)

M06.A-N.1.1.1 (Advanced)	Interpret and compute quotients of fractions (including mixed numbers), and solve word problems involving division of fractions by fractions. Example 1: Given a story context for (2/3) ÷ (3/4), explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = (a/b) × (d/c) = ad/bc.) Example 2: How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi? Example 3: How many 2 1/4-foot pieces can be cut from a 15 1/2-foot board?
M06.A-N.2.1.1 (Advanced)	Solve problems involving operations (+, –, ×, ÷) with whole numbers, decimals (through thousandths), straight computation, or word problems.
M06.A-N.2.2.1 (Advanced)	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12.
M06.A-N.2.2.2 (Advanced)	Apply the distributive property to express a sum of two whole numbers, 1 through 100, with a common factor as a multiple of a sum of two whole numbers with no common factor. Example: Express 36 + 8 as 4(9 + 2).
M06.A-N.3.1.1 (Advanced)	Represent quantities in real-world contexts using positive and negative numbers, explaining the meaning of 0 in each

	situation (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge).
M06.A-N.3.1.2 (Advanced)	Determine the opposite of a number and recognize that the opposite of the opposite of a number is the number itself (e.g., –(–3) = 3, and that 0 is its own opposite).
M06.A-N.3.1.3 (Advanced)	Locate and plot integers and other rational numbers on a horizontal or vertical number line; locate and plot pairs of integers and other rational numbers on a coordinate plane.
M06.A-N.3.2.1 (Advanced)	Write, interpret, and explain statements of order for rational numbers in real-world contexts. Example: Write –3°C > –7°C to express the fact that –3°C is warmer than –7°C.
M06.A-N.3.2.2 (Advanced)	Interpret the absolute value of a rational number as its distance from 0 on the number line and as a magnitude for a positive or negative quantity in a real-world situation. Example: For an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars, and recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.
M06.A-N.3.2.3 (Advanced)	Solve real-world and mathematical problems by plotting points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.
NATIONAL: US Common Core State Standards	
MA.6.NS.1 (Advanced)	Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.
MA.6.NS.2 (Advanced)	Fluently divide multi-digit numbers using the standard algorithm.
MA.6.NS.3 (Advanced)	Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
MA.6.NS.4 (Advanced)	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor.
MA.6.NS.5 (Advanced)	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
MA.6.NS.6 (Advanced)	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
MA.6.NS.6.A (Advanced)	Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., -(-3) = 3, and that 0 is its own opposite.
MA.6.NS.6.B (Advanced)	Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.
MA.6.NS.6.C (Advanced)	Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.
MA.6.NS.7 (Advanced)	Understand ordering and absolute value of rational numbers.
MA.6.NS.7.A (Advanced)	Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.
MA.6.NS.7.B (Advanced)	Write, interpret, and explain statements of order for rational numbers in real-world contexts.
MA.6.NS.7.C (Advanced)	Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.
MA.6.NS.7.D (Advanced)	Distinguish comparisons of absolute value from statements

	about order.
MA.6.NS.8 (Advanced)	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

Lesson Topic: Core Lesson 1: Division of Fractions

Core Lesson/Topic Description:	Students interpret and compute quotients of fractions (including mixed numbers), and solve word problems involving division of fractions by fractions.
Core Lesson/Topic Big Ideas:	1. Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms. 2. Numerical quantities and calculations can be estimated by using numbers that are close to the actual values, but easier to compute.
Core Lesson/Topic Essential Questions:	1. How does the understanding of situations that require multiplying or dividing and an understanding of the inverse relationship between multiplication and division help us to solve problems involving fractions and decimals in a real world context? 2. How are fractions, decimals, percents, and ratios related and used to represent real world situations including those dealing with proportionality?
Core Lesson/Topic Key Terminology & Definitions:	1. Quotient- the number obtained by dividing one quantity by another 2. Simplest form- the form of a fraction when the GCF of the numerator and denominator is 1. The fraction $\frac{3}{4}$ is in simplest form because the GCF of 3 and 4 is 1 3. Reciprocal- Any two numbers whose product is 1. Since $\frac{5}{6} \cdot \frac{6}{5} = 1$, $\frac{5}{6}$ *and* $\frac{6}{5}$ are reciprocals.
Core Lesson/Topic Student Learning Outcomes:	1. Review multiplying fractions. 2. Divide fractions. 3. Write quotients in simplest form. 4. Divide fractions and whole numbers. 5. Solve word problems involving division of fractions by fractions.

Lesson Topic: Core Lesson 2: Addition, Subtraction, Multiplication and Division with Whole Numbers and Decimals

Core Lesson/Topic Description:	Students solve problems involving operations ($+, -, \times, \div$) with whole numbers, decimals (through thousandths) straight computation or word problems.
Core Lesson/Topic Big Ideas:	1. Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms. 2. Numerical quantities and calculations can be estimated by using numbers that are close to the actual values, but easier to compute.
Core Lesson/Topic Essential Questions:	1. How are fractions, decimals, percents, and ratios related and used to represent real world situations including those dealing with proportionality?
Core Lesson/Topic Student Learning Outcomes:	1. Add and subtract decimals (through thousandths). 2. Multiply and divide decimals (through thousandths). 3. Solve word problems involving $+, -, \times$ *and* $\div$ of decimals (through thousandths).

Lesson Topic: Core Lesson 3: Greatest Common Factor and Least Common Multiple

Core Lesson/Topic Description:	Students find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12.

Core Lesson/Topic Big Ideas:	1. Apply number theory concepts (specifically, factors and multiples). 2. Patterns exhibit relationships that can be extended, described, and generalized. 3. Measures can be estimated by using known referents
Core Lesson/Topic Essential Questions:	1. How are fractions, decimals, percents, and ratios related and used to represent real world situations including those dealing with proportionality?
Core Lesson/Topic Key Terminology & Definitions:	1. Greatest Common Factor- the greatest of the common factors of two or more numbers. The GCF of 24 and 30 is 6. 2. Factor- two or more numbers that are multiplied together to form a product. 3. Prime Number- a whole number that has exactly two factors, 1 and the number itself. 4. Composite Number- a number greater than 1 with more than two factors. 5. Least Common Multiple- the least of the common multiples of two or more numbers; the LCM of 2 and 3 is 6. 6. Multiple- the product of a number and any whole number. 7. Prime Factorization- a composite number expressed as a product of prime numbers.
Core Lesson/Topic Student Learning Outcomes:	1. Apply number theory concepts (specifically, factors and multiples). 2. Find the prime factorization of a composite number. 3. Use rules of divisibility. 4. Find the GCF of two or more numbers. 5. Find the LCM of two or more numbers.
Core Lesson/Topic Notes:	Rules of Divisibility Chart

Lesson Topic: Core Lesson 4: Factoring

Core Lesson/Topic Description:	Students apply the distributive property to express a sum of two whole numbers, 1 through 100, with a common factor as a multiple of a sum of two whole numbers with no common factor.
Core Lesson/Topic Big Ideas:	1. Apply number theory concepts (specifically, factors and multiples). 2. Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms. 3. Patterns exhibit relationships that can be extended, described, and generalized.
Core Lesson/Topic Essential Questions:	1. How can we find the greatest common factor of an expression by applying the distributive property?
Core Lesson/Topic Key Terminology & Definitions:	1. Distributive Property- To multiply a sum by a number, multiply each addend of the sum by the number outside the parenthesis.
Core Lesson/Topic Student Learning Outcomes:	1. Apply number theory concepts (specifically, factors and multiples). 2. Find the prime factorization of a composite number.

Lesson Topic: Core Lesson 5: Integers

Core Lesson/Topic Description:	Students represent quantities in real-world contexts using positive and negative numbers, explaining the meaning of 0 in each situation (i.e., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge).

Core Lesson/Topic Big Ideas:	1. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values and locations on the number line and coordinate plane.
Core Lesson/Topic Essential Questions:	1. How are positive and negative numbers used to represent real life situations? 2. What is the opposite of a number? 3. How do you plot positive and negative numbers on a coordinate plane and a number line?
Core Lesson/Topic Key Terminology & Definitions:	1. Opposites- two numbers with same distance from zero with opposite signs. 2. Coordinate Plane- a plane formed by two intersecting and perpendicular number lines used to help locate the position of any point. 3. Negative Integers- any number less than zero. 4. Positive Integers- any number greater than zero.
Core Lesson/Topic Student Learning Outcomes:	1. Graph positive and negative integers on a number line. 2. Plot positive and negative integers on a coordinate plane. 3. Use positive and negative integer to represent real-life situations. 4. Identify the opposite of a number. 5. Interpret the absolute value of a rational number and its distance from zero on the number line.

Unit: Unit 3: Ratios and Proportional Relationships

Unit/Module Description:	Students understand ratio concepts and use ratio reasoning to solve problems.
Unit/Module Big Ideas:	1. Similarity relationships between objects are a form of proportional relationships. 2. Two variable quantities are proportional if their values are in a constant ratio. The relationship between proportional quantities can be represented as a linear function.
Unit/Module Essential Questions:	1. How are fractions, decimals, percents, and ratios related and used to represent real world situations including those dealing with proportionality?
Unit/Module Key Terminology & Definitions :	1. Rate- a ratio of two measurements having different kinds of units. (i.e.) $12 for 3 pounds . 2. Unit rate- when a rate is simplified so that it has a denominator of 1. 3. Ratio- a comparison of two numbers by division. The ratio of 2 to 3 can be stated as 2 out of 3, 2 to 3, 2:3, or $\frac{2}{3}$. 4. Equivalent ratios- ratios that have the same value.
Unit/Module Student Learning Outcomes:	Concepts: 1. Understand we can represent and/or solve real world and mathematical problems using rates, ratios,and/or percents. Competencies: 1. Use ratio language and notation (such as 3 to 4, 3:4, 3/4) to describe a ratio relationship between two quantities. 2. Find the unit rate a/b associated with a ratio a:b(with b ≠ 0) and use rate language in the context of a ratio relationship. 3. Construct tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and/or plot the pairs of values on the coordinate plane. Use tables to compare ratios. 4. Solve unit rate problems including those involving unit pricing and constant speed. 5. Find a percent of a quantity as a rate per 100 (e.g.,30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percentage.

STANDARDS

STATE: PA Common Core Anchors and Eligible Content (May 2012)

M06.A-R.1.1.1 (Advanced)	Use ratio language and notation (such as 3 to 4, 3:4, 3/4) to describe a ratio relationship between two quantities. Example 1: "The ratio of girls to boys in a math class is 2:3, because for every 2 girls there are 3 boys." Example 2: "For every five votes candidate A received, candidate B received four votes."
M06.A-R.1.1.2 (Advanced)	Find the unit rate a/b associated with a ratio a:b (with b 0), and use rate language in the context of a ratio relationship. Example 1: "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." Example 2: "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."
M06.A-R.1.1.3 (Advanced)	Construct tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and/or plot the pairs of values on the coordinate plane. Use tables to compare ratios.
M06.A-R.1.1.4 (Advanced)	Solve unit rate problems including those involving unit pricing and constant speed. Example: If it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?
M06.A-R.1.1.5 (Advanced)	Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
NATIONAL: US Common Core State Standards	
MA.6.RP.1 (Advanced)	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
MA.6.RP.2 (Advanced)	Understand the concept of a unit rate a/b associated with a ratio a:b with b is not equal to 0, and use rate language in the context of a ratio relationship.
MA.6.RP.3 (Advanced)	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
MA.6.RP.3.A (Advanced)	Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
MA.6.RP.3.B (Advanced)	Solve unit rate problems including those involving unit pricing and constant speed.
MA.6.RP.3.C (Advanced)	Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
MA.6.RP.3.D (Advanced)	Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

Lesson Topic: Core Lesson 1: Ratios

Core Lesson/Topic Description:	Students use ratio language and notation (such as 3 to 4, 3:4, 3/4) to describe a ratio between two quantities.
Core Lesson/Topic Big Ideas:	1. Similarity relationships between objects are a form of proportional relationships. 2. Two variable quantities are proportional if their values are in a constant ratio. The relationship between proportional quantities can be represented as a linear function.
Core Lesson/Topic Essential Questions:	1. How are fractions, decimals, percents, and ratios related and used to represent real world situations including those dealing with proportionality?
Core Lesson/Topic Key Terminology & Definitions:	1. Ratio- a comparison of two numbers by division. The ratio of 2 to 3 can be stated as 2 out of 3, 2 to 3, 2:3, or $\frac{2}{3}$ 2. Equivalent ratios- ratios that have the same value
Core Lesson/Topic Student	1. Express ratios in fraction form. 2. Write ratios in the simplest form.

Learning Outcomes:	3. Write equivalent ratios.

Lesson Topic: Core lesson 2: Unit rate

Core Lesson/Topic Description:	Students find the unit rate $\frac{a}{b}$ associated with a ratio a:b and use rate language in the context of a ratio relationship.
Core Lesson/Topic Big Ideas:	1. Similarity relationships between objects are a form of proportional relationships. 2. Two variable quantities are proportional if their values are in a constant ratio. The relationship between proportional quantities can be represented as a linear function.
Core Lesson/Topic Essential Questions:	1. How are fractions, decimals, percents, and ratios related and used to represent real world situations including those dealing with proportionality?
Core Lesson/Topic Key Terminology & Definitions:	1. Rate- a ratio of two measurements having different kinds of units. (i.e.) $12 for 3 pounds 2. Unit rate- when a rate is simplified so that it has a denominator of 1.
Core Lesson/Topic Student Learning Outcomes:	1. Write a unit rate given a problem situation. 2. Solve unit rate problems including those involving unit pricing and constant speed. 3. Find a percent of a quantity as a rate per 100. 4. Solve problems involving finding whole, given a part and a percentage.

Lesson Topic: Core lesson 3: Tables of Equivalent Ratios

Core Lesson/Topic Description:	Students construct tables of equivalent ratios relating quantities with whole-number measurements, find missing values in tables , and/or plot the pairs of values on the coordinate plane.
Core Lesson/Topic Big Ideas:	1. Similarity relationships between objects are a form of proportional relationships. 2. Two variable quantities are proportional if their values are in a constant ratio. The relationship between proportional quantities can be represented as a linear function.
Core Lesson/Topic Essential Questions:	1. How are fractions, decimals, percents, and ratios related and used to represent real world situations including those dealing with proportionality?
Core Lesson/Topic Student Learning Outcomes:	1. Construct tables of equivalent ratios relating quantities with whole-number measurements. 2. Find missing values in ratio tables and plot the pairs of values on a coordinate grid.

Unit: Unit 4: Expressions and Equations

Unit/Module Description:	Students apply and extend previous understandings of arithmetic to algebraic expressions. Students reason about and solve one-variable equations and inequalities. Students represent and analyze quantitative relationships between dependent and independent variables.
Unit/Module Big Ideas:	1. There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities. 2. Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms. 3. Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations.

4. Patterns exhibit relationships that can be extended, described, and generalized.

Unit/Module Essential Questions:

1. How do you translate given situations into math expressions and equations and formulas and use these to solve problems?

Unit/Module Key Terminology & Definitions :

1. Exponents- In a power, the number of times the base is used as a factor. In the exponent is 3. that is, =
2. Numerical expressions- a combination of numbers and operations
3. Algebraic expressions- an expression consisting of of one or more numbers and variables along with one or more arithmetic operations.
4. Order of operations- 1. Evaluate expressions inside grouping symbols
   2. Evaluate all powers
   3. Do all multiplications and/ or divisions from left to right.
   4. Do all additions and/ or subtractions from left to right.
5. Sum - The result of adding a set of numbers or algebraic expressions.
6. Term - A literal or numerical expression that has its own sign.
7. Product - The result of multiplying a set of numbers or expressions.
8. Factor - A number that divides into a whole number with a remainder of zero.
9. Quotient - The result of dividing two numbers or expressions.
10. Coefficient - The numerical factor of a term that contains a variable.
11. Quantity - something on which a mathematical operation can be performed <multiply the quantity x by y>
12. Variable - A placeholder for any value.
13. Equivalent Expressions - Expressions that have the same value.
14. Dependent Variable - The variable for the output of a function.
15. Independent Variable - The variable for the input of a function.
16. Inequality - A mathematical sentence that contains <, >, ≠, ≥, or ≤.
17. Substitution - Putting a number in place of a variable.

Unit/Module Student Learning Outcomes:

Concepts:
1. Identify, write, and evaluate numerical and algebraic expressions.
2. Create, solve, and interpret one variable equations or inequalities in real-world and mathematical problems.
3. Use variables to represent two quantities in a real-world problem that change in relationship to one another.

Competencies:
1. Write and evaluate numerical expressions involving whole-number exponents.
2. Write algebraic expressions from verbal descriptions.
Example: Express the description "five less than twice a number" as 2y – 5.
3. Identify parts of an expression using mathematical terms (e.g., sum, term, product, factor, quotient, coefficient, quantity).
Example: Describe the expression 2(8 + 7)as a product of two factors.
4. Evaluate expressions at specific values of their variables, including expressions that arise from formulas used in real-world problems.
Example: Evaluate the expression b2 – 5 when b = 4.
5. Apply the properties of operations to generate equivalent expressions.
Example 1: Apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x.
Example 2: Apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6(4x + 3y).
Example 3: Apply properties of operations to y + y + y to produce the equivalent expression 3y.
6. Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
7. Write algebraic expressions to represent real-world or mathematical problems.
8. Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q, and x are allnon-negative rational numbers.
9. Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem and/or represent solutions of such inequalities on number lines.
10. Write an equation to express the relationship between the dependent and independent variables. Example: In a problem involving motion at a constant speed of 65 units, write the equation d = 65t to represent the relationship between distance and time.
11. Analyze the relationship between the dependent and independent variables using graphs and tables and/or relate these to an equation.

STANDARDS

STATE: PA Common Core Anchors and Eligible Content (May 2012)

M06.B-E.1.1.1 (Advanced) Write and evaluate numerical expressions involving whole-number exponents.

M06.B-E.1.1.2 (Advanced)	Write algebraic expressions from verbal descriptions. Example: Express the description "five less than twice a number" as 2y – 5.
M06.B-E.1.1.3 (Advanced)	Identify parts of an expression using mathematical terms (e.g., sum, term, product, factor, quotient, coefficient, quantity). Example: Describe the expression 2(8 + 7) as a product of two factors.
M06.B-E.1.1.4 (Advanced)	Evaluate expressions at specific values of their variables, including expressions that arise from formulas used in real-world problems. Example: Evaluate the expression b2 – 5 when b = 4.
M06.B-E.1.1.5 (Advanced)	Apply the properties of operations to generate equivalent expressions. Example 1: Apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x. Example 2: Apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y). Example 3: Apply properties of operations to y + y + y to produce the equivalent expression 3y.
M06.B-E.2.1.1 (Advanced)	Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
M06.B-E.2.1.2 (Advanced)	Write algebraic expressions to represent real-world or mathematical problems.
M06.B-E.2.1.3 (Advanced)	Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q, and x are all non-negative rational numbers.
M06.B-E.2.1.4 (Advanced)	Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem and/or represent solutions of such inequalities on number lines.
M06.B-E.3.1.1 (Advanced)	Write an equation to express the relationship between the dependent and independent variables. Example: In a problem involving motion at a constant speed of 65 units, write the equation d = 65t to represent the relationship between distance and time.
M06.B-E.3.1.2 (Advanced)	Analyze the relationship between the dependent and independent variables using graphs and tables, and/or relate these to an equation.

NATIONAL: US Common Core State Standards

MA.6.EE.1 (Advanced)	Write and evaluate numerical expressions involving whole-number exponents.
MA.6.EE.2 (Advanced)	Write, read, and evaluate expressions in which letters stand for numbers.
MA.6.EE.2.A (Advanced)	Write expressions that record operations with numbers and with letters standing for numbers.
MA.6.EE.2.B (Advanced)	Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.
MA.6.EE.2.C (Advanced)	Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).
MA.6.EE.3 (Advanced)	Apply the properties of operations to generate equivalent expressions.
MA.6.EE.4 (Advanced)	Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).
MA.6.EE.5 (Advanced)	Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
MA.6.EE.6 (Advanced)	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
MA.6.EE.7 (Advanced)	Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers.

MA.6.EE.8 (Advanced)	Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.
MA.6.EE.9 (Advanced)	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

Lesson Topic: Core lesson 1: Evaluate Expressions

Core Lesson/Topic Description:	Students write and evaluate numerical expressions involving whole-number exponents. They write algebraic expressions from verbal descriptions. Students identify the parts of the expression using the mathematical terms. They evaluate expressions at specific values of their variables. Students apply properties of operations to generate equivalent expressions.
Core Lesson/Topic Big Ideas:	1. There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities. 2. Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms.
Core Lesson/Topic Essential Questions:	1. How do you translate given situations into math expressions and equations and formulas and use these to solve problems?
Core Lesson/Topic Key Terminology & Definitions:	1. Exponents- In a power, the number of times the base is used as a factor. In 5^3 the exponent is 3. that is, $5^3 = 5 \times 5 \times 5$ 2. Numerical expressions- a combination of numbers and operations 3. Algebraic expressions- an expression consisting of of one or more numbers and variables along with one or more arithmetic operations. 4. Order of operations- 1. Evaluate expressions inside grouping symbols 2. Evaluate all powers 3. Do all multiplications and/ or divisions from left to right. 4. Do all additions and/ or subtractions from left to right. 5. Sum - The result of adding a set of numbers or algebraic expressions. 6. Term - A literal or numerical expression that has its own sign. 7. Product - The result of multiplying a set of numbers or expressions. 8. Factor - A number that divides into a whole number with a remainder of zero. 9. Quotient - The result of dividing two numbers or expressions. 10. Coefficient - The numerical factor of a term that contains a variable. 11. Quantity - something on which a mathematical operation can be performed <multiply the quantity x by y> 12. Variable - A placeholder for any value. 13. Equivalent Expressions - Expressions that have the same value.
Core Lesson/Topic Student Learning Outcomes:	1. Write expressions involving whole numbers exponents using the order of operations. 2. Evaluate expressions involving whole numbers exponents using the order of operations. 3. Write algebraic expressions from verbal descriptions. 4. Identify parts of an expression using mathematical terms. (e.g., sum, term, product, factor, quotient, coefficient, quantity). 5. Evaluate expressions at specific values of their variables. 6. Evaluate expressions that arise from formulas used in real-world problems. 7. Apply the properties of operations to generate equivalent expressions. 8. Write algebraic expressions to represent real-world or mathematical problems.

Lesson Topic: Core Lesson 2: Equations and Inequalities

Core Lesson/Topic Description:	Students use substitution to determine whether a given number in a specified set makes an equation or inequality true. They solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q, and x are all non-

	negative rational numbers. Students write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem and/or represent solutions of such inequalities on number lines. They write equations to express the relationship between the dependent and independent variables. Students analyze the relationship between the dependent and independent variables using graphs and tables and/or relate these to an equation.
Core Lesson/Topic Big Ideas:	1. There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities. 2. Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms. 3. Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations. 4. Patterns exhibit relationships that can be extended, described, and generalized.
Core Lesson/Topic Essential Questions:	1. How do you translate given situations into math expressions and equations and formulas and use these to solve problems?
Core Lesson/Topic Key Terminology & Definitions:	1. Dependent variable - The variable for the output of a function. 2. Independent variable - The variable for the input of a function. 3. Inequality - A mathematical sentence that contains <, >, $\neq$, $\leq$, or $\geq$. 4. Substitution - Putting numbers in place of letters.
Core Lesson/Topic Student Learning Outcomes:	1. Use substitution to determine whether a given number in a specified set makes an equation or inequality true. 2. Solve real-world and mathematical problems by writing and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q, and x are all non-negative rational numbers. 3. Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem and/or represent solutions of such inequalities on number lines. 4. Write an equation to express the relationship between the dependent and independent variables. 5. Analyze the relationship between the dependent and independent variables using graphs and tables and/or relate these to an equation.

Unit: Unit 5: Geometry

Unit/Module Description:	Students solve real-world and mathematical problems involving area, surface area, and volume. They determine the area of triangles and special quadrilaterals. Students extend their knowledge to find the area of irregular or compound polygons and apply to the coordinate plane. They look at nets of three-dimensional figures and see they are composed of rectangles and triangles. Students determine volumes of right rectangular prisms that include fractional lengths. They calculate surface area of triangular and rectangular prisms.
Unit/Module Big Ideas:	1. Congruence describes a special similarity relationship between objects and is a form of equivalence. 2. Measures can be estimated by using known referents. 3. Shapes can be composed or decomposed.
Unit/Module Essential Questions:	1. How can we use the relationship between area and volume to help us draw, construct, model, and represent real situations and/or solve problems of area and volume?
Unit/Module Key Terminology & Definitions :	1. area - The surface included within a closed figure, measured by the number of square units needed to cover the surface. 2. cube - A rectangular prism in which all of the faces are squares. 3. edge - The intersection of faces of a three-dimensional figure. 4. irregular polygon - A polygon that does not have all sides equal and all angles equal. 5. net - A pattern that you can cut and fold to make a model of a solid shape. 6. parallelogram - A quadrilateral with both pairs of opposite sides parallel and congruent. 7. prisms - A polyhedron with two parallel, congruent faces called bases. 8. quadrilateral - A polygon that has four sides and four angles. 9. rectangle - A parallelogram with four right angles. 10. rhombus - A parallelogram with four congruent sides. 11. square - A parallelogram with four congruent sides and four right angles. 12. surface area - The sum of the areas of all the faces of a three-dimensional figure. 13. trapezoid - A quadrilateral with exactly one pair of parallel opposite sides.

14. triangle - A figure formed by three line segments that intersect only at their endpoints.
15. vertex(vertices) of a polygon - The point of intersection of the sides.
16. volume - The number of cubic units needed to fill the space occupied by a solid.

Unit/Module Student Learning Outcomes:

Concepts:
1. Understand area, surface area, and volume by applying formulas and using various strategies.

Competencies:
1. Determine the area of triangles and special quadrilaterals (i.e., square, rectangle,parallelogram, rhombus, and trapezoid). Formulas will be provided.
2. Determine the area of irregular or compound polygons. Example: Find the area of a room in the shape ofan irregular polygon by composing and/or decomposing.
3. Determine the volume of right rectangular prisms with fractional edge lengths. Formulas will be provided.
4. Given coordinates for the vertices of a polygon in the plane, use the coordinates to find side lengths and area of the polygon (limited to triangles and special quadrilaterals). Formulas will be provided.
5. Represent three-dimensional figures using nets made of rectangles and triangles.
6. Determine the surface area of triangular and rectangular prisms (including cubes). Formulas will be provided.

STANDARDS

STATE: PA Common Core Anchors and Eligible Content (May 2012)

M06.C-G.1.1.1 (Advanced)	Determine the area of triangles and special quadrilaterals (i.e., square, rectangle, parallelogram, rhombus, and trapezoid). Formulas will be provided.
M06.C-G.1.1.2 (Advanced)	Determine the area of irregular or compound polygons. Example: Find the area of a room in the shape of an irregular polygon by composing and/or decomposing.
M06.C-G.1.1.3 (Advanced)	Determine the volume of right rectangular prisms with fractional edge lengths. Formulas will be provided.
M06.C-G.1.1.4 (Advanced)	Given coordinates for the vertices of a polygon in the plane, use the coordinates to find side lengths and area of the polygon (limited to triangles and special quadrilaterals). Formulas will be provided.
M06.C-G.1.1.5 (Advanced)	Represent three-dimensional figures using nets made up of rectangles and triangles.
M06.C-G.1.1.6 (Advanced)	Determine the surface area of triangular and rectangular prisms (including cubes). Formulas will be provided.

NATIONAL: US Common Core State Standards

MA.6.G.1 (Advanced)	Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
MA.6.G.2 (Advanced)	Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w h and V = b h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.
MA.6.G.3 (Advanced)	Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.
MA.6.G.4 (Advanced)	Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

Lesson Topic: Core Lesson 1: Area of Triangles and Quadrilaterals

Core Lesson/Topic Description: Students solve real-world and mathematical problems involving area. They determine the area of triangles and special quadrilaterals. Students apply their knowledge to triangles and quadrilaterals drawn on the coordinate plane.

Core Lesson/Topic Big Ideas:	1. Measures can be estimated by using known referents.
Core Lesson/Topic Essential Questions:	1. How do we find the area of triangles? 2. What are the special quadrilaterals? 3. How do we find the area of special quadrilaterals?
Core Lesson/Topic Key Terminology & Definitions:	1. area - The surface included within a closed figure, measured by the number of square units needed to cover the surface. 2. parallelogram - A quadrilateral with both pairs of opposite sides parallel and congruent. 3. quadrilateral - A polygon that has four sides and four angles. 4. rectangle - A parallelogram with four right angles. 5. rhombus - A parallelogram with four congruent sides. 6. square - A parallelogram with four congruent sides and four right angles. 7. trapezoid - A quadrilateral with exactly one pair of parallel opposite sides. 8. triangle - A figure formed by three line segments that intersect only at their endpoints. 9. vertex(vertices) of a polygon - The point of intersection of the sides.
Core Lesson/Topic Student Learning Outcomes:	1. Calculate the area of triangles.(Formula provided.) 2. Identify special quadrilaterals.(square, rectangle, parallelogram, rhombus, and trapezoid) 3. Calculate the area of squares.(Formula provided.) 4. Calculate the area of rectangles.(Formula provided.) 5. Calculate the area of parallelograms.(Formula provided.) 6. Calculate the area of rhombus.(Formula provided.) 7. Calculate the area of trapezoids.(Formula provided.) 8. Given coordinates for the vertices of a polygon in the plane, use the coordinates to find side lengths and area of the polygon(limited to triangles and special quadrilaterals.)

Lesson Topic: Core Lesson 2: Area of Irregular/Compound Polygons

Core Lesson/Topic Description:	Students extend their knowledge to calculate the area of compound and irregular polygons.
Core Lesson/Topic Big Ideas:	1. Shapes can be composed or decomposed.
Core Lesson/Topic Essential Questions:	1. How can we find the area of an irregular polygon? 2. How can we find the area of a compound polygon?
Core Lesson/Topic Key Terminology & Definitions:	1. area - The surface included within a closed figure, measured by the number of square units needed to cover the surface. 2. irregular polygon - A polygon that does not have all sides equal and all angles equal.
Core Lesson/Topic Student Learning Outcomes:	1. Determine the area of irregular or compound polygons.

Lesson Topic: Core Lesson 3: Nets

Core Lesson/Topic Description:	Students look at nets of three-dimensional figures and see they are composed of rectangles and triangles.
Core Lesson/Topic Big Ideas:	1. Congruence describes a special similarity relationship between objects and is a form of equivalence. 2. Measures can be estimated by using known referents.
Core Lesson/Topic Essential Questions:	1. How can we represent three-dimensional figures using nets made of rectangles and triangles?

Core Lesson/Topic Key Terminology & Definitions:	1. edge - The intersection of faces of a three-dimensional figure. 2. net - A pattern that you can cut and fold to make a model of a solid shape. 3. prisms - A polyhedron with two parallel, congruent faces called bases. 4. vertex(vertices) of a polygon - The point of intersection of the sides.
Core Lesson/Topic Student Learning Outcomes:	1. Represent three-dimensional figures using nets made of rectangles and triangles.

Lesson Topic: Core Lesson 4: Volume and Surface Area

Core Lesson/Topic Description:	Students find volume of right rectangular prisms with fractional edge lengths. They determine the surface area of triangular, rectangular prisms and cubes.
Core Lesson/Topic Big Ideas:	1. How can we use the relationship between area and volume to help us draw, construct, model, and represent real situations and/or solve problems of area and volume?
Core Lesson/Topic Essential Questions:	1. How can we use the relationship between area and volume to help us draw, construct, model, and represent real situations and/or solve problems of area and volume?
Core Lesson/Topic Key Terminology & Definitions:	1. cube - A rectangular prism in which all of the faces are squares. 2. prisms - A polyhedron with two parallel, congruent faces called bases. 3. surface area - The sum of the areas of all the faces of a three-dimensional figure. 4. volume - The number of cubic units needed to fill the space occupied by a solid.
Core Lesson/Topic Student Learning Outcomes:	1. Calculate the volume of right rectangular prisms with fractional edge lengths. (Formula provided.) 2. Calculate the surface area of triangular prisms. (Formula provided.) 3. Calculate the surface area of rectangular prisms including cubes. (Formula provided.)

Unit: Unit 6: Statistics and Probability

Unit/Module Description:	Students develop an understanding of statistical variability. Students summarize and describe distributions.
Unit/Module Big Ideas:	1. Some questions can be answered by collecting, representing, and analyzing data, and the question to be answered determines the data to be collected, how best to collect it, and how best to represent it. 2. Numerical measures describe the center and spread of numerical data. 3. The likelihood of an event occurring can be described numerically and used to make predictions. 4. Measures can be estimated by using known referents.
Unit/Module Essential Questions:	1. How do you display numerical data in line plots? 2. How do you display data in histograms? 3. How do you display data in box-and-whisker plots? 4. How do you determine median? 5. How do you determine mean? 6. How do you determine mode? 7. How do you determine range? 8. How do you determine interquartile range? 9. How do you determine mean absolute deviation? 10. What patterns can be found in data? 11. How can we choose measures of center and variability based on the data?
Unit/Module Key Terminology & Definitions :	1. box-and-whisker plots - A method of visually displaying a distribution of data values by using the median, quartiles, and extremes of the data set. A box shows the middle 50% of the data. 2. data - unprocessed facts and figures collected about people or things. 3. histograms - A special kind of bar graph that displays the frequency of data that has been organized into equal intervals. The interval covers all possible values of data, therefore there are no spaces between the bars of the graph.

4. interquartile range - The range of the middle half of the data. The difference between the upper quartile and the lower quartile.
5. line plot - A number line labeled with a scale to include all the data with an X placed above a data point each time it occurs.
6. lower quartile - The median of the lower half of a set of data.
7. measures of center - mean, median, mode
8. measures of variability - range, interquartile range, mean absolute deviation
9. mean - A measure of center in a set of numerical data, computed by adding the vlaues in a list and then dividing by the number of values in the list.
10. mean absolute deviation - A measure of variation in a set of numerical data, computed by adding the distances between each data value and the mean, then dividing by the number of data values.
11. median - A measure of center in a set of numerical data.
12. mode - The number(s) or item(s) that appear most often in a set of data.
13. upper quartile - The median of the upper half of a set of data.

Unit/Module Student Learning Outcomes:

Concepts:
1. Know how to display, analyze, and summarize numerical data sets in relation to their context.
2. Understand measures of center and variability.
3. Understand when to choose measures of center and variability based on the data.

Competencies:
1. Display numerical data in plots on a number line, including line plots, histograms, and box- and whisker plots.
2. Determine quantitative measures of center (e.g.,median, mean, mode) and variability (e.g., range, interquartile range, mean absolute deviation).
3. Describe any overall pattern and any deviations from the overall pattern with reference to the context in which the data were gathered.
4. Relate the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

STANDARDS

STATE: PA Common Core Anchors and Eligible Content (May 2012)

M06.D-S.1.1.1 (Advanced)	Display numerical data in plots on a number line, including dot plots, histograms, and box-andwhisker plots.
M06.D-S.1.1.2 (Advanced)	Determine quantitative measures of center (e.g., median, mean, and/or mode) and variability (e.g., range, interquartile range, and/or mean absolute deviation).
M06.D-S.1.1.3 (Advanced)	Describe any overall pattern and any deviations from the overall pattern with reference to the context in which the data were gathered.
M06.D-S.1.1.4 (Advanced)	Relate the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

NATIONAL: US Common Core State Standards

MA.6.SP.1 (Advanced)	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.
MA.6.SP.2 (Advanced)	Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
MA.6.SP.3 (Advanced)	Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.
MA.6.SP.4 (Advanced)	Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
MA.6.SP.5 (Advanced)	Summarize numerical data sets in relation to their context, such as by:
MA.6.SP.5.A (Advanced)	Reporting the number of observations.
MA.6.SP.5.B (Advanced)	Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
MA.6.SP.5.C (Advanced)	Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
MA.6.SP.5.D (Advanced)	Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data

were gathered.

Lesson Topic: Core Lesson 1: Measures of Center

Core Lesson/Topic Description:	Students determine quantitative measures of center. They calculate mean, median, and mode of data.
Core Lesson/Topic Big Ideas:	1. Some questions can be answered by collecting, representing, and analyzing data, and the question to be answered determines the data to be collected, how best to collect it, and how best to represent it. 2. Numerical measures describe the center and spread of numerical data. 3. The likelihood of an event occurring can be described numerically and used to make predictions. 4. Measures can be estimated by using known referents.
Core Lesson/Topic Essential Questions:	1. Some questions can be answered by collecting, representing, and analyzing data, and the question to be answered determines the data to be collected, how best to collect it, and how best to represent it. 2. Numerical measures describe the center and spread of numerical data. 3. The likelihood of an event occurring can be described numerically and used to make predictions. 4. Measures can be estimated by using known referents.
Core Lesson/Topic Key Terminology & Definitions:	1. data - unprocessed facts and figures collected about people or things. 2. measures of center - mean, median, mode 3. mean - A measure of center in a set of numerical data, computed by adding the values in a list and then dividing by the number of values in the list. 4. median - A measure of denter in a set of numerical data. 5. mode - The number(s) or item(s) that appear most often in a set of data.
Core Lesson/Topic Student Learning Outcomes:	1. Calculate the mean. 2. Calculate the median. 3. Calculate the mode.

Lesson Topic: Core Lesson 2: Measures of Variability

Core Lesson/Topic Description:	Students determine the measures of variability. Students calculate range, interquartile range and mean absolute deviation.
Core Lesson/Topic Big Ideas:	1. Some questions can be answered by collecting, representing, and analyzing data, and the question to be answered determines the data to be collected, how best to collect it, and how best to represent it. 2. Numerical measures describe the center and spread of numerical data. 3. The likelihood of an event occurring can be described numerically and used to make predictions. 4. Measures can be estimated by using known referents.
Core Lesson/Topic Essential Questions:	1. How do you determine range? 2. How do you determine interquartile range? 3. How do you determine mean absolute deviation?
Core Lesson/Topic Key Terminology & Definitions:	1. interquartile range - The range of the middle half of the data. The difference between the upper quartile and the lower quartile. 2. lower quartile - 2. mean absolute deviation - A measure of variation in a set of numerical data, computed by adding the distances between each data value and the mean, then dividing by the number of data values. 3. measures of variability - range, interquartile range, mean absolute deviation 4. range - The difference between the greatest number and the least number in a set of data. 6. upper quartile - The median of the upper half of a set of data.
Core Lesson/Topic Student	1. Calculate range of a set of data. 2. Find upper and lower quartiles of a set of data. 3. Calculate interquartile range of a set of data.

Learning Outcomes:	4. Calculate mean absolute deviation of a set of data.

Lesson Topic: Core Lesson 3: Displaying Data

Core Lesson/Topic Description:	Students display numerical data sets in relation to their context. Students display numerical data in plots on a number line, including line plots, histograms, and box-and-whisker plots.
Core Lesson/Topic Big Ideas:	1. Some questions can be answered by collecting, representing, and analyzing data, and the question to be answered determines the data to be collected, how best to collect it, and how best to represent it. 2. Numerical measures describe the center and spread of numerical data. 3. The likelihood of an event occurring can be described numerically and used to make predictions. 4. Measures can be estimated by using known referents.
Core Lesson/Topic Essential Questions:	1. How do you display numerical data in line plots? 2. How do you display data in histograms? 3. How do you display data in box-and-whisker plots?
Core Lesson/Topic Key Terminology & Definitions:	1. box-and-whisker plots - A method of visually displaying a distribution of data values by using the median, quartiles, and extremes of the data set. A box shows the middle 50% of the data. 2. data - unprocessed facts and figures collected about people or things. 3. histograms - A special kind of bar graph that displays the frequency of data that has been organized into equal intervals. The interval covers all possible values of data, therefore there are no spaces between the bars of the graph. 4. line plot - A number line labeled with a scale to include all the data with an X placed above a data point each time it occurs.
Core Lesson/Topic Student Learning Outcomes:	1. Display numerical data in line plots. 2. Display numerical data in histograms. 3. Display numerical data in box-and-whisker plots.

Lesson Topic: Core Lesson 4: Analyzing Data

Core Lesson/Topic Description:	Students develop understanding of statistical variability. They will summarize and describe distributions.
Core Lesson/Topic Big Ideas:	1. Some questions can be answered by collecting, representing, and analyzing data, and the question to be answered determines the data to be collected, how best to collect it, and how best to represent it. 2. Numerical measures describe the center and spread of numerical data. 3. The likelihood of an event occurring can be described numerically and used to make predictions. 4. Measures can be estimated by using known referents.
Core Lesson/Topic Essential Questions:	1. What patterns can be found in data? 2. How can we choose measures of center and variability based on the data?
Core Lesson/Topic Key Terminology & Definitions:	1. measures of center - mean, median, mode 2. measures of variability - range, interquartile range, mean absolute deviation
Core Lesson/Topic Student Learning Outcomes:	1. Describe any overall pattern and any deviations from the overall pattern with reference to the context in which the data were gaterhed. 2. Relate the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.