

## ACADEMIC COURSE OUTLINE

<b>Department</b>	Mathematics	<b>Course Title</b>	Math 6	<b>Course Length</b>	1 year
<b>Grade Level(s)</b>	6	<b>Short Name</b>	Math 6	<b>Course Code</b>	1864

### **COURSE OVERVIEW:**

In Grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

### **COURSE CONTENT AND TIME ALLOTMENT:**

Content sequencing, activities and time allocations may be adjusted by the content team to suit student needs.

#### **Unit 1: Write, Interpret and Graph Rational Numbers**

**Duration:** 5 weeks (August/September)

#### **Description:**

Major themes of Unit 1 are to understand rational numbers as points on the number line and to extend previous understandings of numbers to the system of rational numbers, which now include negative numbers. Students extend horizontal and vertical number lines to plot negative numbers that can represent quantities in real-world contexts. They use the number line to order numbers and to understand the absolute value of a number. Students also begin to solve real-world and mathematical problems by graphing points in all four quadrants, a concept that continues to be used into high school and beyond.

**Materials:** EMC 1 Packet and Go Math - Modules 1 - 3

**Standards Addressed:** CCSS 6.NS.4, 6.NS.5, 6.NS.6, 6.NS.7, 6.NS.8

#### **Unit 2: Fractions**

**Duration:** 3 weeks (September/October)

#### **Description:**

In Unit 2, students expand their understanding of the number system and build their fluency in arithmetic operations. Students learned in 5th grade to divide whole numbers by unit fractions and unit fractions by whole numbers. Now, they apply and extend their understanding of multiplication and division to divide fractions by fractions. The meaning of this operation is connected to real-world problems as students are asked to create and solve fraction division word problems.

**Materials:** EMC 2 Packet and Go Math - Modules 4

**Standards Addressed:** CCSS 6.NS.1

**Priority Standard:** 6.NS.1 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.

### **Unit 3: Decimals**

**Duration:** 3 weeks (October/November)

**Description:**

In Unit 3, students continue (from fifth grade) to build fluency with adding, subtracting, multiplying, and dividing multi-digit decimal numbers using the standard algorithms. While students work with just numerical expressions in this unit, students will continue their work with order of operations and expanding it with exponents.

**Materials:** EMC 3 Packet and Go Math - Module 5

**Standards Addressed:** CCSS 6.NS.2, 6.NS.3

**Priority Standard:** 6.NS.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

### **Unit 4: Ratios and Rates**

**Duration:** 5 weeks (November/December)

**Description:**

In Unit 4, students build on their prior work in measurement and in multiplication and division as they study the concepts and language of ratios and unit rates. They use proportional reasoning to solve problems. In particular, students solve ratio and rate problems using tape diagrams, tables of equivalent ratios, double number line diagrams, and equations. They plot pairs of values generated from a ratio or rate on the first quadrant of the coordinate plane.

**Materials:** EMC 4 Packet and Go Math - Modules 6 - 8

**Standards Addressed:** CCSS 6.RP.1, 6.RP.2, 6.RP.3

**Review Priority Standards:** 6.NS.1, 6.NS.3

### **Unit 5: Expressions**

**Duration:** 4 weeks (January)

**Description:**

The main ideas of Unit 5 are algebraic expressions. Students will evaluate and translate algebraic expressions as well as learn about the properties of arithmetic. (Commutative, Associative, Distributive).

**Materials:** EMC 5 Packet and Go Math - Modules 9 and 10

**Standards Addressed:** CCSS 6.EE.1, 6.EE.2, 6.EE.3, 6.EE.4

**Priority Standard:** 6.EE.2c 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).

### **Unit 6:** Equations and Inequalities

**Duration:** 4 weeks (February/March)

**Description:**

In Unit 6, students will write, interpret, and use equations as they reason about and solve one-step equations in one variable. They will use variables to represent numbers and write expressions when solving real-world or mathematical problems. Students will know that the solution of an equation is the value of the variable that makes the equation true. They will 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. Students will then analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. Students will also learn about inequalities, which are mathematical sentences with an inequality symbol. Students will know that the solution of a one variable inequality consists of all values for the variable that make the inequality a true statement. Students will also graph the solution of a one variable inequality on a number line to represent all the values in the solution.

**Materials:** EMC 6 Packet and Go Math - Modules 11 and 12

**Standards Addressed:** CCSS 6.EE.5, 6.EE.6, 6.EE.7, 6.EE.8, 6.EE.9

**Priority Standards:** 6.EE.7 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.

### **Unit 7:** Area, Surface Area, and Volume

**Duration:** 4 weeks (March/April)

**Description:**

Unit 7 is an opportunity to practice the material learned in Unit 6 in the context of geometry; students apply their newly acquired capabilities with expressions and equations to solve for unknowns in three-dimensional shapes finding surface area and volume of right rectangular prisms with fractional edge lengths.

**Materials:** EMC 7 Packet and Go Math - Modules 13 and 14

**Standards Addressed:** CCSS 6.G.1, 6.G.2, 6.G.3, 6.G.4

**Review Priority Standards:** 6.NS.1, 6.NS.3, 6.EE.2c, 6.EE.7

### **Unit 8:** Statistics

**Duration:** 3 weeks (April/May)

**Description:**

In Unit 8, students develop an understanding of statistical variability and apply that understanding as they summarize, describe, and display distributions. In particular, careful attention is given to measures of center and variability.

**Materials:** EMC 8 Packet and Go Math - Module 16

**Standards Addressed:** CCSS 6.SP.1, 6.SP.2, 6.SP.3, 6.SP.4, 6.SP.5

**Review Priority Standards:** 6.NS.1, 6.NS.3, 6.EE.2c, 6.EE.7

### **GRADE WEIGHTING**

Assessments - 70% (Includes: Test, Quizzes, Group Tests)

Assignments - 30% (Includes: Homework, Classwork, Notes, Tasks)

### **REQUIREMENTS FOR MATH 7 ACC**

3.75 GPA and an 80% or higher on the final exam

OR 3.50 GPA and a 90% or higher on the final exam

### **COMPLETE LIST OF STANDARDS BY UNIT**

#### **EMC #1: Write, Interpret, and Graph Rational Numbers using GCF and LCM**

6.NS.4 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. For example, express  $36 + 8$  as  $4(9 + 2)$ .

6.NS.5 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.

6.NS.6 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.

6.NS.6a 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.

6.NS.6b 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.

6.NS.6c 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.

6.NS.7 Understand ordering and absolute value of rational numbers.

6.NS.7a Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. For example, interpret  $-3 > -7$  as a statement that  $-3$  is located to the right of  $-7$  on a number line oriented from left to right.

6.NS.7b Write, interpret, and explain statements of order for rational numbers in real-world contexts. For example, write  $-3^{\circ}\text{C} > -7^{\circ}\text{C}$  to express the fact that  $-3^{\circ}\text{C}$  is warmer than  $-7^{\circ}\text{C}$ .

6.NS.7c 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. For example, for an account balance of  $-30$  dollars, write  $|-30| = 30$  to describe the size of the debt in dollars.

6.NS.7d Distinguish comparisons of absolute value from statements about order. For example, recognize that an account balance less than  $-30$  dollars represents a debt greater than 30 dollars.

6.NS.8 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.

### **EMC #2: Solve Problems Involving Operations with Fractions**

6.NS.1 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. For example, create a story context for  $(2/3) \div (3/4)$  and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that  $(2/3) \div (3/4) = 8/9$  because  $3/4$  of  $8/9$  is  $2/3$ . (In general,  $(a/b) \div (c/d) = ad/bc$ .) How much chocolate will each person get if 3 people share  $1/2$  lb of chocolate equally? How many  $3/4$ -cup servings are in  $2/3$  of a cup of yogurt? How wide is a rectangular strip of land with length  $3/4$  mi and area  $1/2$  square mi?

### **EMC #3: Compute Decimals with Fluency**

6.NS.2 Fluently divide multi-digit numbers using the standard algorithm.

6.NS.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

### **EMC #4: Interpret and Use Rates and Ratios**

6.RP.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."

6.RP.2 Understand the concept of a unit rate  $a/b$  associated with a ratio  $a:b$  with  $b \neq 0$ , and use rate language in the context of a ratio relationship. For example, "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." "We paid \$75 for 15 hamburgers, which is a rate of \$5 per hamburger."

6.RP.3 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.

6.RP.3a 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.

6.RP.3b Solve unit rate problems including those involving unit pricing and constant speed. For 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?

6.RP.3c 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.

6.RP.3d Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

### **EMC #5: Write, Read, and Evaluate Expressions**

6.EE.1 Write and evaluate numerical expressions involving whole-number exponents.

6.EE.2 Write, read, and evaluate expressions in which letters stand for numbers.

6.EE.2a Write expressions that record operations with numbers and with letters standing for numbers. For example, express the calculation “Subtract  $y$  from 5” as  $5 - y$ .

6.EE.2b 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. For example, describe the expression  $2(8 + 7)$  as a product of two factors; view  $(8 + 7)$  as both a single entity and a sum of two terms.

6.EE.2c 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). For example, use the formulas  $V = s^3$  and  $A = 6s^2$  to find the volume and surface area of a cube with sides of length  $s = \frac{1}{2}$ .

6.EE.3 Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression  $3(2 + x)$  to produce the equivalent expression  $6 + 3x$ ; apply the distributive property to the expression  $24x + 18y$  to produce the equivalent expression  $6(4x + 3y)$ ; apply properties of operations to  $y + y + y$  to produce the equivalent expression  $3y$ .

6.EE.4 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). For example, the expressions  $y + y + y$  and  $3y$  are equivalent because they name the same number regardless of which number  $y$  stands for.

#### **EMC #6: Reason about and Solve One-Variable Equations and Inequalities**

6.EE.5 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.

6.EE.6 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.

6.EE.7 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.

6.EE.8 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.

6.EE.9 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. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation  $d = 65t$  to represent the relationship between distance and time.

#### **EMC #7: Solve Problems Involving Area, Surface Area, and Volume**

6.G.1 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.

6.G.2 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  $V = lwh$  and  $V = bh$  to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

6.G.3 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.

6.G.4 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.

### **EMC #8: Understand Statistical Variability and Distributions**

6.SP.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, “How old am I?” is not a statistical question, but “How old are the students in my school?” is a statistical question because one anticipates variability in students’ ages.

6.SP.2 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.

6.SP.3 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.

6.SP.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

6.SP.5 Summarize numerical data sets in relation to their context, such as by:

6.SP.5a Reporting the number of observations.

6.SP.5b Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

6.SP.5c Giving quantitative measures of center (median and/or mean) and variability (inter-quartile 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.

6.SP.5d 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.