COBB

TEACHING AND LEARNING STANDARDS

7th Grade Math

COBB COUNTY SCHOOL DISTRICT

ONE TEAM ONE GOAL STUDENT SUCCESS

7th Grade Mathematics Teaching & Learning Framework

Quarter 1		Quarter 2		Quarter 3		Quarter 4	
Unit 1 6 weeks	**Unit 2** 6 weeks	**Unit 3** 6 weeks	**Unit 4** 5 weeks	**Unit 5** 4 weeks	**Unit 6** 4 weeks	**Unit 7** 5 weeks	
Operations with Rational Numbers	**Expressions & Equations**	**Ratios & Proportional Relationships**	**Geometry**	**Inferences**	**Probability**	**Review and Extend**	
MGSE7.NS.1 (Add & subtract rationals) **MGSE7.NS.1a** (Additive inverses) **MGSE7.NS.1b** (p+q as a distance) **MGSE7.NS.1c** (subtracting rationals) **MGSE7.NS.1d** (Properties with rationals) **MGSE7.NS.2** (Multiply & divide rationals) **MGSE7.NS.2a** (Distributive property) **MGSE7.NS.2b** (Dividing rationals) **MGSE7.NS.2c** (Properties with rationals) **MGSE7.NS.2d** (Convert a rational to a decimal) **MGSE7.NS.2d** (Solve real-world problems)	**MGSE7.EE.1** (Properties of operations) **MGSE7.EE.2** (Equivalent expressions) **MGSE7.EE.3** (Solve multi-step problems) **MGSE7.EE.4** (Construct equations & inequalities) **MGSE7.EE.4a** (Solve 2-step equations) **MGSE7.EE.4b** (Solve 2-step inequalities) **MGSE7.EE.4c** (Solve 1-step equations)	**MGSE7.RP.1** (Unit rates) **MGSE7.RP.2** (Proportional relationships) **MGSE7.RP.2a** (Table & graphing) **MGSE7.RP.2b** (Constant of proportionality) **MGSE7.RP.2c** (Equations) **MGSE7.RP.2d** (Coordinates) **MGSE7.RP.3** (Percent problems) **MGSE7.G.1** (Scale drawings)	**MGSE7.G.2** (Geometric shapes) **MGSE7.G.3** (Cross-sections) **MGSE7.G.4** (Area & circumference) **MGSE7.G.5** (Angles) **MGSE7.G.6** (Area, volume & surface area)	**MGSE7.SP.1** (Sampling & population) **MGSE7.SP.2** (Draw inferences) **MGSE7.SP.3** (Compare data) **MGSE7.SP.4** (Draw inferences)	**MGSE7.SP.5** (Probability of an event) **MGSE7.SP.6** (Approximate probability) **MGSE7.SP.7** (Probability models with experimental & theoretical) **MGSE7.SP.7a** (Uniform models) **MGSE7.SP.7b** (Different models) **MGSE7.SP.8a** (Compound events) **MGSE7.SP.8b** (Sample space methods) **MGSE7.SP.8c** (Simulations)	<u>**Review:**</u> **All standards by differentiating for student needs** <u>**Extend:**</u> **MGSE8.EE.7a** (Multi-step equations) **MGSE8.EE.3** (Estimate with scientific notation) **MGSE8.EE.4** (Compute with scientific notation)	

These units were written to build upon concepts from prior units, so later units contain tasks that depend upon the concepts addressed in earlier units.
All units will include the Mathematical Practices and indicate skills to maintain

NOTE: Mathematical standards are interwoven and should be addressed throughout the year in as many different units and tasks as possible in order to stress the natural connections that exist among mathematical topics.

Grades 6-8 Key: NS = The Number System, RP = Ratios and Proportional Relationships, EE = Expressions and Equations, G = Geometry, SP = Statistics and Probability.

Standards for Mathematical Practice

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 problem 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).

1. Make sense of problems and persevere in solving them.

In grade 7, students solve problems involving ratios and rates and discuss how they solved them. Students solve real world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?"

2. Reason abstractly and quantitatively.

In grade 7, students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.

3. Construct viable arguments and critique the reasoning of others.

In grade 7, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like "How did you get that?", "Why is that true?" "Does that always work?" They explain their thinking to others and respond to others' thinking.

4. Model with mathematics.

In grade 7, students model problem situations symbolically, graphically, tabularly, and contextually. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical representations. Students explore covariance and represent two quantities simultaneously. They use measures of center and variability and data displays (i.e. box plots and histograms) to draw inferences, make comparisons and formulate predictions. *Students use experiments or simulations to generate data sets and create probability models. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use all of these representations as appropriate to a problem context*

5. Use appropriate tools strategically.

Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 7 may decide to represent similar data sets using dot plots with the same scale to visually compare the center and variability of the data. *Students might use physical objects or applets to generate probability data and use graphing calculators or spreadsheets to manage and represent data in different forms.*

6. Attend to precision.

In grade 7, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students define variables, specify units of measure, and label axes accurately. *Students use appropriate terminology when referring to rates, ratios, probability models*, geometric figures, data displays, and components of expressions, equations or inequalities.

7. Look for and make use of structure.

Students routinely seek patterns or structures to model and solve problems. For instance, students recognize patterns that exist in ratio tables making connections between the constant of proportionality in a table with the slope of a graph. Students apply properties to generate equivalent expressions (i.e. $6 + 2x = 3 (2 + x)$ by distributive property) and solve equations (i.e. $2c + 3 = 15$, $2c = 12$ by subtraction property of equality), $c = 6$ by division property of equality). Students compose and decompose two- and three-dimensional figures to solve real world problems involving scale drawings, surface area, and volume. Students examine tree diagrams or systematic lists to determine the sample space for compound events and verify that they have listed all possibilities.

8. Look for and express regularity in repeated reasoning.

In grade 7, students use repeated reasoning to understand algorithms and make generalizations about patterns. During multiple opportunities to solve and model problems, they may notice that $a/b \div c/d = ad/bc$ and construct other examples and models that confirm their generalization. They extend their thinking to include complex fractions and rational numbers. Students formally begin to make connections between covariance, rates, and representations showing the relationships between quantities. *They create, explain, evaluate, and modify probability models to describe simple and compound events.*

Ratios and Proportional Relationships (7.RP)

Analyze proportional relationships and use them to solve real-world and mathematical problems.

MGSE7.RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction (1/2)/(1/4) miles per hour, equivalently 2 miles per hour.

MGSE7.RP.2 Recognize and represent proportional relationships between quantities.

    a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

    b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

    c. Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t = pn$.

    d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (*1,r*) where r is the unit rate.

MGSE7.RP.3 Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, and fees.

The Number System (7.NS)

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

MGSE7.NS.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

   a. Show that a number and its opposite have a sum of 0 (are additive inverses). Describe situations in which opposite quantities combine to make 0. *For example, your bank account balance is -$25.00. You deposit $25.00 into your account. The net balance is $0.00.*

   b. Understand p + q as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Interpret sums of rational numbers by describing real world contexts.

   c. Understand subtraction of rational numbers as adding the additive inverse, *p – q = p + (– q)*. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

   d. Apply properties of operations as strategies to add and subtract rational numbers.

MGSE7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

   a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (- 1)(– 1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

   b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If *p* and *q* are integers then *– (p/q) = (– p)/q = p/(–q)*. Interpret quotients of rational numbers by describing real-world contexts.

   c. Apply properties of operations as strategies to multiply and divide rational numbers.

   d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

MGSE7.NS.3 Solve real-world and mathematical problems involving the four operations with rational numbers.

Expressions and Equations (7.EE)

Use properties of operations to generate equivalent expressions.

MGSE7.EE.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

MGSE7.EE.2 Understand that rewriting an expression in different forms in a problem context can clarify the problem and how the quantities in it are related. *For example a + 0.05a = 1.05a means that adding a 5% tax to a total is the same as multiplying the total by 1.05.*

Solve real-life and mathematical problems using numerical and algebraic expressions and equations

MGSE7.EE.3 Solve multistep real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals) by applying properties of operations as strategies to calculate with numbers, converting between forms as appropriate, and assessing the reasonableness of answers using mental computation and estimation strategies.
For example:
- *If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50.*

- *If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.*

MGSE7.EE.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where *p, q*, and *r* are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*

b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where *p, q*, and *r* are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example, as a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.*

c. Solve real-world and mathematical problems by writing and solving equations of the form $x+p = q$ and $px = q$ in which p and q are rational numbers.

Geometry (7.G)

Draw, construct, and describe geometrical figures and describe the relationships between them.

MGSE7.G.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

MGSE7.G.2 Explore various geometric shapes with given conditions. Focus on creating triangles from three measures of angles and/or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

MGSE7.G.3 Describe the two-dimensional figures (cross sections) that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms, right rectangular pyramids, cones, cylinders, and spheres.

Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

MGSE7.G.4 Given the formulas for the area and circumference of a circle, use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

MGSE7.G.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

MGSE7.G.6 Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Statistics and Probability (7.SP)

Use random sampling to draw inferences about a population.

MGSE7.SP.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

MGSE7.SP.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be*

Draw informal comparative inferences about two populations.

MGSE7.SP.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the medians by expressing it as a multiple of the interquartile range.

MGSE7.SP.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.*

Investigate chance processes and develop, use, and evaluate probability models.

MGSE7.SP.5 Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

MGSE7.SP.6 Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency. Predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.*

Investigate chance processes and develop, use, and evaluate probability models continued

MGSE7.SP.7 Develop a probability model and use it to find probabilities of events. Compare experimental and theoretical probabilities of events. If the probabilities are not close, explain possible sources of the discrepancy.

    a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.*

    b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?*

MGSE7.SP.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

    a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

    b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.

    c. Explain ways to set up a simulation and use the simulation to generate frequencies for compound events. *For example, if 40% of donors have type A blood, create a simulation to predict the probability that it will take at least 4 donors to find one with type A blood?*