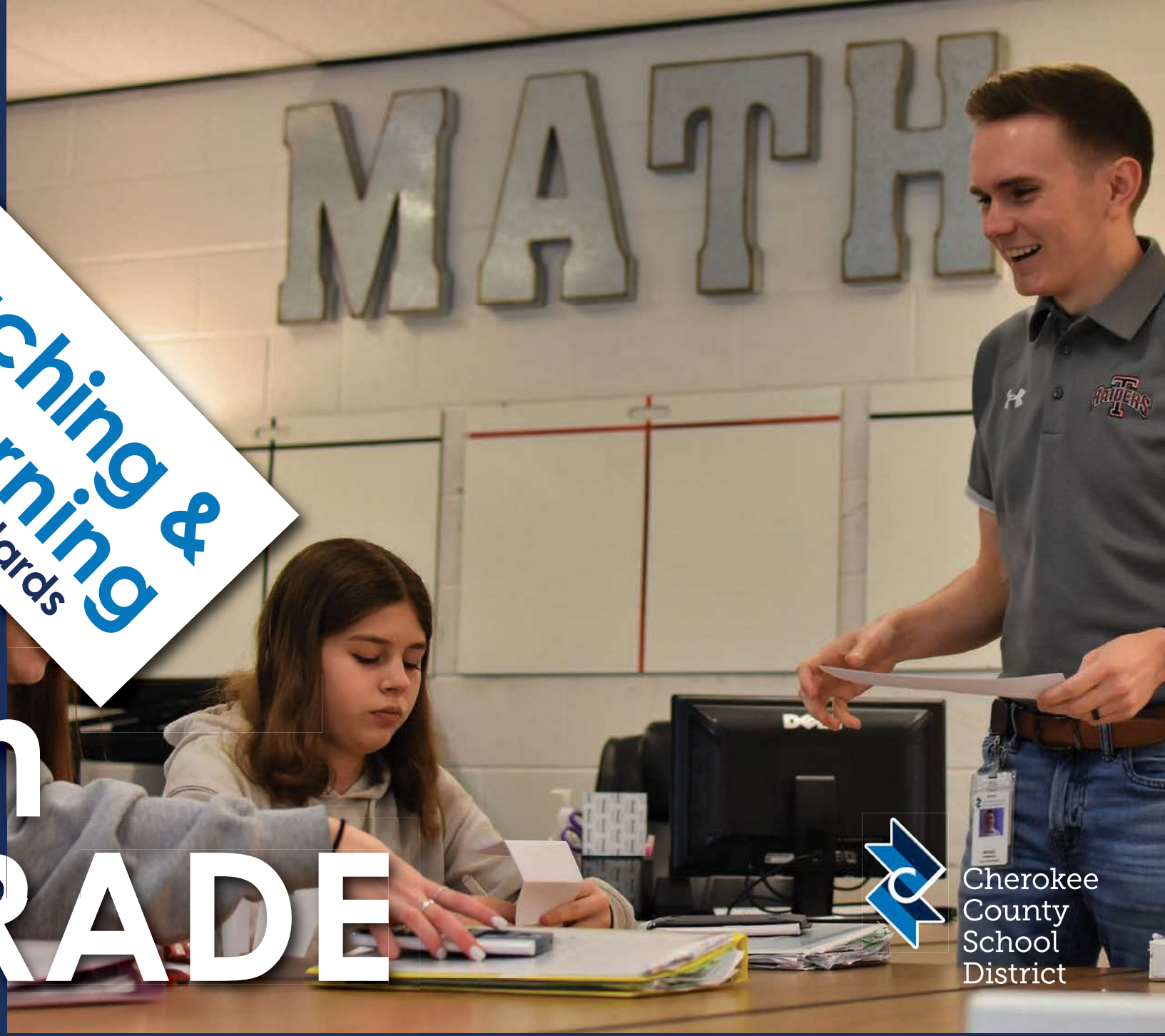
Teaching & Learning Standards

8th GRADE



Cherokee County School District

Mathematics

Year Long Mathematical Practices (MP):

Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration, and expression. Seek help and apply feedback. Set and monitor goals.

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

MP.2 – Reason abstractly and quantitatively

MP.3 – Construct viable arguments and critique reasoning of others.

MP.4 – Model with mathematics.

MP.5 – Use appropriate tools strategically.

MP.6 – Attend to precision.

MP.7 – Look for and make use of structure.

MP.8 – Look for and express regularity in repeated reasoning.

Unit 1: Investigating Linear Expression, Equations, and Inequalities in One Variable (4-5 weeks)

In Unit 1 students will incorporate patterning and algebraic reasoning to create, interpret, solve, and graph linear equations and inequalities in one variable. The equations and inequalities include those with rational coefficients, variables on both sides and whose solutions require the use of the distributive property and combining of like terms. Students will interpret expressions with multiple factors and/or terms and manipulate linear and literal equations expressed in various forms.

Overarching Standards for Unit 1

PAR.3: Create and interpret expressions within relevant situations. Create, interpret, and solve linear equations and linear inequalities in one variable to model and explain real phenomena.

Standards for Student Mastery for Unit 1

PAR.3.1: Interpret expressions and parts of an expression, in context, by utilizing formulas or expressions with multiple terms and/or factors.

PAR.3.2: Describe and solve linear equations in one variable with one solution (x = a), infinitely many solutions (a = a), or no solutions (a = b). Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).

PAR.3.3: Create and solve linear equations and inequalities in one variable within a relevant, real-life application.

PAR.3.4: Using algebraic properties and the properties of real numbers, justify the steps of a one-solution equation or inequality.

PAR.3.5: Solve linear equations and inequalities in one variable with coefficients represented by letters and explain the solution based on the contextual, mathematical situation.

PAR.3.6: Use algebraic reasoning to fluently manipulate linear and literal equations expressed in various forms to solve relevant, mathematical problems.

Unit 2: Modeling Linear Relationships & Functions (5-6 weeks)

In Unit 2, students will analyze the connections between proportional and nonproportional lines and equations and be able to relate their graphs to their solution sets in the coordinate plane. They will apply functional and graphical reasoning to identify whether or not functions are linear or nonlinear. Students will also interpret, write, graph, and solve linear functions in different forms, depending upon the given context.

Overarching Standards for Unit 2

PAR.4: Show and explain the connections between proportional and non-proportional relationships, lines, and linear equations; create and interpret graphical, mathematical models and use the graphical, mathematical model to explain real-life phenomena represented in the graph.

FGR.5: Describe the properties of functions to define, evaluate, and compare relationships, and use functions and graphs of functions to model and explain real-life phenomena.

Standards for Student Mastery for Unit 2

PAR.4.1: Use the equation y = mx (proportional) for a line through the origin to derive the equation y = mx + b (non-proportional) for a line intersecting the vertical axis at b.

PAR.4.2: Show and explain that the graph of an equation representing an applicable situation in two variables is the set of all its solutions plotted in the coordinate plane.

FGR.5.1: Show and explain that a function is a rule that assigns to each input exactly one output.

FGR.5.2: Within realistic situations, identify and describe examples of functions that are linear or nonlinear. Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

FGR.5.3: Relate the domain of a linear function to its graph and where applicable to the quantitative relationship it describes.

FGR.5.4: Compare properties (rate of change and initial value) of two functions used to model an authentic situation each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

FGR.5.5: Write and explain the equations y = mx + b (slope-intercept form), Ax + By = C (standard form), and $(y - y_1) = m(x - x_1)$ (point-slope form) as defining a linear function whose graph is a straight line to reveal and explain different properties of the function.

FGR.5.6: Write a linear function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

FGR.5.7: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x,y) values, including reading these from a table or from a graph.

FGR.5.8: Explain the meaning of the rate of change and initial value of a linear function in terms of the situation it models and in terms of its graph or a table of values.

FGR.5.9: Graph and analyze linear functions expressed in various algebraic forms and show key characteristics of the graph to describe applicable situations.

Unit 3: Investigating Data & Statistical Reasoning (3-4 weeks)

In this unit, students will extend the study of linear relationships by exploring models and tables. They will apply their functional and graphical reasoning to model relationships between quantities and describe the rate of change. The study of statistics expands from more simplistic samples and collections in sixth and seventh grade, to bivariate data, which can be graphed and a line of best fit determined. They will also make predictions and answer statistical questions based on data distributions.

Overarching Standards for Unit 3

FGR.6: Solve practical, linear problems involving situations using bivariate quantitative data.

Standards for Student Mastery for Unit 3

FGR.6.1: Show that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, visually fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line of best fit.

FGR.6.2: Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercepts.

FGR.6.3: Explain the meaning of the predicted slope (rate of change) and the predicted intercept (constant term) of a linear model in the context of the data.

FGR.6.4: Use appropriate graphical displays from data distributions involving lines of best fit to draw informal inferences and answer the statistical investigative question posed in an unbiased statistical study.

Semester 2 (January – May)

Unit 4: Real-Life Phenomena Explored through Systems of Linear Equations (5-6 weeks)

In this unit, students will extend their understanding of solving equations and functional and graphical reasoning to solving systems of equations, including those created by parallel and/or perpendicular lines. Solving systems should include estimating solutions graphically, solving using substitution, and solving using elimination.

Overarching Standards for Unit 4

FGR.7: Justify and use various strategies to solve systems of linear equations to model and explain real-life phenomena.

Standards for Student Mastery for Unit4

FGR.7.1: Interpret and solve relevant mathematical problems leading to two linear equations in two variables.

FGR.7.2: Show and explain that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because the points of intersection satisfy both equations simultaneously.

FGR.7.3: Approximate solutions of two linear equations in two variables by graphing the equations and solving simple cases by inspection.

FGR.7.4: Analyze and solve systems of two linear equations in two variables algebraically to find exact solutions.

FGR.7.5: Create and compare the equations of two lines that are either parallel to each other, perpendicular to each other, or neither parallel nor perpendicular.

Unit 5: Exploring Irrational Numbers, Integer Exponents (5-6 weeks)

In Unit 5, students extend their knowledge of numerical reasoning and real numbers to include irrational numbers, develop an understanding of the properties of exponents, and perform operations with numbers expressed in scientific notation.

Overarching Standards for Unit 5

NR.1: Solve problems involving irrational numbers and rational approximations of irrational numbers to explain real-life applications.

NR.2: Solve problems involving radicals and integer exponents including relevant application situations; apply place value understanding with scientific notation and use scientific notation to explain real-life phenomena.

Standards for Student Mastery for Unit 5

NR.1.1: Distinguish between rational and irrational numbers using decimal expansion. Convert a decimal expansion which repeats eventually into a rational number.

NR.1.2: Approximate irrational numbers to compare the size of irrational numbers, locate them approximately on a number line, and estimate the value of expressions.

NR.2.1: Apply the properties of integer exponents to generate equivalent numerical expressions.

NR.2.2: Use square root and cube root symbols to represent solutions to equations. Recognize that x^2 = p (where p is a positive rational number and |x| ≤ 25) has two solutions and x^3 = p (where p is a negative or positive rational number and |x| ≤ 10) has one solution. Evaluate square roots of perfect squares ≤ 625 and cube roots of perfect cubes ≥ -1000 and ≤ 1000.

NR.2.3: Use numbers expressed in scientific notation to estimate very large or very small quantities, and to express how many times as much one is than the other.

NR.2.4: Add, subtract, multiply and divide numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Interpret scientific notation that has been generated by technology (e.g., calculators or online technology tools).

Unit 6: Exploring Geometric Relationships (3-4 weeks)

In Unit 6, students will extend their work with irrational numbers and apply their geometric and spatial reasoning to interpret and solve problems involving the Pythagorean Theorem. Students will work with right triangles and investigate proofs of the Pythagorean Theorem and its converse. They will also extend their knowledge of volume from previous grades to solve problems involving cones, cylinders, and spheres.

Overarching Standards for Unit 6

GSR.8: Solve geometric problems involving the Pythagorean Theorem and the volume of geometric figures to explain real-life phenomena.

Standards for Student Mastery for Unit 6

GSR.8.1: Explain a proof of the Pythagorean Theorem and its converse using visual models.

GSR.8.2: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles within authentic mathematical problems in two and three dimensions.

GSR.8.3: Apply the Pythagorean Theorem to find the distance between two points in a coordinate system in practical mathematical problems.

GSR.8.4: Apply the formulas for the volume of cones, cylinders, and spheres and use them to solve relevant, real-life problems.

Unit 7 - Culminating Capstone Unit (1-2 weeks)

The capstone unit applies content that has already been learned in previous interdisciplinary PBLs and units throughout the school year. The capstone unit is an interdisciplinary unit that allows students to create a presentation, report, or demonstration that could include their models used to answer an overarching driving question. (e.g., Students can present their solution(s), findings, project, or answer to the driving question to a larger audience during the culminating capstone unit.)

Overarching Standards for Unit 7

PAR.3: Create and interpret expressions within relevant situations. Create, interpret, and solve linear equations and linear inequalities in one variable to model and explain real phenomena.

PAR.4: Show and explain the connections between proportional and non-proportional relationships, lines, and linear equations; create and interpret graphical, mathematical models and use the graphical, mathematical model to explain real-life phenomena represented in the graph.

FGR.5: Describe the properties of functions to define, evaluate, and compare relationships, and use functions and graphs of functions to model and explain real-life phenomena.

FGR.6: Solve practical, linear problems involving situations using bivariate quantitative data.

FGR.7: Justify and use various strategies to solve systems of linear equations to model and explain real-life phenomena.

NR.1: Solve problems involving irrational numbers and rational approximations of irrational numbers to explain real-life applications.

NR.2: Solve problems involving radicals and integer exponents including relevant application situations; apply place value understanding with scientific notation and use scientific notation to explain real-life phenomena.

GSR.8: Solve geometric problems involving the Pythagorean Theorem and the volume of geometric figures to explain real-life phenomena.

Standards for Student Mastery for Unit 7

ALL associated learning objectives.