

## 8<sup>th</sup> Grade Math Curriculum/7<sup>th</sup> Grade Advanced

### **Course Information:**

*Course:* Course 3 of Prentice Hall Common Core

*Length:* 46 minutes/day

*Description:* Mathematics at the 8<sup>th</sup> grade level will cover a variety of fundamental math skills, along with application of real-life scenarios. Skills expected to be mastered are number sense, geometry, equations, inequalities, measurement, statistics, probability, data analysis, algebra, relations, functions, consumer math, and ratios and linear equations including systems of equations.

### **Essential Understanding:**

The eighth grade curriculum is designed to focus but not be limited to four critical areas using a variety of mathematical practices.

- (1) Formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations.
- (2) Grasping the concept of a function and using functions to describe quantitative relationships; and
- (3) Analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

### **Theme Samples:**

1. Real Numbers & the Coordinate Plane
2. Solving Linear Equations
3. Introduction to Functions
4. Graphing Functions
5. Systems of Linear Equations
6. Exponents
7. An Introduction to Geometry
8. Transformations
9. Geometry & Measurement
10. Data Analysis

### **Mathematical Practices**

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

### **Course Expectations**

1. Students use exponents and square roots to explore the Pythagorean Theorem.
2. Students simplify algebraic expressions, write, and solve two-step equations.
3. Students graph relationships, functions, proportional relationships and linear and nonlinear functions.
4. Students investigate linear and nonlinear functions.
5. Students use graphing, the substitution method, and the elimination method to solve systems of linear equations.
6. Students learn how to multiply and divide powers, including zero and negative exponents.
7. Students solve problems by learning and using the properties of pairs of angles, of parallel lines, and of polygons.
8. Students explore the four principle types of transformations and apply the rules of transformations in real-world situations.
9. Students continue their study of geometric concepts as they learn about solid figures. They apply formulas to find volume.
10. Students explore ways to display, analyze, and interpret data.

### **Student Objectives**

1. Students will be able to write equivalent fraction and decimals; find and estimate square roots; classify numbers as rational or irrational; find cube roots and solve cube root equations; use Pythagorean Theorem; finding missing measurements using Pythagorean Theorem; and to graph points in the coordinate plane.
2. Students will solve two-step equations; combine like terms and to simplify expressions; write and solve multi-step equations; write and solve equations with variables on both sides; and identify whether linear equations have solutions.
3. Students will interpret graphs; evaluate functions and complete input-output tables; determine if relationships are proportional; recognize linear functions and be able to graph; and identify nonlinear functions.
4. Students will find slope from a graph or table; graph linear functions; learn to write function rules; and compare properties of two functions represented in different ways.
5. Students will solve systems of two linear equations by graphing; solve a system of linear equations by substitution; solve a system of linear equations by elimination; and use systems of equations to solve real-world problems.
6. Students will write numbers in standard form and scientific notation; multiply powers with the same base; multiply numbers written in scientific notation; divide powers with the same base; simplify expressions with negative exponents; and divide numbers written in scientific notation.
7. Students will identify types of angles; find angle measures; identify parallel lines and angles formed by parallel lines and transversals; identify congruent figures; identify similar figures using proportions to find missing measurements; determine measure of angles of triangles; and find angle measures of polygons.
8. Students will graph and describe transformations in the coordinate plane; including translations, reflections, rotations, and dilations; line and rotational symmetry; scale factor; and describe sequences of transformations to determine congruency and similarity.
9. Students will identify solids, parts of solids, skew lines; find volume of prisms, cylinders, pyramids and cones; find surface area and volume of spheres; and explore similar solids using proportions.

10. Students will interpret and make scatter plots of bivariate data; describe patterns in scatter plots, such as clustering, outliers, positive or negative association, linear or non-linear association; assess trend lines to estimate and make predictions; and construct and interpret two-way frequency tables.

**Pacing**

**Montana Common Core Standard**

**Quarter 1**

Fundamental Skills Review

Real Numbers & the Coordinate Plane

8.NS.1: 8.NS.2: 8.EE.2: 8.G.6: 8.G.7: 8.G.8

**Quarter 2**

Solving Linear Equations

8.EE.7

Introduction to Functions

8.EE.5: 8.F.1: 8.F.3: 8.F.5

Graphing Functions

8.EE.5: 8.EE.6: 8.F.1: 8.F.2: 8.F.3: 8.F.4

**Quarter 3**

Systems of Linear Equations

8.EE.8

Exponents

8.EE.1: 8.EE.3: 8.EE.4

Geometry

8.G.2: 8.G.4: 8.G.5: 8.G.6

**Quarter 4**

Transformations

8.G.1: 8.G.2: 8.G.3: 8.G.4

Geometry & Measurement

8.G.7: 8.G.9

Data Analysis

8.SP.1: 8.SP.2: 8.SP.3: 8.SP.4

**Timeline**

- |    |                                     |              |
|----|-------------------------------------|--------------|
| 1. | Fundamental Skills Review           | 20 days      |
| 2. | Real Numbers & the Coordinate Plane | 14 – 16 days |
| 3. | Solving Linear Equations            | 14 – 16 days |
| 4. | Introduction to Functions           | 12 – 14 days |
| 5. | Graphing Functions                  | 14 – 16 days |
| 6. | Systems of Linear Equations         | 10 – 12 days |
| 7. | Exponents                           | 18 – 20 days |

8. Geometry	16 – 18 days
9. Transformations	20 – 22 days
10. Geometry & Measurement	16 – 18 days
11. Data Analysis	8 – 10 days

## **Content**

### **Quarter 1**

Fundamental Skills Review

Real Numbers & the Coordinate Plane

- A. Rational Numbers
- B. Irrational Numbers and Square Roots
- C. Cube Roots
- D. The Pythagorean Theorem
- E. Using Pythagorean Theorem
- F. Convers of the Pythagorean Theorem
- G. Distance in the Coordinate Plane

### **Quarter 2**

Solving Linear Equations

- A. Solving Two-Step Equations
- B. Simplifying Algebraic Expressions
- C. Solving Multi-Step Equations
- D. Solving Equations with Variables on Both Sides

Introduction to Functions

- A. Relating Graphs to Events
- B. Functions
- C. Proportional Relationships
- D. Linear Functions
- E. Nonlinear Functions

Graphing Functions

- A. Understanding Slope
- B. Graphing Linear Functions
- C. Writing Rules for Linear Functions
- D. Comparing Functions

## **Quarter 3**

### Systems of Linear Equations

- A. Solving Systems by Graphing
- B. Solving Systems by Substitution
- C. Solving Systems by Elimination
- D. Systems in the Real World

### Exponents

- A. Scientific Notation
- B. Exponents & Multiplication
- C. Multiplying & Scientific Notation
- D. Exponents & Division
- E. Dividing with Scientific Notation

### Geometry

- A. Pairs of Angles
- B. Angles & Parallel Lines
- C. Congruent Figures
- D. Exponents & Division
- E. Dividing with Scientific Notation

## **Quarter 4**

### Transformations

- A. Translations
- B. Reflections & Symmetry
- C. Rotations
- D. Transformations & Congruence
- E. Dilations
- F. Transformations & Similarity

### Geometry & Measurement

- A. Solids
- B. Volumes of Prisms & Cylinders
- C. Volumes of Pyramids & Cones
- D. Spheres
- E. Exploring Similar Solids

### Data Analysis

- A. Scatter Plots
- B. Analyzing Scatter Plots
- C. Modeling Data With Lines
- D. Two-Way Tables

## Montana Content Standards

### Montana Mathematics Grade 8 Content Standards

In Grade 8, instructional time should focus on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; and (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

1. Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions ( $y/x = m$  or  $y = mx$ ) as special linear equations ( $y = mx + b$ ), understanding that the constant of proportionality ( $m$ ) is the slope, and the graphs are lines through the origin. They understand that the slope ( $m$ ) of a line is a constant rate of change, so that if the input or  $x$ -coordinate changes by an amount  $A$ , the output or  $y$ -coordinate changes by the amount  $m \cdot A$ . Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model, and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and  $y$ -intercept) in terms of the situation.

Students strategically choose and efficiently implement procedures to solve linear equations in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutions of the original equation. Students solve systems of two linear equations in two variables and relate the systems to pairs of lines in the plane; these intersect, are parallel, or are the same line. Students use linear equations, systems of linear equations, linear functions, and their understanding of slope of a line to analyze situations and solve problems.

2. Students grasp the concept of a function as a rule that assigns to each input exactly one output. They understand that functions describe situations where one quantity determines another. They can translate among representations and partial representations of functions (noting that tabular and graphical representations may be partial representations), and they describe how aspects of the function are reflected in the different representations.

3. Students use ideas about distance and angles, how they behave under translations, rotations, reflections, and dilations, and ideas about congruence and similarity to describe and analyze two-dimensional figures and to solve problems. Students show that the sum of the angles in a triangle is the angle formed by a straight line, and that various configurations of lines give rise to similar triangles because of the angles created when a transversal cuts parallel lines. Students understand the statement of the Pythagorean Theorem and its converse, and can explain why the Pythagorean Theorem holds, for example, by decomposing a square in two different ways. They apply the Pythagorean Theorem to find distances between points on the coordinate plane, to find lengths, and to analyze polygons. Students complete their work on volume by solving problems involving cones, cylinders, and spheres.

### Mathematical Practices

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### Grade 8 Overview

#### The Number System

- Know that there are numbers that are not rational, and approximate them by rational numbers.

#### Expressions and Equations

- Work with radicals and integer exponents.
- Understand the connections between proportional relationships, lines, and linear equations.
- Analyze and solve linear equations and pairs of simultaneous linear equations.

#### Statistics and Probability

- Investigate patterns of association in bivariate data.

#### Geometry

- Understand congruence and similarity using physical models, transparencies, or geometry software.
- Understand and apply the Pythagorean Theorem.
- Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.

#### Functions

- Define, evaluate, and compare functions.
- Use functions to model relationships between quantities.

### Resources

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Prentice Hall Course 3 Mathematics Common Core ISBN-13: 978-1-256-73724-7

Prentice Hall Course 3 Mathematics ISBN-13: 978-0-13-372122-5