

INTEGRATED Math 1

Grade 9–10 | WORLD'S #1 ACADEMIC OUTLINE

Common Core
State Standards

High
School

Algebraic Expressions, Writing Equations, Solving Inequalities, Functions, Arithmetic Sequences, Systems of Equations, and more!

ALGEBRAIC EXPRESSIONS & PROPERTIES ASSE1.NQ.3

A **variable** is a symbol that is used to represent an unknown quantity. An **algebraic expression** is a mathematical expression that contains one or more variables, one or more numbers, and one or more arithmetic operations.

EX: x
 $5 - b$
 $4p + 2q + 7$
 $3x^2 + 7x - 1$

Order of Operations

The **order of operations** is a set of rules that determine which operations to perform first when evaluating a numerical expression.

1. Evaluate within grouping symbols.
2. Evaluate all powers.
3. Multiply and divide from left to right.
4. Add and subtract from left to right.

Properties of Real Numbers

For real numbers a , b , and c , the following properties are true.

Property	Expression
Commutative Property of Addition	$a + b = b + a$
Commutative Property of Multiplication	$a \cdot b = b \cdot a$
Associative Property of Addition	$a + (b + c) = (a + b) + c$
Associative Property of Multiplication	$a \cdot (b \cdot c) = (a \cdot b) \cdot c$

Distributive Property	$a \cdot (b + c) = a \cdot b + a \cdot c$
Additive Identity Property	$a + 0 = a$
Additive Inverse Property	$a + (-a) = 0$
Multiplicative Inverse Property	$a \cdot \left(\frac{1}{a}\right) = 1, a \neq 0$
Multiplicative Property of Zero	$a \cdot 0 = 0$

Parts of an Expression

A **term** is a number, variable, or the product of numbers and variables in an expression. **Like terms** are terms that have the same variables raised to the same powers. Two quantities that are being multiplied in an expression are called **factors**. The **coefficient** of a term is the numerical factor of the term. A term that consists of a number and no variables is called a **constant**.

REASONING WITH QUANTITIES NQ1.NQ.3

The units of a quantity can help you understand and solve multi-step problems.

Dimensional Analysis

Dimensional analysis is the process of using conversion factors to change from one set of units to another set of units.

EX: Jamie jogged 495 feet in 45 seconds. What was her speed in miles per hour?

Write the given information as a ratio. Then use appropriate conversion factors to change units.

$$\frac{495 \cancel{ft}}{45 \cancel{s}} \cdot \frac{1 \text{ mi}}{5280 \cancel{ft}} = \frac{1 \text{ mi}}{480 \cancel{s}}$$

Convert from feet to miles.

$$\frac{1 \text{ mi}}{480 \cancel{s}} \cdot \frac{60 \cancel{s}}{1 \text{ min}} = \frac{1 \text{ mi}}{8 \text{ min}}$$

Convert from seconds to minutes.

$$\frac{1 \text{ mi}}{8 \cancel{\text{ min}}} \cdot \frac{60 \cancel{\text{ min}}}{1 \text{ hr}} = \frac{7.5 \text{ mi}}{1 \text{ hr}}$$

Convert from minutes to hours.

Jamie's speed was 7.5 miles per hour.

Modeling with Appropriate Units

When modeling with quantities, it is important to choose appropriate units.

EX: Suppose a tourist buys a map of Florida while on vacation. What might the scale of the map be? What units would represent the actual distance between cities?

The map is a small-scale drawing of the state. Distances on the map will be very small compared to the actual distances between cities. A scale for the map might be 1 cm = 250 km or 2 in. = 175 mi. The distances between the actual cities would be measured in miles or kilometers.

Accuracy & Precision

Accuracy describes how close a measured value is to the actual value.

EX: Thomas is 5 feet 10.25 inches tall. A measurement of 5 feet 10 inches is more accurate than a measurement of 6 feet when describing his height.

Precision describes the exactness of a measurement and is dependent on the unit of measure. The **precision unit** is the smallest unit on the tool being used to measure. As the units of measurement get smaller, the measurement gets more precise.

EX: A ruler that measures in millimeters is more precise than a ruler that measures in centimeters.

EX: For a scale that gives weight in pounds and ounces, the precision unit is ounces.

WRITING EQUATIONS ACE1.E.ACE2.3

An **equation** is a number sentence that states that two quantities are equal to each other. The verbal expressions **equals**, **is**, **is equal to**, and **is the same as** indicate an equation.

Modeling with Equations

Equations can be used to model real-world situations and solve problems.

EX: Reggie's little sister is 3 years younger than him. The sum of their ages is 27 years. How old is Reggie?

- Define a variable.
- Let r represent Reggie's age.
- Translate the verbal description into an equation.

Reggie's age: r
Reggie's sister's age: $r - 3$
Sum of their ages: $r + (r - 3)$
Because the sum of their ages is 27 years, the equation $r + (r - 3) = 27$ models the situation.

You can verify that the solution to the equation is $r = 15$. So, Reggie is 15 years old. In the next section, you will learn several methods for solving equations.

SOLVING EQUATIONS A-REI.1.A-REI.3

You can use the following properties of equality to solve equations.

- **Addition Property of Equality:** If you add the same number to both sides of an equation, the two sides remain equal.
- **Subtraction Property of Equality:** If you subtract the same number from both sides of an equation, the two sides remain equal.
- **Multiplication Property of Equality:** If you multiply both sides of an equation by the same number, the two sides remain equal.
- **Division Property of Equality:** If you divide both sides of an equation by the same nonzero number, the two sides remain equal.

Solving Multi-step Equations

Equations that have multiple operations and more complicated expressions are called **multi-step equations**. To solve these types of equations, simplify both sides as much as you can and use the properties you have learned to undo the operations.

EX: A coin-operated car wash costs \$1.75 plus \$0.50 per minute of use. Shawna spent \$2.75 using the car wash. Solve the equation $1.75 + 0.5m = 2.75$ to find the number of minutes, m , that she used the car wash.

$$1.75 + 0.5m = 2.75$$

$$1.75 - 1.75 + 0.5m = 2.75 - 1.75$$

$$0.5m = 1$$

$$2(0.5m) = 2(1)$$

$$m = 2$$

Shawna used the car wash for 2 minutes.

Original equation
Subtract 1.75 from each side.
Simplify.
Multiply each side by 2.
Simplify.

Math Practice 3: Construct viable arguments and critique the reasoning of others.

Each time you apply a property of real numbers or a property of equality to transform an equation, you can justify that both sides of the equation are still equal. As you solve equations, think about which property allows you to transform it into an equivalent form.

Maths 9th Grade Study Guide

Wenbin Ji



Maths 9th Grade Study Guide:

Maths 9th Grade Study Guide Book Review: Unveiling the Power of Words

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