VOCABULARY

Opposite The opposite, or additive inverse, of any number b is $-b$.

Reciprocal The reciprocal, or multiplicative inverse, of any nonzero number b is $\frac{1}{b}$.

SUBSETS OF REAL NUMBERS

The real numbers consist of the rational numbers and the irrational numbers. Two subsets of the rational numbers are the whole numbers (0, 1, 2, 3...) and the integers (−3, −2, −1, 0, 1, 2, 3...).

Rational Numbers	Irrational Numbers
• Can be written as quotients of integers	• Cannot be written as quotients of integers
• Can be written as decimals that terminate or repeat	• Cannot be written as decimals that terminate or repeat

PROPERTIES OF ADDITION AND MULTIPLICATION

Let a, b, and c be real numbers.

Property	Addition	Multiplication
Closure	$a + b$ is a real number.	ab is a real number.
Commutative	$a + b = b + a$	$ab = ba$
Associative	$(a + b) + c = a + (b + c)$	$(ab)c = a(bc)$
Identity	$a + 0 = a$, $0 + a = a$	$a \cdot 1 = a$, $1 \cdot a = a$
Inverse	$a + (-a) = 0$	$a \cdot \frac{1}{a} = 1, a \neq 0$

The following property involves both addition and multiplication.

Distributive $a(b + c) = ab + ac$

DEFINING SUBTRACTION AND DIVISION

Subtraction is defined as adding the opposite. The opposite, or additive inverse, of any number b is $-b$. If b is positive, then $-b$ is negative. If b is negative, then $-b$ is positive.

$a - b = a + (-b)$ Definition of subtraction

Division is defined as multiplying by the reciprocal. The reciprocal, or multiplicative inverse, of any nonzero number b is $\frac{1}{b}$.

$a \div b = a \cdot \frac{1}{b}, b \neq 0$ Definition of division

VOCABULARY

Power An expression formed by repeated multiplication of the same factor

Variable A letter that is used to represent one or more numbers

Term In an expression that can be written as a sum, the parts added together are called terms.

Coefficient When a term is a product of a number and a power of a variable, the number is called the coefficient of the power.

Identity A statement that equates two equivalent expressions

ORDER OF OPERATIONS

Step 1	**First,** do operations that occur within grouping symbols.	$1 + 7^2 \cdot (5 - 3)$
Step 2	**Next,** evaluate powers.	$= 1 + 7^2 \cdot 2$
Step 3	**Then,** do multiplications and divisions from left to right.	$= 1 + 49 \cdot 2$
Step 4	**Finally,** do additions and subtractions from left to right.	$= 1 + 98$
		$= 99$

TERMS AND COEFFICIENTS

In an expression that can be written as a sum, the parts added together are called terms.

A term that has a variable part is a variable term. A term that has no variable part is a constant term.

When a term is a product of a number and a power of a variable, the number is called the coefficient of the power.

VOCABULARY

Equation A statement that two expressions are equal

Linear equation A linear equation in one variable is an equation that can be written in the form $ax + b = 0$, where a and b are constants and $a \neq 0$.

Solution A number is a solution of an equation in one variable if substituting the number for the variable results in a true statement.

Equivalent equations Two equations are equivalent equations if they have the same solution(s).

TRANSFORMATIONS THAT PRODUCE EQUIVALENT EQUATIONS

Addition Property of Equality	Add the same number to each side.	If $a = b$, then $a + c = b + c$.
Subtraction Property of Equality	Subtract the same number from each side.	If $a = b$, then $a - c = b - c$.
Multiplication Property of Equality	Multiply each side by the same nonzero number.	If $a = b$ and $c \neq 0$, then $a \cdot c = b \cdot c$
Division Property of Equality	Divide each side by the same nonzero number.	If $a = b$ and $c \neq 0$, then $a \div c = b \div c$.

VOCABULARY

Formula An equation that relates two or more quantities, usually represented by variables

Solve for a variable To rewrite an equation as an equivalent equation in which the variable is on one side and does not appear on the other side

VOCABULARY

Verbal model Writing an equation in words before you write it in mathematical symbols

VOCABULARY

Linear inequality A linear inequality in one variable can be written in one of the following forms, where a and b are real numbers and $a \neq 0$: $ax + b < 0$, $ax + b > 0$, $ax + b \leq 0$, $ax + b \geq 0$.

Compound inequality Consists of two simple inequalities joined by "and" or "or"

Equivalent inequalities Inequalities that have the same solutions as the original inequality

TRANSFORMATIONS THAT PRODUCE EQUIVALENT INEQUALITIES

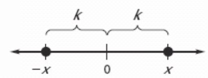
Transformation Applied to Inequality	Original Inequality	Equivalent Inequality
Add the same number to each side.	$x - 7 < 4$	$x <$ 11
Subtract the same number from each side.	$x + 3 \geq -1$	$x \geq -4$
Multiply each side by the same positive number.	$\frac{1}{2}x > 10$	$x >$ 20
Divide each side by the same positive number.	$5x \leq 15$	$x \leq$ 3
Multiply each side by the same negative number and reverse the inequality.	$-x < 17$	$x > -17$
Divide each side by the same negative number and reverse the inequality.	$-9x \geq 45$	$x \leq -5$

INTERPRETING ABSOLUTE VALUE EQUATIONS

Equation $|x| = |x - 0| = k$

Meaning The distance between x and 0 is k.

Graph



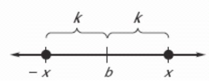
Solutions $x - 0 = -k$ or $x - 0 = k$

$x = -k$ or $x = k$

Equation $|x - b| = k$

Meaning The distance between x and b is k.

Graph



Solutions $x - b = -k$ or $x - b = k$

$x = b - k$ or $x = b + k$

SOLVING AN ABSOLUTE VALUE EQUATION

Use these steps to solve an absolute value equation $|ax + b| = c$ where $c > 0$.

Step 1 **Write** two equations: $ax + b = c$ or $ax + b = -c$.

Step 2 Solve each equation.

Step 3 **Check** each solution in the original absolute value equation.

ABSOLUTE VALUE INEQUALITIES

In the inequalities below, $c > 0$.

Inequality	Equivalent Form	Graph of Solution
$\lvert ax + b\rvert < c$	$-c < ax + b < c$	
$\lvert ax + b\rvert > c$	$ax + b < -c$ or $ax + b > c$