

Notes for 5.01

Algebra Concepts

Variable

- A variable is a symbol for a number we don't know.
- It is a letter.
- "X" is commonly used as a variable.

ANY letter of the alphabet can be a **VARIABLE**

Expression

Numbers (constant), symbols and operation (such as + and \times) grouped together that show the value of something.

Example:



Equation

*An **equation** says that two things are **equal**.

*It will have an **equal sign** "="

The equation says:

what is on the **left** (X+2) is equal to what is on the **right** (6)

$$X + 2 = 6$$

Numerical Expression/Numerical Equation

A numerical expression contains **numbers** and an **operation(s)**

A numerical expression and equation can contain one or more operations.

Example:

$$3 + 12 \quad 3(4+12)$$

A numerical equation contains **numbers**, an **operation** and an **equal sign**.

$$4 + 5 = 9 \quad 4(3+12) = 60$$

Algebraic Expression/Algebraic Equation

An algebraic expression contains a **variable** and an **operation(s)**

An algebraic expression and equation can contain one or more operations.

Example:

$$A + 3 \quad 3(A+12)$$

An algebraic equation contains a **variable**, an **operation** and an **equal sign**.

$$A + 3 = 12 \quad 3(a+12) = 48$$

Solving Algebraic Equations

Solve this problem:

$$n + 10 = 25$$

Problem Solved:

Use the inverse/opposite to solve:
Addition/Subtraction

$$\begin{array}{r} n + 10 = 25 \\ - 10 \quad -10 \quad \text{Inverse} \\ \hline n = 15 \end{array}$$

Solving Algebraic Equations

Solve this problem:

Use the inverse/opposite to solve
Multiplication/Division

$$\begin{array}{r} \underline{5g} = \underline{60} \\ 5 \quad 5 \\ \hline g = 12 \end{array}$$

Inequalities

Inequality tells us about the **relative size** of two values. Mathematics is not always about "equals"! Sometimes we only know that something is bigger or smaller.

| Symbol | Words | Example |
|--------|--------------------------|-----------------|
| $>$ | greater than | $x + 3 > 2$ |
| $<$ | less than | $7x < 28$ |
| \geq | greater than or equal to | $5 \geq x - 1$ |
| \leq | less than or equal to | $2y + 1 \leq 7$ |

Solving Inequalities

Solve this inequality using the inverse operation:

$$\begin{array}{r} 6 + n < 10 \\ -6 \quad -6 \quad \text{Inverse} \\ \hline n < 4 \end{array}$$

Notes for Lesson 5.02

Variables and Equations

Word Sentences can be written as equations or expressions (see examples below)

Four **added** to x equals 12

$$X + 4 = 12$$

Two **less than** $n = 8$

$$N - 2 = 8$$

Writing Expressions



The product of 8 and 6 is written 8×6 .



The sum of 7 and 43 is written $7 + 43$.



Eight more than n is written $n + 8$.



Sixteen times the number y is written $16y$.

Write an Algebraic Expression for each:

8 **more than** n **$8 + n$**

16 **times** the number y **$16y$**

A number x **increased by** 4 **$x+4$**

Notes for 5.03

Equations and Inequalities

Solving Division problems by using Multiplication

Using Multiplication to Solve

$$\frac{M}{9} = 8$$

$$9 \times \frac{M}{9} = 8 \times 9$$

$$M = 72$$

Evaluating Expressions

Evaluate means to find the value of an algebraic expression by **substituting numbers** in for variables.

$$m = 2$$

$$6 + m ?$$

$$6 + 2$$

$$\textcircled{8}$$

Evaluate just means **solve by substitution**.

Notes for 5.04

Expressions and Equations

| Vocabulary Term | Definition | Example |
|-----------------|--|--------------------|
| Variable | A letter of the alphabet representing the unknown. | a |
| Expression | A number, variable and operation | $C + 5$ or $3 + 2$ |
| Equation | Number, variable, operation and an equal sign | $b + 5 = 10$ |
| Inequality | Number, variable, operation and inequality sign | $g - 10 < 20$ |

| Show the Inverse/Opposite | |
|---------------------------|----------------|
| Addition | Subtraction |
| Subtraction | Addition |
| Multiplication | Division |
| Division | Multiplication |

How do we solve an equation?

$$x + 4 = 12$$

$$-4 = -4$$

$$x = 8$$

Combine Like Terms

Combine numbers:

What numbers can I combine?

$$4 + x + 2 = 18$$

$$6 + x = 18$$

$$-6 = -6$$

$$x = 12$$

(combine the $4 + 2 = 6$)

(use the inverse – subtraction)

Notes for 5.05

Problem Solving Equations

Solving Equations with More than One Step:

$$40 - 5b = 15$$

First, try to isolate the variable ($-5b$) by subtracting 40 from each side of the equation.

$$40 - 40 - 5b = 15 - 40$$

$$-5b = -25$$

To complete the isolation of the variable, divide each side of the equation by -5 .

$$\frac{-5b}{-5} = \frac{-25}{-5}$$
$$b = 5$$


Check by replacing the value of b in the equation.

$$40 - 5(b) = 15$$

$$40 - 25 = 15$$

Problem Solving Strategies

| "Key" Words | |
|---|---|
| Addition How many in all Altogether Sum Join Total Both Add | Subtraction Minus Away Difference Remain Less Than How many more How many are left "er" words such as longer, farther, fewer, faster |
| Multiplication Times Each Area Total Product How many in all Multiples of Altogether | Division How many in each Shared equally Part Per Divided Quotient Groups of Factors |



Writing Equations to Solve Word Problems

There are 347 students in the seventh grade. This is 21 more than the number of seventh grade students last year. How many were there last year?

$$347 = n + 21$$

Solve:

$$347 = n + 21$$

$$-21 = n - 21$$

$$326 = n$$