

ALGEBRA 1 NOTES

Section 2-1: Solving One-Step Equations

Objective: To solve one step equations in one variable.

SOLVING EQUATIONS GOAL: _____

Operation	Inverse Operation
Addition	
Subtraction	
Multiplication	
Division	

Example 1 Solve each equation using *PROPER FORMATTING!*

a. $-18 = m + 12$

b. $p - 2 = -6$

c. $-147 = 7y$

d. $-9 = \frac{y}{-3}$

e. $10 = \frac{w}{-8}$

f. $\frac{3}{5}n = 12$

Example 2 Solve each equation using *PROPER FORMATTING*!

a. $-6 = \frac{2}{3}x$

c. $-8y = -72$

d. $m + 1\frac{2}{3} = 2\frac{4}{5}$

e. $\frac{x}{3} = 4\frac{1}{6}$

Example 3 Anthony mowed several lawns to earn money for camp. He paid \$17 for gas, he had \$75 remaining to pay for camp. Write and solve an equation to find how much money Anthony earned mowing lawns.

a. Define a variable _____

b. Write an equation.

c. Solve

d. Explain answer in a sentence. _____

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Section 2-2: Solving Two-Step Equations

Objective: To solve two step equations in one variable.

Warm-Up A community center is serving a free meal to senior citizens. The center plans to feed 700 people in 4 hours. Find the average number of people the center is planning to feed each hour.

a. Define a variable_____

b. Write an equation.

c. Solve the equation.

d. Explain answer in a sentence._____

Example 1 Solve each equation using *PROPER FORMATTING!*

a. $7n + 12 = -23$

Check:

b. $19 + \frac{x}{3} = 8$

Check:

Example 2 Solve each equation using *PROPER FORMATTING!*

a. $\frac{m-2}{3} = 5$

b. $1.4 = 0.4x + 0.2$

Example 3 Solve each equation using *PROPER FORMATTING!*

a. $3 = \frac{c}{2} - 5$

b. $\frac{p + 5}{4} = -7$

Example 4 The 9th grade class is selling granola bars to raise money. They purchased 1250 granola bars and paid a delivery fee of \$25. The total cost including the delivery fee, was \$800. What was the cost of each granola bar?

a. Define a variable _____

b. Write an equation.

c. Solve

d. Explain answer in a sentence. _____

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Section 2-3: Solving Multi-Step Equations

Objectives: *To use the distributive property when combining like terms.
To use the distributive property when solving equations.*

Warm-Up: For problems 1 and 2, solve each equation using *PROPER FORMATTING!*

1. $-6 + 4y = -26$

2. $-2 = \frac{x}{4} + 5$

3. You go to the store to buy school supplies. You bought a pack of notebooks for \$12, and 5 folders. Your total bill came to \$21.50. How much did each folder cost?

a. Define a variable _____

b. Write an equation.

c. Solve

d. Explain answer in a sentence. _____

When solving equations, you **MUST** combine_____.

There should be no more than _____ per side.

Example 1 Solving equations with like terms. Use *PROPER FORMATTING!*

a. $2x + x + 12 = 78$

b. $-2m + 5 + 5m = 19$

Example 2 Solving equations with like terms. Use *PROPER FORMATTING!*

a. $4b + 16 + 2b = 46$

b. $-3x + 8 - 2x = -12$

Example 3 Solving equations using the distributive property. Use *PROPER FORMATTING!*

a. $-2(x - 4) = 12$

b. $15 = -3(m - 1) + 9$

Solving Equations with Fractions → CLEAR FRACTIONS

Solving Equations with Decimals → CLEAR DECIMALS

Example 4 Solving equations by clearing fractions. Use *PROPER FORMATTING!*

a. $\frac{2x}{3} + \frac{x}{2} = 7$

b. $\frac{2}{3}x - \frac{5}{8}x = \frac{1}{24}$

Example 5 Solving equations with decimals. Use *PROPER FORMATTING!*

a. Solve using traditional method.

$$11.3 - 7.2f = -3.82$$

b. Solve by clearing decimals.

$$11.3 - 7.2f = -3.82$$

Example 6 Martha takes her niece and nephew to a concert. She buys t-shirts and bumper stickers for them. The bumper stickers cost \$1 each. Martha's niece wants 1 t-shirt and 4 bumper stickers. Her nephew wants 2 t-shirts but no bumper stickers. If Martha's total is \$67, what is the cost of one shirt?

a. Define a variable _____

b. Write an equation.

c. Solve

d. Explain answer in a sentence. _____

Example 7 Noah and Kate are shopping for new guitar strings in a music store. Noah buys 2 packs of strings. Kate buys two packs of strings and a music book. The book costs \$16. Their total cost is \$72. How much is one pack of strings?

a. Define a variable _____

b. Write an equation.

c. Solve

d. Explain answer in a sentence. _____

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Section 2-4: Solving Equations with Variables on Both Sides

Objectives: *To solve equations with variables on both sides.
To identify equations that are identities or have no solutions.
To use the properties of mathematics to justify the solution to an equation.*

Warm-Up: Solve each equation using *PROPER FORMATTING!*

1. $3(n - 5) = 9$

2. $8 - 2(x + 1) = 18$

3. $\frac{m}{2} - \frac{m}{5} = 4$

4. $0.11k + 1.5 = 2.49$

3 possible cases when solving equations:

# of Solutions	Possible example	Solution

To solve problems with variables on both sides, you must:

- Move the variables to one side
- Move the constants to the other side

Example 1 Solve each equation using *PROPER FORMATTING*!

a. $2(c - 6) = 9c + 2$

b. $0.2n + 10 = 8(0.4n - 1)$

Example 2 Solve each equation using *PROPER FORMATTING*!

If appropriate, write *identity* or *no solution*.

a. $10 - 8a = 2(5 - 4a)$

b. $6x - 2(5x + 3) = -2(2x - 7)$

Example 3: Solve each equation using *PROPER FORMATTING!*
If appropriate, write *identity* or *no solution*.

a. $\frac{1}{4}(12x + 16) = 10 - 3(x - 2)$

b. $\frac{3}{8}m + \frac{1}{2} = 6\left(\frac{1}{16}m - 2\right)$

c. $0.5x + 0.25(x + 16) = 4 + 0.75x$

Example 4 Three times the sum of a number and 4 is 8 less than one-half the number.
Find the number.

a. Define a variable _____

b. Write an equation.

c. Solve

d. Explain answer in a sentence. _____

Example 5 A movie club charges a one-time membership fee of \$25 which allows members to purchase movies for \$7 each. Another club does not charge a membership fee and sells movies for \$12 each. How many movies must a member purchase for the cost of the two clubs to be equal?

a. Define a variable _____

b. Write an equation.

c. Solve

d. Explain answer in a sentence. _____

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Section 2-5: Literal Equations and Formulas

Objectives: To rewrite literal equations.

Warm-Up: Solve each equation using *PROPER FORMATTING!*

1. $2(2n - 1) = 4(n - 2)$

2. $\frac{2m}{7} + \frac{3m}{14} = 1$

3. $-(3z + 6) = 6z - 3(3z + 2)$

Definition:

A literal equation is an equation that involves _____ variables.

Example 1 Solve each equation for y.

a. $3x + y = 4$

b. $x - 4y = -4$

Example 2 Solve each equation for y.

a. $2x + 4y = 8$

b. $ay - by = c$

Example 3 Solve each of the equations for x.

a. $\frac{mx+nx}{p} = 2$

b. $m = \frac{x-h}{k}$

Example 4

Solve the equation for y. Then find the value of y for each value of x (use a table).

$-9x + 3y = 24; \quad x = -1, 1, 3$

x		y

Example 5

Consider the equation $10x + 5y = 80$, where x is the number of pizzas and y is the number of sandwiches. How many sandwiches can you buy if you buy 3 pizzas? 6 pizzas?

Step 1: _____

Step 2: _____

EXAMPLES OF LITERAL EQUATIONS: (I expect you to know the top 5 formulas.)

Formula Name	Formula	Definitions of Variables
Perimeter of a rectangle	$P = 2\ell + 2w$	P = perimeter, ℓ = length, w = width
Circumference of a circle	$C = 2\pi r$	C = circumference, r = radius
Area of a rectangle	$A = \ell w$	A = area, ℓ = length, w = width
Area of a triangle	$A = \frac{1}{2}bh$	A = area, b = base, h = height
Area of a circle	$A = \pi r^2$	A = area, r = radius
Distance traveled	$d = rt$	d = distance, r = rate, t = time
Temperature	$C = \frac{5}{9}(F - 32)$	C = degrees Celsius, F = degrees Fahrenheit

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Sections 2-6 & 2-7: Ratios, rates and solving proportions

Objectives: To find ratios, and proportions.
To convert units and rates.

Warm-Up

1. Solve $y = \frac{x-v}{b}$ for x.

2. A triangle has height 6 feet and area of 42 ft^2 .

What is the length of its base?

Vocabulary	Definition	Example
RATIO	A comparison of two quantities by division	
RATE	A ratio of a to b where a and b represent quantities measured in different units.	
UNIT RATE	A rate with a denominator of 1.	
UNIT ANALYSIS	Includes units for each quantity in a calculation to determine the unit of the answer.	
CONVERSION FACTOR	A ratio of two equivalent measures in different units.	

Example 1: You are shopping for sweaters. Which store offers the best deal?

	RATE	UNIT RATE
Store A: \$60 for 2 sweaters		
Store B: \$80 for 3 sweaters		

Know the following conversions:

Name of unit	Conversion Information	Name of unit	Conversion Information
1 meter	1 m = 1000 mm 1 m = 100 cm	1 minute	1 min = 60 sec
1 kilometer	1 km = 1000 m	1 hour	1 hour = 60 min
1 inch	1 in = 2.5 cm (about)	1 day	1 day = 24 hours
1 foot	1 ft = 12 in	1 week	1 week = 7 days
1 yard	1 yd = 36 in 1 yd = 3 feet	1 year	1 year = 365 days 1 year = 52 weeks
1 mile	1 mi = 5280 ft		

CONVERTING UNITS WITHIN SYSTEMS

Example 2 What is the given amount converted to the given units?

a) Convert 12 hours to minutes.

b) Convert 10 miles to feet.

CONVERTING UNITS BETWEEN SYSTEMS

Example 3 Use the fact that 1 m \approx 3.28 ft.

a. The Sears Tower in Chicago, Illinois, is 1450 ft tall. How many meters tall is the tower?

b. The Space Needle in Seattle, Washington, is 605 ft tall. About how many meters tall is the building?

CONVERTING RATES

Example 4

- a. Jared's car gets 26 mi per gal. What is his fuel efficiency in kilometers per liter?
Use the fact that 1.6 km » 1 mile and 3.8 L » 1 gal.
- b. A cheetah can run 300 feet in 2.92 seconds. What was the cheetah's speed in miles per hour? Use the fact that 5280 ft » 1 mile and 3600 sec » 1 hr.

SOLVING PROPORTIONS

Cross Products of a Proportion (Cross Multiplication of Means-Extremes)

If $\frac{a}{b} = \frac{c}{d}$ where $b \neq 0$ and $d \neq 0$, then $ad = bc$.

Example 5 Solve the following proportions using cross multiplying. **Check** your answer.

a. $\frac{t}{9} = \frac{5}{6}$

b. $\frac{x+4}{5} = \frac{x-2}{7}$

Example 5 Solve the following proportions using cross multiplying.

a. $\frac{x}{8} = \frac{6}{5}$

b. $\frac{x+2}{2x-6} = \frac{3}{8}$

USING A PROPORTION TO SOLVE A PROBLEM

Example 6 An 8-oz can of orange juice contains about 97 mg of vitamin C. About how many milligrams of vitamin C are there in a 12-oz can of orange juice?

a. Define a variable _____

b. Write a proportion and solve.

c. Explain answer in a sentence. _____

Example 7 A box of cereal weighing 354 grams contains 20 grams of fat. How many grams of fat would be in a recommended serving size of 55 grams?

a. Define a variable _____

b. Write a proportion and solve.

c. Explain answer in a sentence. _____

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Section 2-9: Percents

Objectives: To solve percent problems using proportions.
To solve percent problems using the percent equation.

Warm-Up: Solve each proportion using *PROPER FORMATTING!*

1. $\frac{5}{8} = \frac{7}{y}$

2. $\frac{5x}{6} = \frac{x+4}{2}$

Percent Proportion

You can represent “ a is p percent of b ” using the percent proportion shown below.

$$\frac{amt}{base} = \frac{\%}{100}, \text{ where } b \neq 0$$

Percent Equation

You can represent “ a is p percent of b ” using the percent equation shown below.

$$(\%)(base) = amount$$

Example 1 Find the PERCENT using a proportion and equation.

What percent of 50 is 25?

Proportion

Equation

Example 2 Finding the *PART/AMOUNT* using a proportion and equation.

What is 38% of 45?

Proportion

Equation

Example 3 Find the *BASE* using a proportion and equation.

a. 125% of what number is 17.5?

Proportion

Equation

Example 4

A dress shirt that normally costs \$42.00 is on sale for 30% off.

a. What is the discount price of the shirt?

b. What is the sales price of the shirt?

Example 7 Solve each using a proportion and equation.

a. What percent of 56 is 42?

Proportion

Equation

b. What is 12.5% of 104?

Proportion

Equation

c. 30% of what number is 12.5?

Proportion

Equation

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Section 2-10: Change Expressed as a Percent

Objectives: *To find the percent change.*
To find the relative error in linear and non-linear measurements.

Warm-Up Solve using either a proportion OR an equation.

1. What percent of 32 is 40?

2. What is 150% of 63?

Percent change is the ratio of the amount of change to the original amount.

$$\text{percent change} = \frac{\text{difference in amounts}}{\text{original amount}}$$

Example 1 Determine whether the percent change is an increase or decrease.
Then find the percent change. Round to the nearest percent.

a. Original amount: 60
New amount: 48

b. Original amount: 15
New amount: 25

Example 2 A coat is on sale. The original price of the coat is \$82. The sale price is \$74.50. What is the discount expressed as a percent change?

Example 3 A store buys an electric guitar for \$295. The store then marks up the price of the guitar to \$340. What is the mark up expressed as a percent change?

Example 4 The average monthly precipitation for Chicago, Illinois, peaks in June at 4.1 inches. The average monthly precipitation in December is 2.8 inches. What is the percent decrease from June to December?

Example 5 In one year, the toll for passenger cars to use a tunnel rose from \$3 to \$3.50. What was the percent increase?

Relative error is the ratio of the absolute value of the difference of a measured (or estimated) value and an actual value compared to the actual value.

$$\text{relative error} = \frac{|\text{measured or estimated value} - \text{actual value}|}{\text{actual value}}$$

When relative error is expressed as a percent, it is called **percent error**.

Example 6 A decorator estimates that a rectangular rug is 5 ft by 8 ft. The rug is actually 4 ft by 8 ft. What is the percent error in the estimated area?

Example 7 The diagram at the right shows the dimensions of a gift box to the nearest inch. What is the greatest possible percent error in calculating the volume of the gift box?

