Holt Algebra 1: 2.1 Solving Equations by Adding or Subtracting

equation: ____

solution of an equation: ____

isolate the variable: ____

inverse operations: ____

Think about an equation like a balanced scale. To keep the balance, perform the same operation to both sides.

Step 1:

Step 2:

Step 3:

Example 1: Solving Equations by Using Addition

Solve each equation. (Remember that just means to find the number that replaces the variable to make it true!)

A. $-23 + v = -8$

B. $x - 8 = 15$

C. $21 = -17 + k$

D. $-3 + d = -14$

E. $n - 19 = 13$

F. $-12 = j - 2$

G. $-7 = m - 16$

H. $11 = -4 + w$

Example 2: Solving Equations by Using Subtraction

Solve each equation. Check your answer by putting your answer back in for the variable to see if it's true.

A. $8 + y = 18$

B. $22 = h + 14$

C. $p + 15 = 2$

D. $-7 = t + 9$

E. $3 = 18 + k$

F. $42 = x + 28$

G. $2 + b = -25$

H. $13 + f = 13$

Example 3: Solving Equations with Fractions and Variables

Do the same thing as you would normally do. Just be careful!

A. $\frac{-1}{6} + h = \frac{4}{6}$

B. $-\frac{1}{3} = k - \frac{2}{3}$

C. $x + \frac{2}{7} = -8$

D. $3.1 = 6 + p$

E. $-5.9 + z = -2.2$

F. $-3.7 = q - 6.6$

Holt Algebra 1: 2.2 Solving Equations by Multiplying or Dividing

inverse operations: ____

coefficient: ____

To solve an equation for a variable that is in a fraction, you will need to use ________________.

Why? Well a fraction models ________________, and the inverse operation of division is ________________.

You are allowed to multiply both sides of the equation by the same number, and the number you should choose is ____

Example 1: Solving Equations by Using Multiplication

Solve each equation. Check your answer by substituting your answer back into the original equation.

A. $3 = \frac{x}{5}$

B. $\frac{p}{-8} = -1$

C. $\frac{h}{-2} = 7$

D. $20 = \frac{v}{11}$

E. $\frac{w}{6} = 9$

F. $-9 = \frac{m}{-4}$

To solve an equation for a variable with a coefficient, you will need to use ____________________.

Why? Well a coefficient and variable are ________________, and the opposite of multiplication is __________.

You are allowed to divide both sides of the equation by the same number, and the number you should choose is

____

Example 2: Solving Equations by Using Division

A. $6g = 18$

B. $8 = 24x$

C $-2 = 2y$ D. $-7k = -21$

E. $-f = 32$ F. $2t = 7$

If there is a fraction multiplied by the coefficient, multiply both sides by the ___________________.

Why? Multiplying a fraction by its reciprocal equals ___________. Ex:

Example 3: Solving Equations That Contain Fractions

A. $\frac{4}{7}y = \frac{3}{2}$ B. $\frac{6x}{5} = 2$

C. $\frac{1h}{3} = \frac{2}{3}$ D. $10 = \frac{2}{9}k$

E. $\frac{3}{4}d = 6$ F. $4 = \frac{3m}{5}$

HOLT ALGEBRA 1: 2.3 SOLVING TWO-STEP AND MULTI-STEP EQUATIONS

$$3.95c + 19.95 = 63.40$$

Operations in the Equation		To Solve
❶ First c is **multiplied** by 3.95.	Work Backward	❶ **Subtract** 19.95 from both sides of the equation.
❷ Then 19.95 is **added**.		❷ Then **divide** both sides by 3.95.

In general, the goal is to get the variables on one side and the constants (numbers) on the _________________.

If you have _______________ or _______________ on BOTH sides, we have a problem!

1. Look on the side with the variable, and focus on the constant

2. If the constant is being added, ____________________ the constant on both sides.

If the constant is being subtracted, ____________________ the constant on both sides.

3. Combine the constants

4. Multiply or divide both sides by the coefficient of the variable (refer back to 2.2 if needed)

Example 1: Solving Two-Step Equations

A. $5x + 3 = 18$

B. $5 - y = 9$

C. $10p - 17 = 53$

D. $-8 = -12 - 4m$

E. $-2b + 8 = 24$

F. $1 = 9 + 4w$

When you have at least one fraction in an equation, it is usually easiest to "clear the denominator".

This means to multiply every term by the ____________ ________________ ______________________

After simplifying all the terms, the equation will be ____!!!

Example 2: Solving Two-Step Equations That Contain Fractions

A. $\frac{5x}{6} + \frac{1}{3} = \frac{6}{3}$

B. $\frac{1}{5} - \frac{h}{5} = 4$

C. $\frac{7}{8} + \frac{k}{4} = \frac{3}{2}$

D. $\frac{2}{3} = \frac{2p}{3} - \frac{2}{4}$

Sometimes you might see equations that need to be simplified before using inverse operations.

Example 3: Simplifying Before Solving Equations

A. $2x + 9x - 15 = 18$

B. $48 = 15 - (d + 3)$

C. $-4(w - 9) = 36$

D. $3p - 18p = 1 - 46$

E. $-23 = -5 + 4f + 5f$

F. $-15 - 12m - 2m = 8$

G. $3(h - 2) + 5h = 22$

H. $-30 = 6(n + 5)$

Holt Algebra 1: 2.4 Solving Equations with Variables on Both Sides

Remember, to solve equations, you want the variable on one side and the constant on the other side. Sometimes you will need to add or subtract variables on both sides in order to make this happen.

HINT: ____

Example 1: Solving Equations with Variables on Both Sides

A. $8p = 3p + 35$

B. $7x - 9 = 3x + 3$

C. $14 - j = j$

D. $5 - 10x = 16 + x$

E. $6 + 8d = -4d$

F. $2h + 6 = 41 - 3h$

Again, sometimes you may need to simplify one or both sides of an equation before performing inverse operations.

Example 2: Simplifying Each Side Before Solving Equations

A. $\frac{1}{2}(b+6)=3b$

B. $5x - 12 + 18 = 4(x + 1)$

C. $3 - 5y + 2y = -2 - 2(1 - y)$

D. $2(v - 8) = 4(5 - v)$

E. $3 - 6 + 11 + 6f = 4f$

F. $8h - 4 = 5 + 9 - h$

G. $-5 + (-13) + a = 2a - 11$

H. $3t + 3t = -6t - 2 - (-26)$

identity: ____

____

contradiction: ____

____

Example 3: Infinitely Many Solutions or No Solutions

Solve each equation. Your answer will either be INFINITE SOLUTIONS or NO SOLUTIONS.

A. $5 + 7 - 3y = 2y - 5y + 4$

B. $4x + 9 = -12 + 4x - 4$

C. $3(k - 5) = 2k + k$

D. $2w + 4 + 9w = -17 + 11w + 21$

E. $-5m + 9 + 1 = 10 - 5m$

F. $8 - 6 - 6 + 6d = 4(d - 1) + 2d$

Holt Algebra 1: 2.5 Solving for a Variable

formula: ____

You can __________________ a formula to isolate any variable by using inverse operations. This process of isolating a variable in a formula is called ______________________________________.

Example 1: Solving Formulas for a Variable

A. The formula for an object's final velocity *f* is *f* = *I* – *gt*, where *I* is the object's initial velocity, *g* is the acceleration due to gravity, and *t* is the time. Solve for *I*.

B. The formula for a Celsius temperature in terms of degrees Celsius is C = $\frac{5}{9}(F - 32)$. Solve for F.

C. The formula for a Fahrenheit temperature in terms of degrees Fahrenheit is F = $\frac{9}{5}C + 32$. Solve for C.

D. The formula showing the slope and y-intercept of a line is y = *mx* + *b*. Solve for *x*.

literal equations: ____

Example 2: Solving Literal Equations for a Variable

A. Solve $K = 8 + 2m$ for m

B. Solve $\frac{p}{h} = y$ for h

C. Solve $4 - m = 3y$ for y

D. Solve $\frac{a}{b} = c$ for a

E. Solve $7 - g = 4 + w$ for g

F. Solve $-4 = 4f + x$ for x

G. Solve $-4 = 4f + x$ for f

H. Solve $\frac{m}{n} = p - 6$ for n

Holt Algebra 1: 2.6 Rates, Ratios, and Proportions

ratio: ____

proportion: ____

*In the following word problem examples, you are going to be given a situation involving 2 ____________

*Choose everything relating to one group and put the numbers or variable in the _____________________

*Choose everything relating to the other group and put the numbers or variables in the _________________

*Then _________   ______________ and solve for the variable.

Example 1: Using Ratios

A. The ratio of games lost to games won for a baseball team is 4:1. If the team won 20 games, how many games did they lose?

B. The ratio of sheep to goats in a petting zoo is 2 to 7. If there are 21 goats in the petting zoo, how many sheep are there?

C. The ratio of students to teachers at Prospect High School is $\frac{15}{1}$. If there are 480 students in the school, how many teachers are there?

rate: ____

unit rate: ____

*To find unit rates, create a ratio of the given information. _____________ the given numbers, and write the answer as a fraction over __________. Be sure to use correct ____________!

Example 2: Finding Unit Rates

A. Jimmy earns $45.00 in 10 hours. Find the unit rate.

B. Billy can eat 29 hot dogs in 8 minutes. Find the unit rate.

C. Cynthia can catch 90 butterflies in 25 seconds. Find the unit rate.

*When converting rates, first write a ratio reminding you of what you want your final ratio to be.

*In the ratio you are given, one of the units will be __________________ and you need to _______________ it!

*To do this, multiply by a _______________ that compares the ____________________ units with the

________________ units and is equal to __________. Confusing? Let's look at an example below.

Example 3: Converting Rates

A. Cindy can run 15 miles per hour. What is this rate in miles per minute?

B. Kyle can throw a football at a speed of 50 meters per second. What is this rate in meters per minute?

C. There is a fish that can swim at a rate of 55 feet per hour. What is this speed in inches per hour?

Cross Products Property

WORDS	NUMBERS	ALGEBRA
In a proportion, cross products are equal.	$\frac{2}{3} = \frac{4}{6}$ $2 \cdot 6 = 3 \cdot 4$	If $\frac{a}{b} = \frac{c}{d}$ and $b \neq 0$ and $d \neq 0$, then $ad = bc$.

Example 4: Solving Proportions

A. $\frac{w}{2} = \frac{8}{4}$

B. $\frac{15}{v} = \frac{20}{3}$

C. $\frac{x-2}{3} = \frac{4}{3}$

D. $\frac{3}{11} = \frac{2}{p+3}$

E. $\frac{15}{2} = \frac{k}{6}$

F. $\frac{2}{j} = \frac{7}{3}$

G. $\frac{5}{8-h} = \frac{1}{2}$

H. $\frac{t}{6} = \frac{8}{3}$

I. $\frac{3}{5} = \frac{4+h}{10}$

scale: ____

scale drawing or scale model: ____

Example 5: Scale Drawings and Scale Models

A. On the map, 1 inch represents 80 miles. If Chicago is 2.75 inches from Grand Rapids, what is the actual distance between these two cities?

B. An airplane is 48 feet long. If the ratio between the model airplane and the actual airplane is 3:14, find the length of the model airplane.

HOLT ALGEBRA 1: 2.7 APPLICATIONS OF PROPORTIONS

similar figures: ____

corresponding sides: ____

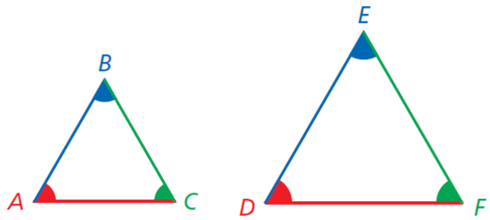
corresponding angles: ____

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$$

$m\angle A = m\angle D$

$m\angle B = m\angle E$

$m\angle C = m\angle F$



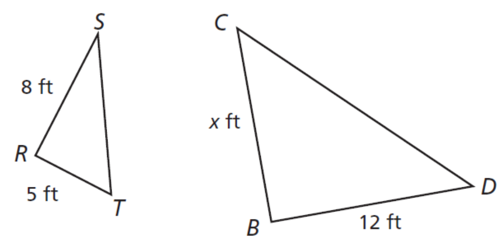
When stating that two figures are similar, use the symbol ~. For the triangles above, you can write $\triangle ABC \sim \triangle DEF$. Make sure corresponding vertices are in the same order. It would be incorrect to write $\triangle ABC \sim \triangle EFD$.

You can use proportions to find missing lengths in similar figures.

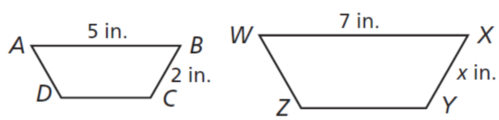
Example 1: Finding Missing Measures in Similar Figures

Find the value of *x* in each diagram.

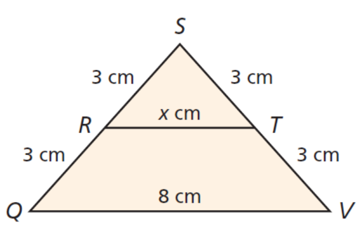
A. $\triangle RST \sim \triangle BCD$



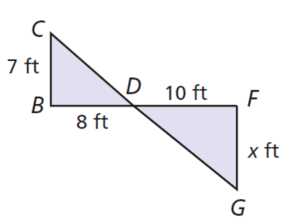
B. Find the value of *x* in the diagram if $ABCD \sim WXYZ$.



C. $\triangle RST \sim \triangle QSV$



D. $\triangle BCD \sim \triangle FGD$



indirect measurement: ____

Example 2: Indirect Measurement Application

A. A forest ranger who is 140 cm tall casts a shadow 42 cm long. At the same time, a nearby tree casts a shadow 230 cm long. Write and solve a proportion to find the height of the tree.

B. A woman who is 5.75 feet tall casts a shadow 3.4 feet long. At the same time, a building casts a shadow 33 feet long. Write and solve a proportion to find the height of the building.

C. A tower casts a 450 ft shadow at the same time that a 4 ft child casts a 6 ft shadow. Write and solve a proportion to find the height of the tower.

HOLT ALGEBRA 1: 2.8 PERCENTS

percent: ____

*To find the fraction equivalent of a percent, write the percent as a _____________ with a _________________ equal to __________. Then _____________.

To find the decimal equivalent of a percent, _______________ by _________.

Some Common Equivalents											
Percent	10%	20%	25%	$33\frac{1}{3}\%$	40%	50%	60%	$66\frac{2}{3}\%$	75%	80%	100%
Fraction	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{2}{5}$	$\frac{1}{2}$	$\frac{3}{5}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{4}{5}$	1
Decimal	0.1	0.2	0.25	$0.\overline{3}$	0.4	0.5	0.6	$0.\overline{6}$	0.75	0.8	1.0

Here, the greatest percent shown in the table is 100%. But, percents can be greater than 100%

You can use the proportion to find unknown values.

Example 1: Finding the Part (round to the nearest hundredth)

A. Find 30% of 60

B. Find 30% of 60

C. Find 45% of 72

D. Find 140% of 25

E. Find 20% of 105

F. Find 75% of 300

Example 2: Finding the Percent (round to the nearest hundredth)

A. What percent of 50 is 25?

B. 25 is what percent of 50?

C. What percent of 60 is 75?

D. 13 is what percent of 104?

E. What percent of 180 is 10?

F. 80 is what percent of 4?

Example 3: Finding the Whole (round to the nearest hundredth)

A. 32% of what number is 25?

B. 40 is 0.8% of what number?

C. 450% of what number is 45?

D. 28 is 70% of what number?

E. 100% of what number is 67?

F. 9 is 5% of what number?

commission: ____

total pay = base salary + commission

= base salary + % of total sales

Example 1: Business Application (round to the nearest hundredth)

A. A telemarketer earns $425 per week, plus a 10% commission on sales. Find her total pay for a week in which her sales are $880.

B. A salesman has a sales total of $2000 for the week. If his base salary is $320 per week and he gets a 16% commission, find his total pay.

C. A ticket vendor earns $200 per week, and this week had $790 of total sales. If her commission is 15%, find her total pay.

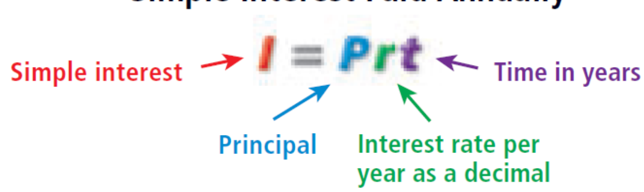
interest: ____

____

principal: ____

simple interest: ____

Simple Interest Paid Annually



Example 2: Finance Application

A. Find the simple interest paid annually for 3 years on a $1500 loan at 20% a year.

B. After 6 months, the annual simple interest on an investment of $3000 was $80. Find the interest rate.

C. Find the simple interest paid annually for 3 months on an investment of $2600 at 5.9% interest annually.

D. After 7 years, the annual simple interest on an investment of $495 was $82. Find the interest rate.

tip: ____

sales tax: ____

Hint: Find 1% of a number by moving the decimal _________ places to the ___________

Find 10% of a number by moving the decimal ________ places to the ___________

Example 3: Estimating with Percents

A. The dinner check for Molly's family is $40.30. Estimate a 16% tip.

B. The sales tax rate is 7.30%. Estimate the sales tax on pants that cost $29.76.

C. The lunch check for Ginger's family is $68.50. Estimate a 20% tip.

Holt Algebra 1: 2.10 Percent Increase and Decrease

percent change: ____

percent increase: ____

percent decrease: ____

Percent Change

percent change = $\frac{\text{amount of increase or decrease}}{\text{original amount}}$, expressed as a percent

Example 1: Finding Percent Increase or Decrease (round to the hundredth)

Find each percent change. Tell whether it is a percent increase or decrease.

A. 10 to 50

B. 50 to 10

C. 2 to 7

D. 45 to 35

E. 9 to 10

F. 18 to 11

Example 2: Finding the Result of a Percent Increase or Decrease

A. Find the result when 40 is increased by 25%.

B. Find the result when 24 is decreased by 62.5%.

C. Find the result when 33 is increased by 42%.

D. Find the result when 70 is decreased by 70%.

discount: ____

*Step 1: Convert any percents to ____________________

*Step 2: Write an equation that states ____

*Step 3: ___________ the equation. You have now found _______ ___________________ !!!

Example 3: Discounts

A. Admission to a football game is $50. Students receive a 15% discount.

How much is the discount? How much do students pay?

B. Stuart used a coupon and paid $5.30 for a pizza that normally costs $8.90. Find the percent discount.

C. Kylie paid $60 for a $78 pair of boots. What was the percent discount?

D. A $160 bicycle was on sale for 65% off. Find the percent discount. How much does the bike cost now?