Foundations of Algebra   Unit 4: Equations & Inequalities   Notes

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Day 6 – Creating Equations from a Context

Explore: Read the scenario below and answer the following questions.

Annie is throwing a graduation party. She wants to send nice invitations to all of her guests. She found a company that will send her a pack of 10 personalized invitations for $6 each, plus a $5 shipping fee for the entire order, no matter how many invitations she orders.

shipping = $5
invite. pack = $6 per pack

a. What is the total cost of Annie purchasing three packs of invitations?

$$6(3) + 5$$
$$18 + 5 = \$23$$

b. What is the total cost of Annie purchasing five packs of invitations?

$$6(5) + 5$$
$$30 + 5 = \$35$$

c. What is the total cost of Annie purchasing ten packs of invitations?

$$6(10) + 5$$
$$60 + 5 = \$65$$

d. Describe how you calculated the cost of each order.

e. Write an algebraic expression that represents the total cost of any order. Let p represent the number of invitation packs that were ordered.

$$6p + 5$$

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f. How many packs of invitations were ordered if the total cost of the order was $53?

$$6p + 5 = 53$$
$$ -5 -5$$
$$6p = 48$$

$$\frac{6p}{6} = \frac{48}{6}$$
$$p = 8$$

g. How many packs of invitation were ordered if the total cost of the order was $29?

$$6p + 5 = 29$$
$$ -5 -5$$
$$6p = 24$$

$$\frac{6p}{6} = \frac{24}{6}$$
$$p = 4$$

h. Describe how you calculated the number of invitation packs ordered for any order amount.

i. Write an equation to describe this situation. Let p represent the number of invitation packs ordered and c represent the total cost of the order.

$$6p + 5 = c$$

j. Use your equation to determine how many invitation packs Annie ordered if her total cost was $47.

$$6p + 5 = 47$$
$$ -5 -5$$
$$6p = 42$$
$$\frac{6p}{6} = \frac{42}{6}$$
$$p = 7$$

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Earlier in our unit, you learned to write expressions involving mathematical operations. You used the following table to help you decode those written expressions. We are going to use those same key words along with words that indicate an expression will become part of an equation or inequality.

Addition	Subtraction	Multiplication	Division	Equals
Sum	Difference	Of	Quotient	Is
Increased by	Decreased by	Product	Ratio of	Equals
More than	Minus	Times	Percent	Will be
Combined	Less	Multiplied by	Fraction of	Gives
Together	Less than	Double	Out of	Yields
Total of	Fewer than	Twice	Per	Costs
Added to	Withdraws	Triple	Divided by	
Gained				
Raised				
Plus				

When taking a word problem and translating it to an equation or inequality, it is important to **"talk to the text"** or underline/highlight key phrases or words. By doing this it helps you see what is occurring in the problem.

Modeling Mathematics with Equations

A person's maximum heart rate is the highest rate, in beats per minute, that the person's heart should reach. One method to estimate the maximum heart rate states your age added to your maximum heart rate is 220. Using this method, write and solve an equation to find the maximum heart rate of a 15 year old.

Age	Added to	Maximum Heart Rate	Is	220

$$a + h = 220$$

In the equation above, we did not know one of the quantities. When we do not know one of the quantities, we use a **variable** to represent the unknown quantity. When creating equations, it is important that whatever variable you use to represent the unknown quantity, you define or state what the variable represents.

Practice Examples: *In the examples below, "talk to the text" as you translate your word problems into equations. Define a variable to represent an unknown quantity, create your equation, and then solve your equation.*

1. Six less than four times a number is 18. What is the number?

Variables: $\underline{x = a \ number}$

Equation: $\underline{4x - 6 = 18}$

6 less than 4 times x is 18

$$4x - 6 = 18$$
$$ + 6 + 6$$
$$\frac{4x}{4} = \frac{24}{4}$$
$$\boxed{x = 6}$$

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2. You and three friends divide the proceeds of a garage sale equally. The garage sale earned $412. How much money did each friend receive?

Variables: _m = $ each friend received_

$$\frac{\$412}{4} = m$$

Equation: _$\frac{\$412}{4} = m$_

$$\frac{\$412}{4} = m$$

$$\$103 = m$$

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3. On her iPod, Mia has rock songs and dance songs. She currently has 14 rock songs. She has 48 songs in all. How many dance songs does she have?

Variables: _x = dance songs_

Equation: _14 + x = 48_

$$14 + x = 48 \quad \text{total}$$
$$\underline{-14 \qquad\qquad -14}$$
$$x = 34$$

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4. Brianna has saved $600 to buy a new TV. If the TV she wants costs $1800 and she saves $20 a week, how many months will it take her to buy the TV (4 weeks = 1 month)?

Variables: _w = # of weeks_

Equation: _600 + 20w = 1800_

$$600 + 20w = 1800$$
$$\underline{-600 \qquad\qquad -600}$$
$$\frac{20w}{20} = \frac{1200}{20}$$
$$w = 60$$

$$m = \frac{w}{4}$$
$$m = \frac{60}{4}$$

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5. It costs Raquel $5 in tolls to drive to work and back each day, plus she uses 3 gallons of gas. It costs her a total of $15.50 to drive to work and back each day. How much per gallon is Raquel paying for her gas?

Variables: _____

Equation: _____

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6. Mrs. Jackson earned a $500 bonus for signing a one year contract to work as a nurse. Her salary is $22 per hour. If her first week's check including the bonus is $1204, how many hours did Mrs. Jackson work?

Variables: _____

Equation: _____

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