

Writing Equations For Word-Problems

- First, you want to identify the unknown, which is your variable. What are you trying to solve for? Identify the variable: Use the statement, Let $x = \text{-----}$. You can replace the x with whatever variable you are using.
- Look for key words that will help you write the equation. Highlight the key words and write an equation to match the problem.
- The following key words will help you write equations for Algebra word problems:

ADDITION

altogether

increase

more

plus

sum

total

combine

SUBTRACTION

difference

decrease

less

fewer

reduce

minus

MULTIPLICATION

per

times

product

double (2x)

triple (3x)

quadruple (4x)

DIVISION

quotient

divided by

divided into

per

share

split

Let's look at an example of an algebra word problem.

Example 1: Algebra Word Problems

Linda was selling tickets for the school play. She sold 10 more adult tickets than children tickets and she sold twice as many senior tickets as children tickets.

1. Let x represent the number of children's tickets sold.
2. Write an expression to represent the number of adult tickets sold.

3. Write an expression to represent the number of senior tickets sold.
 4. Adult tickets cost \$5, children's tickets cost \$2, and senior tickets cost \$3. Linda made \$700. Write an equation to represent the total ticket sales.
 5. How many children's tickets were sold for the play? How many adult tickets were sold? How many senior tickets were sold?
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As you can see, this problem is massive! There are 5 questions to answer with many expressions to write.

Solution

Linda was selling tickets for the school play. She sold 10 more adult tickets than children tickets and she sold twice as many senior tickets as children tickets.

1. Let x represent the number of children's tickets sold.

This is really important information, because we are going to
Let x = the number of children's tickets.

Every other expression will be based on x or the number of children's

2. Write an expression to represent the number of adult tickets sold.

Since she sold 10 more adult tickets than children tickets, the expression is:

$$x + 10 \quad \text{number of adult tickets sold}$$

x $+$ 10
 $\uparrow$ $\swarrow$
of children's 10 more
tickets

3. Write an expression to represent the number of senior tickets sold.

Since she sold twice ($2x$) as many senior tickets as children's tickets, the expression is:

$$2x \quad \text{number of senior tickets sold}$$

$\swarrow$ $\searrow$
2 times number of children's tickets

4. Adult tickets cost \$5, children's tickets cost \$2 and senior tickets cost \$3. The total ticket sales made \$700. Write an equation to represent the total ticket sales.

$$5(x+10) + 2x + 3(2x) = 700$$

$5(x+10) + 2x + 3(2x) = 700$
 \$5 • # of adult tickets + \$2 • # of children's tickets + \$3 • # of senior tickets = total

5. How many children's tickets were sold for the play? How many adult tickets were sold? How many senior tickets were sold?

Solve for x then substitute into the original expressions:

$$5(x+10) + 2x + 3(2x) = 700$$

$$5x + 50 + 2x + 6x = 700$$

$$13x + 50 = 700$$

$$13x + 50 - 50 = 700 - 50$$

$$\underline{13x = 650}$$

$$\underline{13} \quad \underline{13}$$

$$x = 50$$

$$x = 50$$

$$x + 10 = \text{adults tickets,}$$

$$2x = \text{senior tickets}$$

$$50 \text{ children's tickets}$$

$$50 + 10 = 60 \text{ adult tickets}$$

$$2(50) = 100 \text{ senior tickets}$$

A few notes about this problem

1. In this problem, the variable was defined for you. Let x represent the number of children's tickets sold tells what x stands for in this problem. If this had not been done for you, you might have written it like this:

Let x = the number of children's tickets sold

2. For the first expression, I knew that 10 more adult tickets were sold. Since more means add, my expression was $x + 10$. Since the direction asked for an expression, I don't need an equal sign. An equation is written with an equal sign and an expression is without an equal sign. At this point we don't know the total number of tickets.

3. For the second expression, I knew that my key words, twice as many meant two times as many. So my expression was $2x$.

4. We know that to find the total price we have to multiply the price of each ticket by the number of tickets. Take note that since $x + 10$ is the quantity of adult tickets, you must put it in parentheses! So, when you multiply by the price of \$5 you have to distribute the 5.

5. Once I solve for x , I know the number of children's tickets and I can take my expressions that I wrote for #1 and substitute 50 for x to figure out how many adult and senior tickets were sold.

Where Can You Find More Algebra Word Problems to Practice?

Word problems are the most difficult type of problem to solve in math. So, where can you find quality word problems WITH a detailed solution?

The [Algebra Class E-course](#) provides a lot of practice with solving word problems for every unit! The best part is.... if you have trouble with these types of problems, you can always find a step-by-step solution to guide you through the process!

[Click here](#) for more information.

The next example shows how to identify a constant within a word problem.

Example 2 - Identifying a Constant

A cell phone company charges a monthly rate of \$12.95 and \$0.25 a minute per call. The bill for m minutes is \$21.20.

1. Write an equation that models this situation.
 2. How many minutes were charged on this bill?
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Solution

A cell phone company charges a monthly rate of \$12.95 and \$0.25 a minute per call. The bill for m minutes is \$21.20.

1. Write an equation that models this situation.

Let m = number of minutes billed.

$$0.25m + 12.95 = 21.20$$

$0.25m$	+	12.95	=	21.20
↖ ↑		↑		
.25 a minute		monthly flat		total
(.25 • # of min.)		rate		bill

2. How many minutes were charged on this bill?

(Solve for m)

$$.25m + 12.95 = 21.20$$

$$.25m + 12.95 - 12.95 = 21.20 - 12.95$$

$$\underline{.25m} = \underline{8.25}$$

$$\underline{.25} \quad \underline{.25}$$

$$m = 33$$

33 minutes were charged on this bill.

Check: $.25m + 12.95 = 21.20$

$$.25(33) + 12.95 = 21.20$$

$$8.25 + 12.95 = 21.20$$

Notes For Example 2

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- \$12.95 is a monthly rate. Since this is a set fee for each month, I know that this is a constant. The rate does not change; therefore, it is not associated with a variable.
 - \$0.25 per minute per call requires a variable because the total amount will change based on the number of minutes. Therefore, we use the expression $0.25m$
 - You must solve the equation to determine the value for m , which is the number of minutes charged.

The last example is a word problem that requires an equation with variables on both sides.

Example 3 - Equations with Variables on Both Sides

You have \$60 and your sister has \$120. You are saving \$7 per week and your sister is saving \$5 per week. How long will it be before you and your sister have the same amount of money? Write an equation and solve.

Solution

Let x = number of weeks

$$7x + 60 = 5x + 120$$

$7x + 60$	$=$	$5x + 120$
$\underbrace{\hspace{1cm}}$		$\underbrace{\hspace{1cm}}$
Your money		Your sister's money
\$7 per week		\$5 per week + 120
+ 60		

Solve. This is an equation with variables on both sides!

$$7x + 60 - 60 = 5x + 120 - 60$$

$$7x = 5x + 60$$

$$7x - 5x = 60$$

$$\underline{2x = 60}$$

$$\underline{2} \quad \underline{2}$$

$$x = 30$$

In 30 weeks you and your sister will have the same amount of money.

Notes for Example 3

- \$60 and \$120 are constants because this is the amount of money that they each have to begin with. This amount does not change.

- \$7 per week and \$5 per week are rates. The key word "per" in this situation means to multiply.
- The key word "same" in this problem means that I am going to set my two expressions equal to each other.
- When we set the two expressions equal, we now have an equation with variables on both sides.
- After solving the equation, you find that $x = 30$, which means that after 30 weeks, you and your sister will have the same amount of money.

Cited algebra-class.com