

## Introduction to Word Problems

Everyone encounters word problems on a daily basis. People often don't realize it because most of the time, they are not called word problems. The most common difficulty people have with word problems is substituting English terms for algebraic symbols and equations. Below are eight general steps to help you through solving word problems.

1. Read the problem. Ignore the details, and just get an idea of what the problem is dealing with.
2. Read through the problem again. While rereading the problem, answer these questions and put the information in a table. Be sure to allow a little extra room for additional information.
  - a. What is the problem asking? (Usually at the end of the problem.)
  - b. What useful information is in the problem?
  - c. What is the problem implying?
3. Draw a simple picture of the problem to illustrate it. This also allows you to visualize what the problem is talking about. An illustration may not always be needed.
4. Translate the English terms into an algebraic equation using the list of key terms. Also see Example 1.
5. Review the equation to see if it is similar to equations from your homework and to see if it makes sense. Some formulas dealing with specific word problems may need to be rewritten. Distance problems, for example, may need to be written solving for each of the other variables in the formula.  $\text{Distance} = \text{Rate} * \text{Time}$ ; therefore  $\text{Time} = \text{Distance} / \text{Rate}$ , and  $\text{Rate} = \text{Distance} / \text{Time}$ . Usually a distance problem will identify the specific variable to be solved.
6. Solve the equation using the rules of algebra.
7. Look at your answer to see if it makes sense.
8. Read the problem one last time once you believe that you have solved for all of the unknowns in the problem. Be sure that you have found exactly what was asked for.

### Key Terms

Addition	Subtraction	Multiplication	Division	Equals
sum	decreased by	times	per	is
add	less	of	divide	was
in addition	subtract	product	quotient	equal
more than	difference			will be
increased	diminished			results
in excess	reduce			are
greater	minus			gives
total	fewer than			yields

Example 1: Examples of converting from word to Algebraic form

<u>English</u>	<u>Algebraic Form</u>
Five more than x	$5 + x$
A number added to 3	$x + 3$
A number increased by 7	$x + 7$
5 less than 10	$10 - 5$
A number decreased by 6	$x - 6$
Difference between x and 12	$x - 12$
Difference between 8 and x	$8 - x$
Twice a number	$2 * x$
Three times a number	$3 * x$
Quotient of x and 3	$x / 3$
Quotient of 3 and x	$3 / x$
Four is two more than a number	$4 = 2 + x$
The product of 5 times a number is 15	$5 * x = 15$
One half a number is 10	$\frac{1}{2} * x = 10$
Five times the difference of a number and 9	$5(x - 9)$
The sum of two consecutive integers	$x + (x + 1)$
The sum of two even consecutive integers	$x + (x + 2)$
The sum of two odd consecutive integers	$x + (x + 2)$

Example 2: Sam buys a can of peas costing \$3.00 and a can of corn costing \$2.50. What will Sam's total bill be before tax?

1. The problem is dealing with costs of food from a store.
2. Get the information out of the problem

What is being asked for?	Total cost of both the peas and corn		
Useful Information	Peas	\$3.00	
	Corn	\$2.50	
Implied	Do not include tax in the answer (Before tax)		

3. No illustration is needed
4. The key word "total" lets us know to add.  

$$\begin{array}{r} \text{Cost of Peas} + \text{Cost of Corn} = \text{Total Bill} \\ \$3.00 \quad + \quad \$2.50 = \text{Total Bill} \end{array}$$
5. The equation does make sense. To find how much you have to pay at a grocery store, you add together the costs just as this equation does.
6.  $\$3.00 + \$2.50 = \$5.50$
7. It makes sense. We are adding so the answer should be larger than what we are adding together.
8. The problem wanted the total price and that is what we have found.

Example 3: Brenda's car gets 26 mpg in highway driving. If her car's tank holds 20 gallons of gas, how far can her car travel on the highway before it runs out of gas if her tank is half full when she starts?

1. This problem is working with gas mileage and distance.
2. Get the information out of the problem

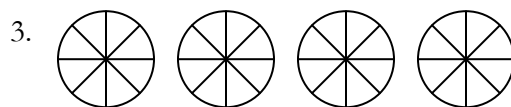
What is being asked for?	How far can she travel? (Distance in miles)	
Useful information	Car's Gas Mileage	26 mpg
	Tank holds	20 gallons
	Amount in tank	$\frac{1}{2}$ a tank
Implied	mpg means miles per gallon	
	Amount of gas * mpg = distance	
	Need to find the amount of gas that was in the tank <b>before</b> the distance can be found	

3. No illustration is needed
4. Gas Mileage \* Amount of Gas = Number of miles  
Amount of Gas = Total amount the tank can hold \* fraction of tank
5. This makes sense. Miles per gallon multiplied by gallons of gas does equal miles as the equation states.
6. Amount of Gas = Total amount the tank can hold \* fraction of tank  
Amount of Gas = 20 gallons \*  $\frac{1}{2}$   
Amount of Gas = 10 gallons  
  
Gas Mileage \* Amount of Gas = Number of miles  
26 mpg \* 10 gallons = 260 miles
7. The answer makes sense.
8. The problem wanted to know how far Brenda could travel, and that is what was found, so the problem is finished.

Example 4: Sara made four pizzas and cut each pizza into eight slices. She then ate these pizzas with some friends. Two pieces of pizza were left over. If each person ate three pieces of pizza, how many friends did Sara eat with?

1. Sara had friends over and they ate pizza.
2. Get the information out of the problem

What is being asked for?	The number of friends Sara ate with
Useful information	4 pizzas
	Each pizza was cut into 8 pieces
	Each person ate 3 pieces
Implied	The answer is the number of friends Sara ate with, <b>not</b> how many people ate pizza.
	Need to find out how many pieces of pizza there were



4. # of pieces = # of pizzas \* # of pieces per pizza  
# of people who ate pizza = # of pieces / # of pieces eaten per person
5. These equations make sense.
6. # of pieces = # of pizzas \* # of pieces per pizza  
# of pieces =  $4 * 8$   
# of pieces = 32

$$\begin{aligned} \text{\# of people who ate pizza} &= \text{\# of pieces} / \text{\# of pieces eaten per person} \\ \text{\# of people who ate pizza} &= 32 / 3 \\ \text{\# of people who ate pizza} &= 10 \text{ R } 2 \end{aligned}$$

So 10 people ate pizza.

7. This makes sense. The problem said that there were two pieces left over and there is a remainder of two after dividing. This shows that the problem has been done correctly.
8. The problem wants the number of people who ate with Sara, not the number of people who ate pizza. So we need to subtract one from the # of people who ate pizza to get what is asked for.

Answer: 9 people ate with Sara

Sources:

- <http://academic.cuesta.acasupp/AS/706.htm>
- <http://homepages.cambrianc.on.ca/tutorial/thetutorialcentre/mathscience/science/How%20To%20Solve%20Word%20Problems.html>
- [www.studygs.net/mathproblems.htm](http://www.studygs.net/mathproblems.htm)