GERMANNA
ACADEMIC CENTER
FOR EXCELLENCE

Introduction to Word Problems

Many students become frustrated with the word problems they encounter in their math classes; they do not see the value in learning how to solve math word problems. However, most of us actually do encounter situations in everyday life that require us to use the same form of critical thinking that is utilized to solve word problems. For example, when shopping, if we see a 30% off sign, many of us look at the original price of the item and figure out the sale price before we decide if we want to buy the item. When this happens, we are using the same strategies to find the item's price as we use when solving word problems. This handout will provide you with eight steps to visualizing and solving math word problems.

1. Read the problem, and try to ignore insignificant details. Those insignificant details are called distractors.
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 information is given 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 the problem; however, an illustration may not always be needed.
4. Translate the words into an algebraic equation using the key terms listed below. 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 one of the other variables in the formula. For example: $d = rt$; therefore, $t = \frac{d}{r}$ and $r = \frac{d}{t}$.
6. Solve the equation.
7. Check your answer to see if it makes sense.
8. Read the problem one last time to be sure that you have answered it thoroughly.

Key Terms

Addition	Subtraction	Multiplication	Division	Equals
sum	decreased by	times	per	is
add	less	of	divide	was
in addition	subtract	product	quotient	are
more than	difference	multiplied by	ratio	will be
increased	diminished	times as much	over	results
in excess	reduce	times as many	separated into	equal/equals
greater	minus		goes into	gives
total	fewer than			yields
joined with	take away			is the same as
plus	less than			makes
and	exceeds			leaves
combined with				earn

Example 1: Examples of converting the given information from word form to algebraic form

Word Form	**Algebraic Form**
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	$2 \times x$
Three times a number	$3 \times x$
Quotient of x and 3	$x \div 3$
Quotient of 3 and x	$3 \div x$
Four is two more than a number	$4 = 2 + x$
The product of 5 times a number is 15	$5 \times x = 15$
One half a number is 10	$½ \times x = 10$
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 that cost $3.00 and a can of corn that cost $2.50. What will Sam's total bill be before tax?

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

What is being asked for?	Total cost of both the peas and corn		
Given 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 use addition.
   Cost of Peas + Cost of Corn = Total Bill
   $3.00 + $2.50 = Total Bill
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. The answer makes sense. Because we are using addition, the answer should be larger than the two numbers we started with.

8. The problem asked for the total price, and that is what we have found. Therefore, the total cost is $5.50.

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. Extract the information out of the problem

What is being asked for?	How far can she travel? (Distance in miles)	
Given information	Car's Gas Mileage	26 mpg
	Tank holds	20 gallons
	Amount in tank	½ 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 **before** 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 × ½
   Amount of Gas = 10 gallons

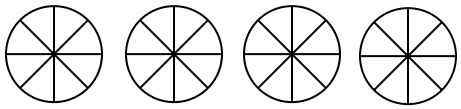
   Gas Mileage × Amount of Gas = Number of miles
   26 mpg × 10 gallons = 260 miles
7. The answer makes sense.
8. The problem wanted to know how far Brenda could travel, the answer to the problem is 260 miles.

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. The problem wants to know how many friends Sara ate pizza with.
2. Extract 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, **not** how many people ate pizza.
	Need to find out how many pieces of pizza there were

3. Use an illustration.



4. Total # of pieces = # of pizzas × # of pieces per pizza
   Total # of people who ate pizza = total # of pieces / # of pieces eaten per person
5. These equations make sense.
6. Total # of pieces = # of pizzas × # of pieces per pizza
   Total # of pieces = 4 × 8
   Total # of pieces = 32

   Total # of people who ate pizza = total # of pieces / # of pieces eaten per person
   Total # of people who ate pizza = 32 / 3
   Total # of people who ate pizza = 10 R 2

   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 number of people who ate pizza to correctly solve the problem: $10 - 1 = 9$. Therefore, 9 people ate with Sara