Take the Anxiety Out of Word Problems

I find that students fear any problem that has words in it. This does not have to be the case. In this chapter, we will practice a strategy for approaching word problems that can help take the fear out of words in your math problems. When approaching your word problems, it is a good idea to understand the entire problem before we start. So when you see an application problem, first take a deep breath and let it out, then read the problem as if you were reading a book. Don't write anything or do anything the first time you read it, just get an idea of what is in the problem. After reading it once, read through it again extremely slowly and I mean extremely slowly, no rushing! Read each word one at a time and as you read translate the words into math symbols. After reading and translating, read the problem again fairly slowly and check each part of your math equation (and drawings if you needed a drawing) to make sure that the symbols match the words. If any part of what you wrote down does not match the words, then change it and repeat this step until the words match the symbols. Finally, our words match our symbols and pictures, so we can read the problem one last time to see what it is asking us to find with our symbols and pictures, and then just solve the problem. The very last thing you should do is check to make sure the answer you got matches what the problem wanted. You will notice that this process asks you to read the problem at least four or five times. Many people want to rush a word problem by reading it and just finding the answer, then they get frustrated because they are having problems. It is extremely important not to rush while solving your word problems; take a deep breadth and let it out, then slow down.

Let's summarize this process.

1. **Read the problem just to get an idea of what the problem is about, but do nothing.**
2. **Read the problem extremely slowly and translate the words to math symbols and pictures (if pictures apply).**
3. **Read the problem again slowly and make sure what you wrote matches the words (repeat step 2 and 3 if necessary).**
4. **Read the problem searching only for what the problem wants you to find.**
5. **Solve the problem.**
6. **Make sure your answer works.**

You are probably thinking, "Great, Kim, but I can never tell what word means what in the math problem! Aren't you going to help me with that?" Of course, that is where we are going next. Below is a grid that will help you with the words that are used the most in word problems. Each section in the grid is for a certain operation, which is underlined at the top of its corresponding box. When any of the words in the box show up in a problem, you will write the symbol for the corresponding operation that is underlined in the box. Occasionally you will have to arrange things a little differently.

Addition	Subtraction	Multiplication
More Increase Greater Sum	Less Less than* Decrease Difference	Of Product
Division	**Equals**	**Inequalities**
Ratio quotient	Is Same As Equivalent	Is Less Than Is Greater Than Is Less Than or Equal To Is Greater Than or Equal To

You will notice that "less than" has an asterisk next to it. The asterisk is there because these two words attached to each other have you do something special.

Example 1

Let's look at a simple word problem to see what is special about this phrase. Our problem includes the words: "8 less than a number." Now we know that we will have an 8 in the expression that we are translating. We also know that since it has "less than" there will be a subtraction. Finally since the words "a number" are in

the problem and we do not know what the number is, we know we have to have a variable. You can pick any variable you want. Let's use "x". Now the trick is do we write "$8 - x$" or "$x - 8$"? Well, if you are 8 less than a number, aren't you 8 smaller than the number? The first expression has us writing x smaller than 8 and the second expression has us writing 8 smaller than x, so we want the second one. The expression that "8 less than a number" translates into is "$x - 8$". Notice that when the 8 and the variable are presented in words, the order is opposite of the way we write them in the expression. The words "less than" have the asterisk next to them to remind us that we need to switch the order that they come in the sentence when we write the mathematical expression.

Example 2

Now let's translate a problem from words to math. "Triple a number increased by 21 is less than 36." Now we need to go extremely slow and translate each word or short phrase. Triple = multiply by 3, a number = x, so "triple a number" is written as $3x$. Increased = +, so we now have $3x +$. Continuing on, we have 21, so now we have $3x + 21$. The next thing we come to is "is less than" which means the inequality symbol < (Note: this phrase translates to the inequality symbol because of the "is" in front of the "less than."). So we now have $3x + 21 <$. Finally we need to put the 36 in the end to get an inequality of $3x + 21 < 36$. Now we could solve this as we did earlier in the book.

Example 3

Now let's look at a problem that is a little different. The sum of three consecutive integers is 33. This problem brings up a new word, "consecutive." What does consecutive mean in math? It means one right after the other, so integers that are one after the other are like 2, 3, 4. How do we get from one integer to the next? Don't we just add one to the previous integer? Let's let x = the first integer. If we add one to this to get the next integer, then the next integer = $x + 1$ and the one after that is one more or $x + 2$. So our three consecutive integers are x, $x + 1$, and $x + 2$. The problem says the sum of these three consecutive integers and sum means addition, so we now have: $x + (x + 1) + (x + 2)$.

Continuing in our slow version of reading the problem, it says that this sum is 33 and "is" means equals, so our equation is $x + (x+1) + (x+2) = 33$. Now, let's read again and make sure this matches the words. The words are "The sum of three consecutive integers is 33." Our equation is $x + (x+1) + (x+2) = 33$. They match, so now we can solve our equation by first simplifying the left side of the equation to get:

$3x+3=33$ Now let's subtract 3 from both sides.

$3x + 3 - 3 = 33 - 3$

$3x = 30$ Now divide by 3 to get the answer for the first integer.

$$\frac{3x}{3} = \frac{30}{3}$$

$$x = 10$$

Since 10 is the first integer, the second is 11, and the third is 12. Notice that the sum of these is 10 + 11 + 12 = 33, so these three numbers are the right numbers.

Example 4

Now, what if instead of consecutive integers, the problem had said consecutive **odd** integers? Consecutive odd integers are like, 3, 5, 7,…. How do we get from one odd integer to the next? Don't we just add 2 to the previous integer? For example, 3+2 = 5, 5 + 2 = 7, etc., so if the first odd integer is x, then the next odd integer is $x + 2$ and the next is 2 more which is $x + 4$, etc. What if instead of consecutive integers, the problem had said consecutive **even** integers? Consecutive even integers are like, 2, 4, 6,…. How do we get from one even integer to the next? Don't we just add 2 to the previous integer? For example, 2+2 = 4, 4 + 2 = 6, etc. So, if the first even integer is x, then the next even integer is x + 2 and the next is 2 more which is x + 4, etc. This means that odd and even integers are dealt with in the same manner. If our problem says the **sum of three consecutive odd integers is 51**, then our equation is

$x + (x + 2) + (x + 4) = 51$ Now to find the three numbers, we will just simplify the left side and solve.

$x + (x + 2) + (x + 4) = 51$

$3x + 6 = 51$

$3x + 6 - 6 = 51 - 6$

$3x = 45$

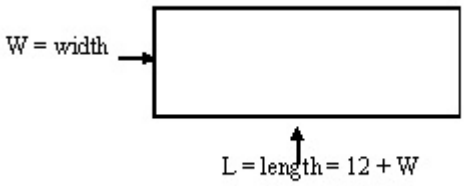
$\frac{3x}{3} = \frac{45}{3}$

$x = 15$

The first odd integer is 15, so the second is 17 and the third is 19. Let's check these answers. 15 + 17 + 19 = 32 + 19 = 51, so they work!

Example 5

We have not looked at any story problems that require us to draw a picture. We will now look at a problem where a picture is a huge help. "The length of a rectangle is 12 more than its width. The perimeter of the rectangle is 52 units. Find the dimensions of the rectangle." Wow! This problem probably seems a lot harder. If we draw a picture, it won't be. The first thing we read is, "the length of a rectangle." We know what a rectangle looks like, so let's draw one and label the length and width.



Now, the problem says, "The length of a rectangle is 12 more than its width." "Is" means equals and "12 more than" means add 12, so we have L = 12 +. Finally, what does the problem say that the length is 12 more than? The width. This gives us an equation of: L = 12 + W, but we are not done reading the problem. If we continue on it says, "The perimeter of the rectangle is 52 units." What is the formula for perimeter of a rectangle? P=2L+2W. The problem says that the perimeter is 52 units, so P = 52 and this gives us another equation of 52 = 2L + 2W. We now have a rectangle and two equations that fit the problem, so what do we do with them? Well, the equations are:

L = 12 + W

$52 = 2L + 2W$

Since the L is the same in both equations, we can replace the L in the second equation with what L equals in the first. This will look like:

$L = 12 + W$

$52 = 2L + 2W$	The L in this equation will get replaced with what is in red in the second equation to get:
$52 = 2(12 + W) + 2W$	Now simplify the right hand side of the equation and solve.

$52 = 24 + 2W + 2W$

$52 = 24 + 4W$

$52 - 24 = 24 - 24 + 4W$

$28 = 4W$

$$\frac{28}{4} = \frac{4W}{4}$$

$$7 = W$$

Since the width is 7 units, the length is 12 more than 7 which is 19 units. Now let's check and see if the dimensions of 7 units by 19 units will give us a perimeter of 52 units. P= 2(19) + 2(7) = 38 + 14 = 52 units, so we are correct!

Now you are ready to try your story problems in your homework. Remember, relax, take a deep breath, slow down, and you will make it. We will look at more application problems in the last section of chapter VI. You are doing great! Keep it up!