UNIVERSITY OF HOUSTON – VICTORIA

Academic Center
Tutoring and Testing at UHV.

Word Problems:
Translating from Math to English

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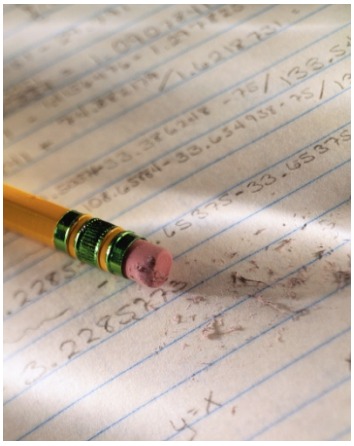
Summary: Provides advice for solving math word problems.
Learning Objectives: To define expression, equation, and variable. To list words that commonly describe math functions, like "minus" or "not" for subtraction.

Mathematics has its own language. We often need to translate between English and math-speak to be able to answer a question correctly. Before we can translate, though, we need to understand the difference between an *expression* and an *equation*.



An **expression** is a mathematical sentence, albeit an incomplete one. An expression is what we generally see in our math textbooks. There are no equal signs or inequalities.

EX: 4+2 $18x \times 7y$ $20 \div 3z$

An **equation**, on the other hand, *will* have some kind of equal or inequality sign. It is the complete mathematical sentence. We often see these in math textbooks when we are trying to solve for a variable or when we are checking the truth of a problem.

EX: 4+2=6 $18x \times 7y = 210$ $20 \div 3z = 5$

Something else that must be understood when we are translating between English and math-speak is that any unknown number can be represented by a **variable**. A variable can be a letter or it can be a symbol. If you want to represent an unknown value as ☺,then you can.

Most math textbooks will use letters or the Greek alphabet to represent variables (unknown values). When using a variable, you want to make it meaningful to your problem. For instance, if you are looking for the amount of change, you might want to use "c" as a variable, but if you are looking for the number of hours worked, you would want to use "h" as your variable. Using the right letter or symbol for your variable can help you remember what you are looking for. A more in-depth discussion of variables can be found in the Academic Center handout, *Understanding Variables*.

Understanding Math Sentences

Just like translating from English to any language, it is important to understand that certain words in a math sentence are verbs (words that express action) and others are subjects, predicates, or

conjunctions (those words that connect things). You will have modifiers as well. Your math-speak conjunctions are your mathematical operations, and you will often have more than one math-speak conjunction in an expression or equation. Examples of mathematical operations are plus (+), minus (-), multiplication (x, *, or a set of parenthesis), and division (÷, /). Your math-speak verb is the equal sign (=) that tells you to actually perform the operations to get the final answer.

Certain words will clue you in as to what operation (or math verb) to use.

Add (+)	**Subtract (-)**	**Multiply (x)**	**Divide (÷)**	**Equals / inequality (=, <, >, ≤, ≥)**
And Plus More than In addition to Also All together In all	Less than Minus Not	Each All together In all Per Double (x2) Triple (x3)	Each Groups Per Half (÷ 2)	Is More than Less than Greater than Fewer than

There are more clue words than are listed here, but this list is a good start.

To translate from English to math-speak just go word by word, for the most part. There are a few times where, like translating from other languages to English or vice versa, you will have to switch "words" around to make the math sentence make sense.

For example:

Terry has four pages of homework that will take her 20 minutes each to complete. How long it take to complete her homework? Let's look at this on a word by word basis:

Terry has **four pages** of homework that will take her **20 minutes each** to complete.

4 20 x

Four and 20 are pretty easy to translate, but the word *each* tells us that we have to either multiply or divide. We need to look at the question "*How long will it take to complete her homework?*" to see that we need to multiply.

Since we are multiplying the two numbers, it would be necessary for us to switch the 20 and the multiplication symbol. (Just as when we translate from Spanish to English we must switch our nouns and verbs for the sentence to make sense.) So our expression now reads: *4 x 20*.

We aren't done, however, because we still have that question. *How long will it take to complete her homework?* This will change our expression into an equation, a complete mathematical sentence. We are looking for an actual final amount. So now our equation will read: *4 x 20 = T*. (*T* is just a variable for our unknown amount of *time* to complete the homework.)

Here are some more examples:

Emilie's Dad gave her **five** pens to **add** to her collection. She already had **fifteen**. ***How many does she now have***?

5 + 15 = p

Eddie scored **18** points in the first half of the game. He **finished** the game with **40** points. How many did he score in the **second half**?

18 + s = 40

Finished is our clue for the equal sign, and since we are looking for how many he scored in the *second half* then this is what our variable will be.

Corey **lifts 10 times** more than **Kevin**.

C = 10 x K

The state **test is 135** minutes long and it is equally **divided** among **3** parts.

T = 135 ÷ 3

Practice Exercises

Try these on your own. Write the math sentence and then decide if it is an expression or an equation.

1. Catie divided her 500 mile driving trip evenly over 2 days.
2. Eric works 5 hours per day four days a week. How many hours does he work each week?
3. Charlie doubled his savings and had a total of $750.

Multiple Math Operations

Now let's look at something with multiple math-speak conjunctions: multiple math operations.

The car rental company rents a small compact car for $75 per day plus $o.08 per mile. If Carolyn rented a car for five days and paid $411.16 all together, how many miles did she drive?

This has a couple of things that we have to look at. First let's look at setting up the expression:

*The car rental company rents a small compact car for **$75 per day plus $0.08 per mile**.*

75 x d + 0.08 x m

This expression was pretty straightforward. The word problem already had everything all lined up for us. Now let's look at the next part.

*If Carolyn rented a car for **five days** and paid **$411.16 all together***

75 x 5 + 0.08 x m = 411.16 (The "=" and "411.16" were switched.)

Let's look at another one that is a little more complicated.

Eric bought 3 loaves of bread for $0.89 a loaf, 4 pounds of cheese for $3.50 a pound, and a dozen oranges for $0.20 each. If he paid with a $20 bill, how much change did he get?

This question is asking for us to work two separate problems to find the final answer. First we need to find out how much Eric spent all together for his purchases. Then once we find out how much he spent, we need to find out how much change he received.

Let's look at the first part of the problem:

*Eric bought **3** loaves of bread for **$0.89** a loaf, **4** pounds of cheese for **$3.50** a pound, and a **dozen** oranges for **$0.20** each.*

3 x 0.89 + 4 x 3.50 + 12 x 0.20

The next thing we need to do is to find the amount of change (c) Eric receives back. (*If he paid with a **$20** bill, how much **change** did he get?)* To do this, we can put the above expression inside parenthesis and then subtract it from $20.

20 – (3 x 0.89 + 4 x 3.50 + 12 x 0.20) = c

Practice Exercises

Try to work a couple of these word problems out on your own. Write the expression or equation needed to find the answer.

4. Maria bought 3 CD's at $19.75 each, 2 DVD's at $24.95 each, and 4 books at $8.99 each online with a free shipping deal. If she started out with $385.82 available in her Paypal account, how much did she have left after making her purchase?
5. Grace returned a pair of boots for a $68.95 store credit. She decided to get a new sweater for $15.49 and a pair of jeans for $24.95. How much does she now have left on the store credit?

Answers

1. 500 ÷ 2 Expression
2. 5 x 4 = h Equation
3. 2s = 750 Equation
4. 385.82 – (3 x 19.75 + 2 x 24.95 + 4 x 8.99) = p
5. 68.95 – (15.49 + 24.95) = c