**Reading and Problem Solving Strategies**

1. **Read the problem**

* Skim the problem first to get the big picture. Make note of words that show up often – they might be good candidates for your variables.
* Read the problem a second time (preferably aloud), and while reading, answer these questions:
  + What is the problem asking me? (Usually at the end of the problem.)
  + What is the problem telling me that is useful? (Highlight or underline relevant information and cross out unnecessary information.)
  + What topics/methods that I have learned that this problem references/connects to?

1. **Transform the information into a mathematical expression**

* Read a third time and employ the following techniques (as applicable to the problem):
  + Draw a simple picture of the problem to make it more real to you. This can range from a geometric figure relevant to the problem to a line that arranges items in size or time or other visualizations that help you put yourself into the situation.
  + Identify variables (unknowns and knowns) and if possible, a function that connects them. Write down definitions (in words) for your variables.
  + Write down the given information in a table or as sentences in your own words in an organized manner.
  + Using the variable(s) you have defined together with the translation list (see back), write down an expression or equation that will assist in solving the problem.
  + Translate the equation you created back into an English sentence to see whether it has the same meaning as the description in the problem.
  + If units are given for the variables, do a unit consistency check to see that all terms of an expression carry the same units. If needed, scale the units (e.g., hours to minutes). If there is a mismatch between type of unit, search for your error.

1. **Identify the solution method** (Make a plan)

* Once you have translated the word problem into a mathematical expression or equation, ask yourself the following questions (as applicable to the problem):
  + What is the type of equation and what specific techniques are applied to solving such an equation.
  + If a graph is to be drawn, what type of function is and whether there are there specific techniques for this type of function (for example, periodic functions)? What are the general graphing techniques that apply?
  + Are multiple equations involved that can be used to reduce the number of variables (think optimization problems with a constraint)?

1. **Check the solution and interpret it in the context of the problem.**

* First do a “common sense” check – could the answer be true? For example, probabilities have to be between 0 and 1, a ball tossed in the air cannot be at a negative height, etc.
* If you are solving an equation (or sets of equations), substitute your answer(s) for the variable(s) in your equation(s) and see if the two sides of the equation(s) have the same value.
* Finally, write down the answer in a complete sentence, making sure you answer the question and to include relevant units.

**Translating English Terms To Algebraic Symbols**

|  |  |  |
| --- | --- | --- |
| Sum | + |  |
| In addition to | + |  |
| More than | + |  |
| Increased | + |  |
| In excess | + |  |
| Greater | + |  |
|  |  |  |
| Decreased by | - |  |
| Less than | - |  |
| Difference | - |  |
| Diminished | - |  |
| Reduce | - |  |
| Remainder | - |  |
|  |  |  |
| Times as much |  |  |
| Percent of |  |  |
| Product |  |  |
| Interest on |  |  |
| Of |  | ¼ **of** the amount |
|  |  |  |
| Per | / | Word before “per” is the numerator.  Connection to %: **PER** means division, and **CENT** stands for 100. (For example, century = 100 years.) Using this, 80% = 80/100 |
| Divide | / |  |
| Quotient | / |  |
|  |  |  |
| Is | = |  |
| Was | = |  |
| Will be | = |  |
| Results | = |  |
|  |  |  |
| Greater than | > |  |
| Greater than or equal |  |  |
| Less than | < |  |
| Less than or equal |  |  |

**WARNING:** Just like in other languages, translation depends on the **context**. For example, “less than” can mean subtraction or refer to an inequality. **Apply this guide wisely.**

Adapted from: Paul Nolting, Winning at Math – Your guide to Learning Mathematics Through Successful Study Skills, 6th Edition, Academic Success Press Inc, 2014