Solving Word Problems

Word problems can be challenging if you don't know how to approach them. The following steps can be helpful.

Step 1: Take time to study the problem.
If you need to, read the problems a couple of times. What is the problem asking you to do?

Step 2: Evaluate the information given.
What information does the problem give? Determine whether you need all the information given and if information is missing.

Step 3: Select a strategy for solving the problem.
There are many ways to solve word problems. If you gave the same problem to 10 students, they might get the same answer using 10 different strategies. You can make a table or list, act the problems out, break the original problem into simpler problems, visualize or draw a picture (such as a graph, pattern, and so on - anything that will help you "see" the math), work backwards, or guess and check. After you choose a strategy, select the operation or operations you need.

Step 4: Select the appropriate operation to solve the problem.
What operation is needed to solve the problem? Determine whether you need to add, subtract, multiply or divide. You may need to use a combination of operations.

Step 5: Set up the problems and estimate a reasonable answer.
Does your estimate make sense based on the information given? Before you actually calculate math answers, it's a good idea to estimate a solution to the problem. Having some idea of what your answer should be close to will alert you to careless calculation errors and help you to check the reasonableness of you answer. You can use whichever estimation technique works best to help you solve the problem quickly: rounding, grouping numbers that are easy to add, front-end estimation, and so on.

Step 6: Find the answer and then check it.
Now, calculate the answer. After you calculate the answer, check to see if it makes sense and answers the question that was asked.

Solving word problems using estimation

Sometimes it is appropriate to use estimation to determine if a solution to a problem might be before doing the exact calculations. Rounding is one way to estimate a solution.

Estimation:
Estimation is a way of getting a "rough idea" of what a solution to a problem might be before doing the exact calculations. Rounding is one way to estimate a solution.

Whole numbers and Decimals:
To round a whole number or decimal you should use these guidelines:

- ✓ Find the digit in the place that you are rounding to
- ✓ Look at the digiti to the right of the place you are rounding to:
  - If this digit is 5 or more, the digit in the place you are rounding to increases by one (use zeros as placeholders where necessary)
  - If this digit is 4 or less, the digit in the place you are rounding to stays the same (use zeros as placeholders where necessary)

Examples

Round 4,569.3<u>2</u>9 to the nearest tenth:	4,569.3	(since $2 < 5$)
Round <u>5</u>,760.192 to the nearest thousand:	6,000.	(since $7 > 5$)

Fractions and Mixed Numbers:
When rounding a fraction or mixed number to the nearest whole number you should use these guidelines:

- ✓ If the fraction part is $\frac{1}{2}$ or greater, the whole number increases by one, and the fraction is dropped (if there is no whole number, the fraction becomes one)
- ✓ If the fraction part is less than $\frac{1}{2}$, the whole number stays the same and the fraction is dropped (if there is no whole number, the fraction becomes zero)

Examples:

Round $\frac{5}{9}$ to the nearest whole number: 1 (since $\frac{5}{9} > \frac{1}{2}$)

Round $3\frac{2}{7}$ to the nearest whole number: 3 (since $\frac{2}{7} < \frac{1}{2}$)

Determining if a solution is reasonable

When solving problems, sometimes an exact answer is not necessary, and an estimate will be sufficient. Estimates are used to determine if a solution to a problem is reasonable. In order to estimate the answer, round the numbers in the problem so that the calculations are simpler.

Example
Karen's 5 math tests scores are shown below:

53, 88, 91, 72, 74

Which statement about the data is most reasonable:

The mean is close to 60.
The mean is close to 70.
The mean is close to 80.
The mean is close to 90.

When doing these types of problems, the answers do not have to be exact so estimating answers makes the math easier. First, round each of the test scores to the nearest tens place:

$53 \rightarrow 50$
$88 \rightarrow 90$
$91 \rightarrow 90$
$72 \rightarrow 70$
$74 \rightarrow 70$

Next, because they are comparing mean scores we need to add up the estimates and divide by the number of tests (5). $50 + 90 + 90 + 70 + 70 = 370 \div 5 = 74$

Remember, that 74 is only an estimate but, the problem is only asking you to get close to the mean so the answer is: The mean is close to 70 because 74 would be rounded down to 70.

Order of Operations

When simplifying mathematical expressions, you must follow the order of operations to get the correct answer.

Step 1: Simplify all expressions in parentheses. (This includes brackets, braces and absolute values.)

Step 2: Simplify all expressions that have a square root or an exponent.

Step 3: Multiply and divide in order from left to right.

Step 4: Add and subtract in order from left to right.

Example:

Simplify: $156 + 8^3 - (25 \bullet 8) \div 2$

Step 1: Simplify the expression inside the parentheses:

$$(25 \bullet 8) = 200$$
$$156 + 8^3 - 200 \div 2$$

Step 2: Simplify the expression with the exponent:

$$8^3 = 8 \bullet 8 \bullet 8 = 512$$
$$156 + 512 - 200 \div 2$$

Step 3: Divide

$$200 \div 2 = 100$$
$$156 + 512 - 100$$

Step 4: Add

$$156 + 512 = 668$$
$$668 - 100$$

Step 5: Subtract

$$668 - 100 = 568$$

the answer is 568