

### Tips for Tutoring Middle School Math

by Kathryn Stout

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As a math tutor, I frequently work with kids having difficulty staying focused. Even when they are able to compute accurately, if a problem requires more than one step to solve, they frequently lose track of what they are ultimately supposed to find out. Therefore, my job includes helping these students develop work habits and organizational skills along with problem solving strategies. Following are a few techniques that have proved helpful:

1. Work is carried out on a separate piece of paper rather than filling in charts or blanks in a workbook in order to teach students how to label and line up their own work. Graph paper is used for computation if students need help lining up numbers or decimals during computation.
2. We discuss the problem. What is it asking? What information are we given? Then the student must use key words, phrases, or symbols to note the original problem.

If asked to find the final cost of a \$10.00 item that is marked 20% off, the student should write on his paper:

\$10.00 item  
20% off  
Final cost = ? (or use a letter representing the unknown  
variable: Final cost = x)

Or he may write the information on one line with enough space between each bit of information to keep everything legible:

\$10.00 item          20% off          Final cost = ?

3. The student must then write an equation for solving the problem, lining it up below his notes about the problem. It is important to teach students to line up their work in columns or rows. They can use scratch paper for computation, but must then put the results in the proper place where work is being recorded. Workbooks have been supplying some of this organization for them, so I find I must train students in how to do this on their own.

For example, continuing with the problem above:

\$10.00 item          20% off          Final cost = ?

\$10.00 x .20 = amount off          (Computation could then be carried out on scratch  
paper.)

\$10.00 x .20 = \$2.00 off          (The student writes the equation again, but with the  
answer this time, maintaining work in a column rather  
than all over the paper.)

\$10.00 - \$2.00 = \$8.00 final cost

4. All work must be labeled properly, not just final solutions--dollar signs, percent symbols, as well as words--as in the example above. This is an especially important habit to be developed. Without the labels reminding the student what he is looking for and what he has just found, it is very easy to end up with a number and not remember what it represents. With problems like the one above, students often stop once they find the \$2.00 instead of remembering that it only represents the discount, not the final cost.

5. I teach students to make simple charts to organize their work when problems require several steps.

For example, a problem asking for compound interest over two or more years on a deposit of \$250.00 at 4% annual interest could end up with a confusing page of scattered multiplication and division problems. Instead, I help students set up information in an informal chart like the one below. The work shown within parenthesis is done on scratch paper and each answer is then written next to the appropriate label.

1st deposit:	\$250.00	Annual interest 4%
1st year interest	\$ 10.00	(\$250.00 x .04 = \$10)
Balance end 1st year	\$260.00	(\$250.00 + \$10.00)
2nd year interest	\$ 10.40	(\$260.00 x .04 \$10.40)
Balance end 2nd year	\$270.40	(\$260.00 + \$10.40)

The original question asked the student to find the compound interest over two years (\$20.40). I add more questions so that he realizes the additional benefit of having a chart. How much is in the savings account at the end of two years? (\$270.04) How much would the interest be at the end of three years?

6. I also use every opportunity to have students identify alternative ways to find a solution before choosing one to use in solving the problem. In the example above, the student was asked to find the total interest earned over two years. He could add \$10.00 + \$10.40, looking at the rows labeled interest, or he could take the ending balance of \$270.04 and subtract the original deposit of \$250.00. When students have difficulty finding alternatives, I show them, letting them see that the answers will be the same. This reinforces the use of reasoning.

7. I also use problems that vary in the way questions are asked so that students don't jump into computation without thinking. If several word problems in a row asked, "How many in all?" a student may see no need to read the problem carefully. He may just copy down any numerals he sees and add. By varying the wording, the student finds it helpful to read the problem carefully and identify what it is asking, a habit I am encouraging him to develop.

8. I ask my students to recite formulas again and again to insure memorization of anything giving them difficulty. I constantly explain concepts as we reason through a problem, but recognize that students can still have success using memorization even without complete understanding. Developmentally, memorization ability is strong in the young, while abstract reasoning is weak. During middle school years, the ability to reason abstractly grows, but, of course, at different rates in each child. Knowing this allows me to patiently go over concepts again and again, never assuming they will be mastered quickly.

9. If a student forgets how to do something, I try to jog his memory by asking questions that lead him through the reasoning process. At the middle school level, students must apply all sorts of memorized skills in order to find solutions. When memory fails them, reasoning can save the day.

For example, while working with percents, a student was asked to find  $4\frac{3}{4}\%$  percent of a number. He couldn't remember how to turn a fraction into a decimal. Instead of simply telling him, I directed his thinking by asking him to read the fraction ( $\frac{3}{4}$ ) out loud in as many ways as he could think of. He said three-fourths and three over four. I added three out of four, and then asked, but what does that line represent? What kind of computation? Addition? Subtraction? Multiplication? Division? That triggered his memory and he read, three divided by four. He was then able to set up his division problem and find the decimal representation.

10. After working on a concept, I apply it to several real-life situations. All students need to see the practical applications of math, but kids with difficulty concentrating find it easier to stay

focused on tasks they find meaningful. This can be as simple as referring to objects in the room as I make up a word problem, or putting them in the problem: "You get \$25.00 for your birthday, so you decide to buy a CD for \$12.99 and then have a slice of pizza that costs \$1.99 and a Pepsi at \$1.50. Will you have enough left to go to a \$7.50 evening movie?"

By developing the habit of methodically listing and labeling steps in an orderly manner, students will be better prepared to solve problems in higher math that require them to show the logical process from problem to solution. It also contributes to such practical math as maintaining a checkbook and a budget. In the meantime, students having difficulty staying focused, or those who lose their place because they reason slowly, develop a strategy that helps them remember what they are supposed to find out.

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Teaching Help is a monthly teaching tips column by Kathryn Stout. Kathryn desires to help home schoolers find out how to keep their entire family excited about learning, how to turn their kids into thinkers and doers, and how to make it all run smoothly.

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