Tips for Teachers

Chapter 1 Operations on the Whole Numbers

Section 1.7 Solving Equations

This is quite likely your students' first experience with variables and equation-solving. What follows is one technique you can use to introduce equation-solving.

Solving By Trial

Given a sentence, or equation, like $5 + \_\_ = 8$, find a number that can be put in the blank to make the sentence true. In other words, answer the question "5 plus what number is 8?" The answer is 3, so we have $5 + \underline{3} = 8$. When we replace the blank with a letter that can represent any number, we are using a variable. Emphasize the relationship between the blank in the equation $5 + \_\_ = 8$ and the variable in the equation $5 + x = 8$. When we solve an equation we find a number that can be used in place of the variable to make the equation true just as we did when found a number to put in the blank in the equation we originally considered.

Continue by pointing out that we solved the equation above by trial - that is, by trying different numbers until we found the one that made it true. We would like to develop a more efficient technique for equation solving, however.

Algebraic Equation-Solving Techniques

Begin this development by considering an equation like $15 \cdot 12 = y$. Here we want to answer the question "15 times 12 is what number?" We find the answer by carrying out the multiplication, obtaining the solution of the equation, 180. Note that when the variable is alone on one side of the equation, we merely have to carry out the computation on the other side to solve the equation. Thus, our equation-solving technique will involve manipulating the equation to put it in this form.

For an equation of the type $x + a = b$, we do this by subtracting a on both sides. For an equation of the type $a \cdot x = b$, we divide by a on both sides. Emphasize that the subtraction or division must be done on *both* sides of the equation. Students can remember whether to subtract or divide by thinking of subtraction as "undoing" addition and of division as "undoing" multiplication.

Supplement Key
Further Instruction and Practice for Your Students

Video	Audio cassette	MathMax CD-ROM	InterAct Math Online Exercises	Printed Test Bank/Instructor's Resource Guide	
				Exercises	Chapter Review
Tape 2	2B	Section 1.7		pp. 613-614	p. 679

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Section 1.8 Applications and Problem Solving

The Five-Step Problem-Solving Process

Students often say that they find it difficult to solve applied problems largely because they don't know how to "get started." The five-step problem-solving process used in this text is a great help in alleviating this difficulty. The five steps are

1. Familiarize yourself with the problem situation.
2. Translate the problem to an equation.
3. Solve the equation.
4. Check the solution in the original wording of the problem.
5. State the answer clearly with appropriate units.

Familiarizing

Although students will often skip or spend very little time on the first step, it is perhaps the most important because it can clarify what is known and what is unknown as well as lead the student to the translation of the problem to an equation. Familiarization with a problem situation can be done in one or more of the following ways. First, reread the problem. Reading it aloud can also be helpful as can rephrasing the problem yourself. List the given information and restate the question being asked. Select a variable to represent the unknown quantity and clearly state what the variable represents. Organize the given and the unknown information in a table, looking for possible patterns. Make a drawing and label it with the given and unknown information. Find further information, if necessary. This might include looking up a definition or formula or consulting a reference librarian or an expert in the field.

Another useful familiarization technique is to guess or estimate the answer and check to see if it is correct. Unfortunately, students are frequently reluctant to make a guess for fear that is will be incorrect. In fact, the guess *is* nearly always incorrect, but the process of checking it will very often give insight into how to translate the problem to an equation. Encourage your students to make guesses and assure them that incorrect guesses are very useful.

Checking the Solution

A mistake that students commonly make in solving applied problems is checking the solution in the equation that was used rather than in the original wording of the problem. If the student has translated to an equation incorrectly and has then solved that equation correctly, checking in the equation will not reveal that the translation was incorrect. Furthermore, it is possible that the translation has been done correctly, but the problem has no solution. Again, the solution must be checked in the original problem in order for this to be apparent. Explain and demonstrate to students the difference between checking in the equation and checking in the original wording of the problem.

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