TAKE IT TO THE MAT

A NEWSLETTER ADDRESSING THE FINER POINTS OF MATHEMATICS INSTRUCTION

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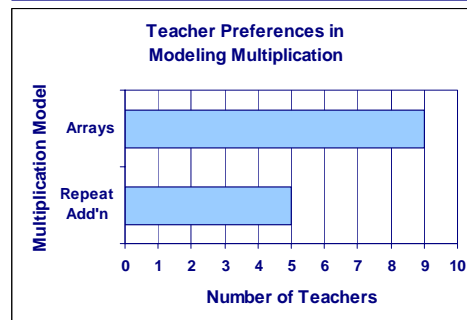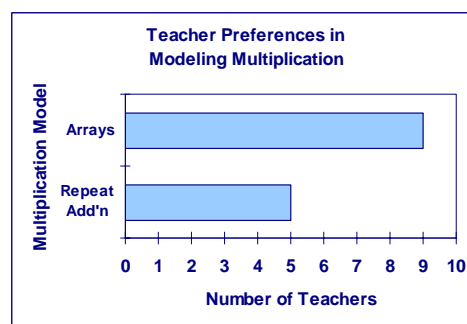
In the March 2005 edition of *Take It to the MAT*, we looked at models of subtraction: one using discrete objects and "take away," and one with a number line and "distance." In this issue, we'll continue to look at the distance model of subtraction and look at some connections to other areas of the curriculum.

The "distance" model using the number line relates to the notions of *difference* and *comparison*. It is superior to the "take away" model with discrete objects in many circumstances. Take this one, for example.

A survey of 14 elementary teachers asked them which model of multiplication they prefer: repeated addition or arrays. The results of the survey are displayed in the bar graph shown at right.

Question: *How many more teachers prefer an array model than repeated addition?* The scenario could be modeled with discrete objects, but the distance model with a number line probably makes more sense. It is particularly suited to this case as the graph already contains a number line.

If it helps, we can add gridlines to the graph to make determining the difference easier. As we learned in the last issue, to determine the difference between the number of teachers preferring arrays and those preferring repeated addition, we need to count the "spaces" or "jumps" from 5 to 9 (or 9 to 5). That difference is 4.


Teacher Preferences in Modeling Multiplication

Teacher Preferences in Modeling Multiplication

The distance model is one example of a comparison model where we might ask "How many more than …?" or "How many less than …?" such that students must understand the relationship between the two numbers. After all, it's relative; sometimes 5 is more, sometimes it is less. Five is more when compared to 3, but less when compared to 10. Discrete models help visualize this; number lines make connections to graphs and frequent use of a variety of graphs offers opportunities to discuss questions of comparison.

We can compare with a *difference unknown*, such as, "Using the information in the graph above, how many more teachers prefer an array model than prefer repeated addition?"

We can also compare with a *larger unknown* such as "There are four more teachers who prefer the array model to the repeated addition model. Five teachers prefer the repeated addition model. How many fewer prefer the addition model?"

A third comparison is that of a *smaller unknown*. "Four fewer teachers prefer the addition model to the array model of multiplication. Nine teachers prefer the array model. How many prefer the addition model?"
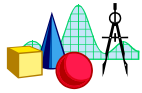
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Where do we see opportunities to build this understanding in our math curriculum? An example of a scenario that encourages this comparative thinking might be in determining if we have enough snacks (or paper, or any object) for the number of students in the class.

Shaping these questions for students verbally, and in writing, encourages comparative thinking and problem solving. Note the comparisons you have to make to answer the following questions:

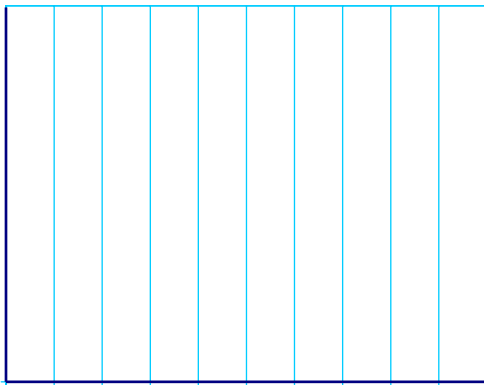"I have 20 pieces of paper but we have 27 students; how many more pieces of paper do we need so that everyone has one?"

"If I have 35 pieces of paper and only 27 students, how many extra pieces (more pieces) of paper do I have for the number of students in the class?"

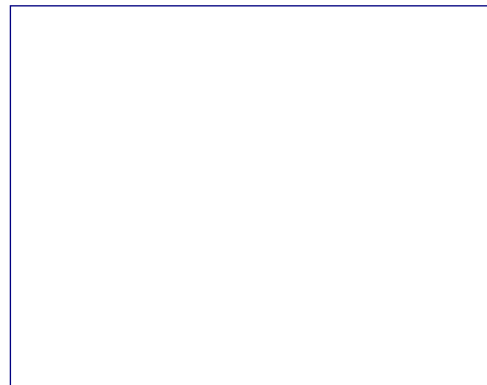"I have 4 fewer pieces of paper than we need. How many copies did I make?"

What would a number line model look like to determine these? A bar graph? A discrete model with objects/people? How might you write the "number sentence" for each of these?

Number Line

Bar Graph

Discrete Model