TAKE IT TO THE MAT

A NEWSLETTER ADDRESSING THE FINER POINTS OF MATHEMATICS INSTRUCTION

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In the last issue of *Take It to the MAT*, we looked at some common errors in language with respect to proportional reasoning. Sometimes such errors occur from lack of understanding and sometimes they occur from a lack of precision in the use of terminology. Regardless of the reason, such errors must be addressed early in a student's schooling. In this issue, we will look at more common misstatements when comparing numbers and looking at change.

Percentage is a common area where people use language imprecisely or incorrectly. Take the phrases "percent of" and "percent more than."

- Eighteen is **six hundred** *percent of* three.
- Eighteen is **five hundred** *percent more than* three.

These are equivalent statements and both are mathematically correct. Yet, the second statement is often heard as, "Eighteen is six hundred percent more than three." This is incorrect and comes from a lack of understanding of what 100% is. One hundred percent is a whole. It's "one times." In each of these statements, the whole—the 100%—is three. We can remedy some of the confusion by connecting back to previously learned terminology. The statements above are parallel to:

- Eighteen is **six** *times as much as* three.
- Eighteen is **five** *times more than* three.

The phrase *times as much as* indicates a comparison as a ratio, as does *percent of*. The ratio between eighteen and three is 6 to 1, or thinking of percent—parts of 100—600 to 100. Six hundred percent is 6 "wholes," so we are essentially saying six *times* three.

Times more than indicates that something is added on, as does *percent more than*. Eighteen is fifteen more than three. We've added five whole threes to three, or five hundred percent of three.

We can turn these statements around by comparing three to eighteen.

- Three is **sixteen and two thirds** *percent of* eighteen.
- Three is **eighty-three and one third** *percent less than* eighteen.

Since eighteen is our whole here—eighteen is 100%—then all comparisons must be made with respect to that. These are equivalent statements to:

- Three is **one-sixth** *times as much as* eighteen.
- Three is **five-sixths** *times less than* eighteen.

While we don't use the phrase *times less than* very often, we do use *percent less than* fairly frequently. Where most people go wrong is in statements like, "The number of defective widgets made this month is 150% less than it was in the same month one year ago." That would be a neat trick! Imagine a company that made 18 defective widgets in February 2004. In February 2005 they would have reduced their error rate by 150% of 18, or 27 defects. That means they made *negative* 9 mistakes! Where do I buy stock in *that* company?

Once again, it is important for us to make sure that our students are taught, and use, precise mathematical terminology. This will eliminate misunderstandings not only in the classroom, but in their everyday lives, as well.