CHAPTER 1

Addition

Concept: Addition is the joining of things of like kind.

This concept is first introduced in kindergarten. For example, kindergarten students solve the following type of joining problems: There are 5 boys and 2 girls. How many children are there altogether? Since the question asked for how many children, the student needs to make sure that both values represent children. Although boys and girls are different, they are of like kind - children. This allows the student to add the associated values of 5 and 2.

Even with kindergarteners, it is appropriate to lay the foundation of this idea of like kind when discussing solutions to story problems. Let's examine the following problem situations:

- Linda has 5 candy bars and 3 lollipops. How many pieces of candy does she have?
  A candy bar and a lollipop are different but are they both a kind of candy? Yes they are so 5 and 3 can be added together.
- Ralph saw 2 puppies and 4 kittens at the pet store. How many pets did he see altogether?
  A puppy and a kitten are different but are they both a kind of pet? Yes they are so 2 and 4 can be added together.

This type of thinking also helps older students when they are given extraneous values. For example, there are 6 boys, 5 girls and 3 puppies on the playground. How many children are on the playground? Students tend to just add all the numbers because they see the word "altogether". Since the question asked for how many children, students need to make sure that the values being added represent children. The students can only use the values of 6 and 5.

Emphasizing this concept is not only essential to developing their understanding of addition but also to their understanding of multiplication. For example, Sandy has 3 boxes of pencils. Each box has 7 pencils. How many pencils does she have altogether? Most students will see the word altogether and immediately think addition. So how do you persuade a student that altogether doesn't always mean add? To explain, we refer back to the concept of addition. The question asked how many pencils; therefore, the student needs to make sure that the values being added represent some type of pencil. In this case, 3 represents boxes and 7 represents pencils. We cannot add boxes and pencils to get pencils. But the student could do 7 pencils + 7 pencils + 7 pencils = 21 pencils which introduces the idea that repeated addition is one strategy for solving multiplication problems. This also reinforces why this situation is not modeled as 3 + 7 and why 3 groups of 7 is written as 3 × 7.

When working with fractions and decimals, like kind refers to having the same whole. Remember, every fraction and decimal comes from a whole. When students see a fraction or decimal in a word problem, they should ask "half of what?" or "0.2 of what?" This will be important to establishing whether or not the values can be added. For example,

- $\frac{1}{2}$ of the class is leaving to go to the gym. $\frac{1}{3}$ of the class is leaving to go to music. What fraction of the class is leaving?

Students should ask themselves "$\frac{1}{2}$ of what?" and "$\frac{1}{3}$ of what?" Both of the fractions come from the same whole which is represented by the entire class so the two fractions can be added.

- $\frac{1}{2}$ of the boys is leaving to go to the gym. $\frac{1}{3}$ of the girls is leaving to go to music. What fraction of the class is leaving?

Students should ask themselves "$\frac{1}{2}$ of what?" and "$\frac{1}{3}$ of what?" In this case, $\frac{1}{2}$ is coming from the total number of boys and $\frac{1}{3}$ is coming from the total number of girls; therefore, the fractions don't come from the same whole and can't be added. If we knew the total number of boys and the total number of girls then we could use the fractions to find the number of students who are leaving the whole class.