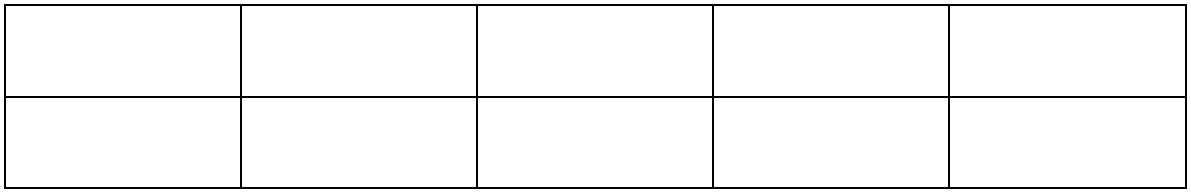
What is a Ten Frame and why is it a useful tool for developing early number relationships and fact fluency?

A ten frame is a simple graphic tool that allows people to "see" numbers.



This You Tube Video introduces the ten frame and explains how this tool is useful for students just beginning to learn about numbers. http://www.youtube.com/watch?v=p6RaMGDPfJg&NR=1

This is an essay that was published by Didax that gives information about how the Ten Frame can be used to foster important math skills and concepts.

Understanding that numbers are composed of tens and ones is an important foundational concept, setting the stage for work with larger numbers. A strong sense of "ten" is a prerequisite for place-value understanding and mental calculations. But how to develop this idea?

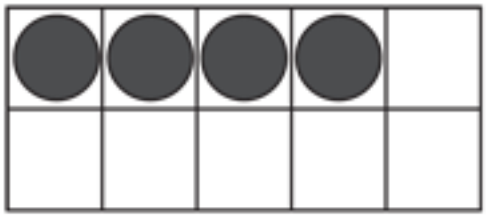
Most elementary school math teachers are familiar with ten-frames, the two-by-five rectangular frames for placing counters to illustrate the numbers 1 through 10. As teachers can attest, ten-frames are highly useful tools for developing number sense within the context of ten. Arranging counters in different ways on the ten-frame prompts students to form mental images of the numbers represented. As NCTM points out, "The ten-frame uses the concept of benchmark numbers (5 and 10) and helps students develop visual images for each number."

Using a ten-frame, students can easily see that 6 is 1 more than 5 and 4 less than 10, or that 8 can be seen as "5 and 3 more" and as "2 away from 10." Once students are able to visualize the numbers 1

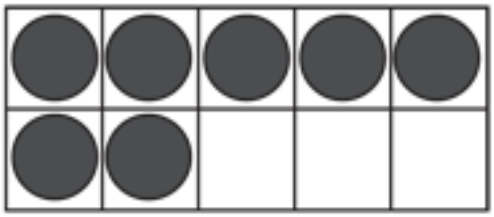
through 10, they begin to develop mental strategies for manipulating those numbers, all within the context of the numbers' relationship to ten.

Begin with a Five-Frame, says Van de Walle

Researcher John Van de Walle recommends that children in kindergarten and early first grade explore numbers with a five-frame for a week or so before moving on to a ten-frame. Introduce the ten-frame with the following rule, says Van de Walle: *Always fill the top row first, starting on the left, the same way you read. When the top row is full, counters can be placed on the bottom row, also from the left. This will produce the "standard way" to show numbers on the ten-frame.* (p. 122)



standard 4 on the ten-frame



standard 7 on the ten-frame

Wait to Introduce Place Value

Once your first-graders are demonstrating a solid understanding of the numbers 1 through 10 in the context of the benchmarks 5 and 10, it's tempting to think it's time to start talking about place value. Not so fast, says Van de Walle, asserting that children need to develop a "pre-place value relationship with 10" before moving on to an understanding of tens and ones. States Van de Walle: "The concept of a single ten is just too strange for a kindergarten or early first-grade child to grasp." (p. 129). The time to introduce place value, he says, is second grade and beyond.

This is a generalization and I prefer to make these decisions on a student-by-student basis. BFG

Math educator Kathy Richardson has observed just how hard it is for children to understand the numbers 11 through 20 in terms of place value. She summarizes as follows her many years of working with and observing children attempting this hurdle: "Children who have not yet learned that numbers are composed of tens and ones think of the numerals that are used to write particular numbers as the way

you 'spell' them. From the child's point of view, it just happens that we need a 1 and a 5 to write fifteen and a 1 and a 2 to write twelve. It is not obvious to young children that the numerals describe the underlying structure of the number." (p. 26)

There is a danger in asking children to work with numbers beyond 10 *before* they have learned the composition and decomposition of numbers to 10. As Richardson has observed, "When children are given practice adding and subtracting numbers to 20 before they know the parts of numbers to 10, many develop fast counting for getting answers instead of learning the basic relationships. Since they are successful at getting answers quickly, their teachers may not be aware that they are, in fact, counting to get those answers. Counting back or counting up does not help children know the answer the next time they confront the same problem." (p. 27)

In summary, all evidence points to a solid grounding in the relationships among the numbers 1 through 10 before place-value concepts can even begin to be developed. If you want your students to really know their number facts and not just become "better counters," have them work with the ten-frame.

This is a link to a Computer Based Interactive Ten Frame
(This is really four activities in one - use the links to the left to choose the different activities)
http://illuminations.nctm.org/activitydetail.aspx?id=75

Other Ten Frame activities taken from Van de Walle

Five-Frame Tell-About

Explain that only one counter is permitted in each section of the five-frame. No counters are allowed on the five-frame mat. Have the children show 3 on their five-frame. "What can you tell me about 3 from looking at your mat?" After hearing from several children, try other numbers from 0 to 5. Children may place their counters on the five-frame in any manner. What they observe will differ a great deal from child to child. For example, with four counters, a child with two on each end may say, "It has a space in the middle" or "It's two and two." There are no wrong answers. Focus attention on how many more counters are needed to make 5 or how far away from 5 a number is. Next try numbers between 5 and 10. The rule of one

counter per section still holds. Numbers greater than 5 are shown with a full five-frame and additional counters on the mat but not on the frame. In discussion, focus attention on these larger numbers as 5 and some more. "Eight is five and three more." (p. 122)

Crazy Mixed-Up Numbers

This activity is adapted from *Mathematics Their Way* (Baratta-Lorton, 1976). All children make their ten-frame show the same number. The teacher then calls out random numbers between 0 and 10. After each number, the children change their ten-frame to show the new number. Children can play this game independently by preparing lists of about 15 "crazy mixed-up numbers." One child plays "teacher" and the rest use the ten-frames. Children like to make up their own number lists. (p. 123)

Ten-Frame Flash

Flash ten-frame cards to the class or group, and see how fast the children can tell how many dots are shown. This activity is fast-paced, takes only a few minutes, can be done at any time, and is a lot of fun if you encourage speed. (p. 123)

Sources

Richardson, K. (2003). *Assessing Math Concepts: Ten Frames.* Rowley, MA: Didax.

Van de Walle, J.A. (2003). *Elementary & Middle School Mathematics.* Boston, MA: Pearson.