Using Ten Frames to Teach Addition & Subtraction

May 3rd - STA Day at Semiahmoo Secondary
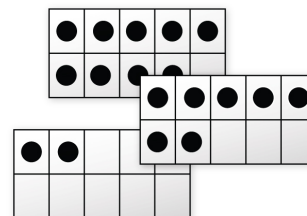
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Why Use Ten Frames?

A ten frame is a five-by-two array used to support the development of the important landmarks of five and ten. Ten frames are a model that help students to visualize numbers. A double ten-frame is used to support the development of landmark numbers ten and twenty. Ten frames can be used to support addition strategies (such as making ten) and place value ideas (ten and some more - 16 is one full ten frame and six more ones). Using ten frames encourages part whole thinking. Students are able to see how numbers can be taken apart and put back together.

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### Becoming familiar with ten frames:

GAMES:
Students should have time to explore ten frames and discuss what they notice and wonder. They need to have **MANY** experiences with the frames so that they are able to subtize (instantly know how many without counting) quantities on a ten frame. Playing games such as Concentration/Memory, Go Fish, and Snap will help build familiarity.

USING TEN FRAMES AS QUICK IMAGES:
Quick Image number talks involve pictures of quantities, usually organized in a particular way to encourage students to subtilize and/or use spatial sense of quantities. The teacher shows an image for a few seconds and then asks "How many _____?" It is important not to show the images for more than few seconds, as doing so provides opportunity for students to count by ones. Students must mentally structure the amounts in efficient ways. Next the teacher facilitates the discussion asking "How did you see them?"

Teachers can help students to link the pictorial and symbolic representation of the quantities by recording how the student saw the quantities (circling each part they saw) and connecting these to how the student combined the numbers - writing an equation. Different colours can be used for each student.

Begin with five frames, then a ten frame, then double ten frames, and eventually you can use hundreds boards. You can use two different colours intentionally to draw students' attention to the two parts that make the whole (conceptual subitizing).
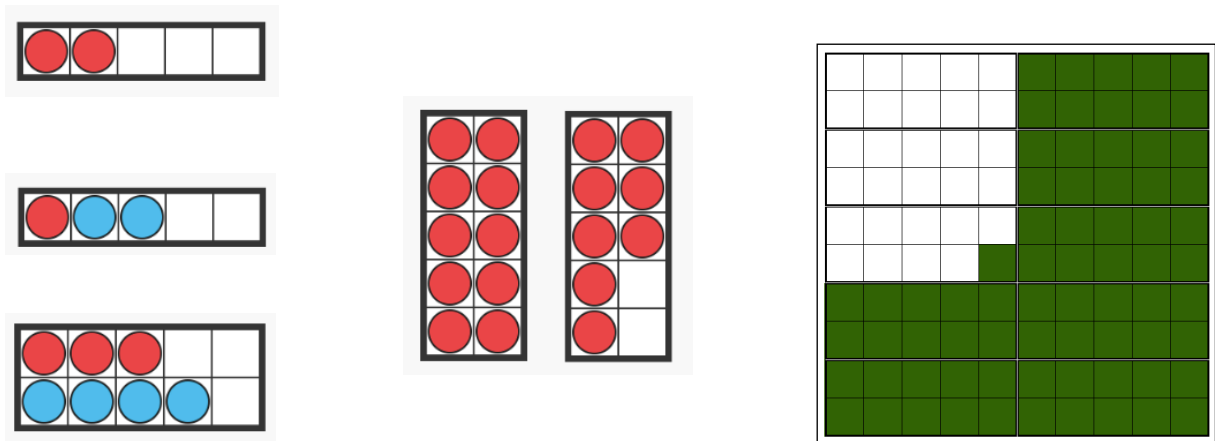
Representing/Comparing quantities with ten frames:

Teachers can invite students to represent a given number with their ten frames. Discuss the different parts - How many ones? tens? hundreds? Teachers can also use place value tent card to connect the different parts to the numbers.

HOW MANY WAYS CAN YOU MAKE?

Although it is important for students to be able to make numbers applying their knowledge of place value (e.g., I can make 12 using one ten and two ones) it is also important that they understand how to decompose number is other flexible ways.

How many ways can you make 22?
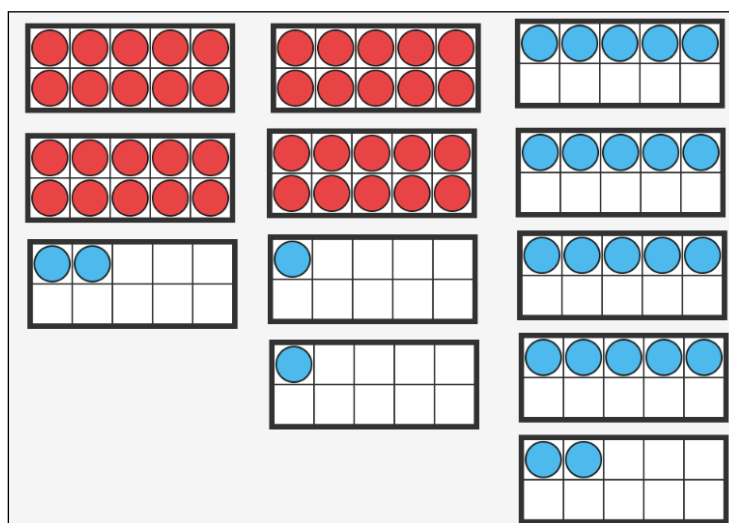
MORE OR LESS GAME:

- Invite students use a single die with dots to six, a numeral die to 9, 10, 12, or 20 or place value dice or double/triple dice which students can use to build a 1, 2 or 3-digit number and build that quantity with the ten frames. With a partner they can compare their quantities and play a game of more/less.
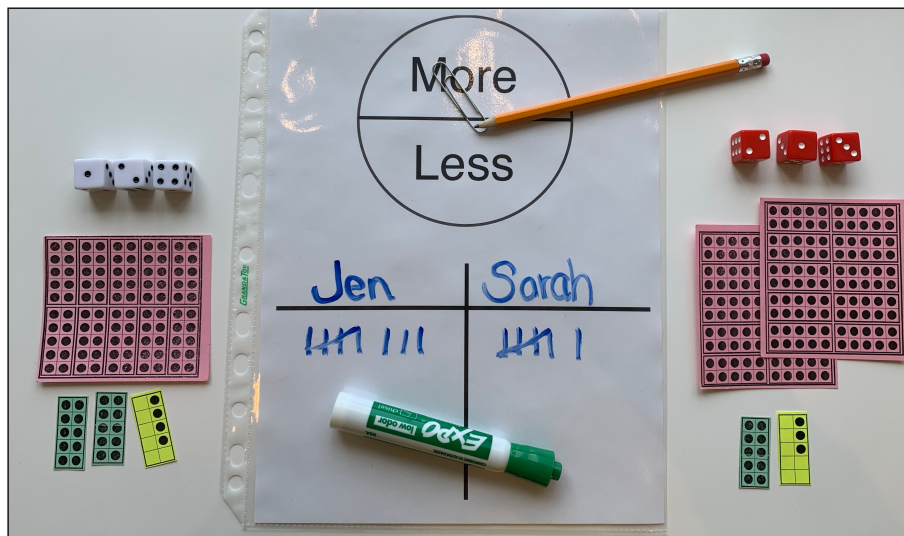

SHRINK OR GROW:

Begin as a class by rolling a die and have the students build that quantity with their ten frames. Then the die is rolled again and students need to adjust their ten frames to represent the new quantity. Watch for students who are able to either add to or take away from their current quantity as opposed to clearing their mats and building the new number from scratch. Students who are able to add to/take away from the current quantity are demonstrating number sense - they see relationally how one number is more or less than another.

HOW MUCH MORE TO MAKE 50/100/1000:

- Invite the class to represent a number using ten frames. Then ask how many more do you need to make 100 or one whole? How could we represent this as an equation? What are all the related facts?
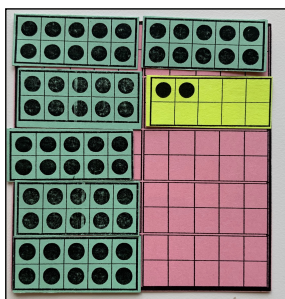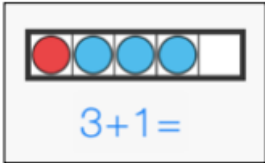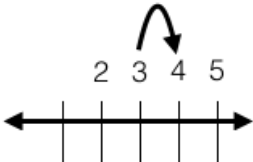

For example:
The teacher asks the students to represent the number 62. Then the teacher asked how many more do we need for 100? The students can visually see they need 38 more.
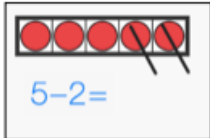
Development of Addition/Subtraction with ten frames:

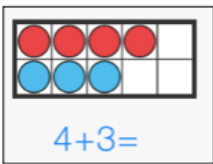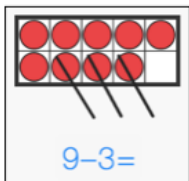- Combinations to 5 - Single digit plus/minus single digit using a five frame mat

- Combinations to 10 - Single digit plus/minus single digit using a ten frame mat
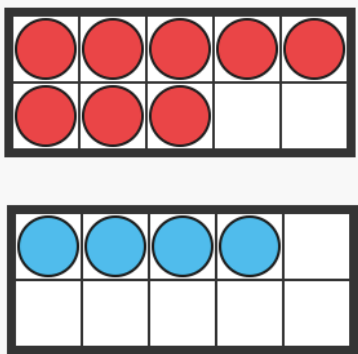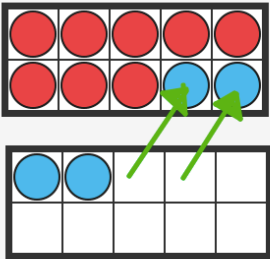
- Combinations beyond 10 - using double ten frame mat - Do not tell the student how to combine the quantities. It is important that as the teacher you support your students in connecting the pictorial representations to the symbolic equations. See below.

- Taking away from teens. Minuend - Subtrahend = Difference
- When the subtrahend (the number we are taking away) is larger than the ones in the minuend (the total we start with), a strategy that some students may find useful is decomposing the minuend into tens and ones and subtracting the subtrahend from ten.

17 - 3 =

I can count backward by 3.

I can subtract 3 from 7 and I know that is 4 and I know 10 and 4 is 14.

I can also think 3 + ___ = 7 and then add that to ten.

$17-9=$

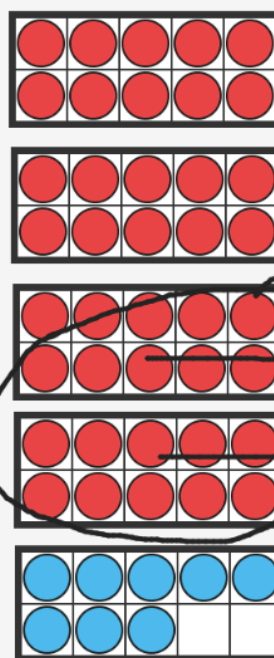$(10+7)=17$

$(10-9)+7=$

$1+7=8$
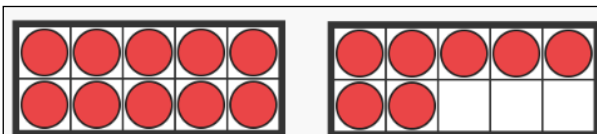
- Adding/Subtracting full tens from 2-digit numbers or adding/subtracting full hundreds from 3-digit numbers Students need many experiences with the concrete materials to develop and understanding that if 2 + 6 = 8, then two tens (20) plus six tens (60) is eight tens (80) or two tenths plus six tenths is eight tenths.
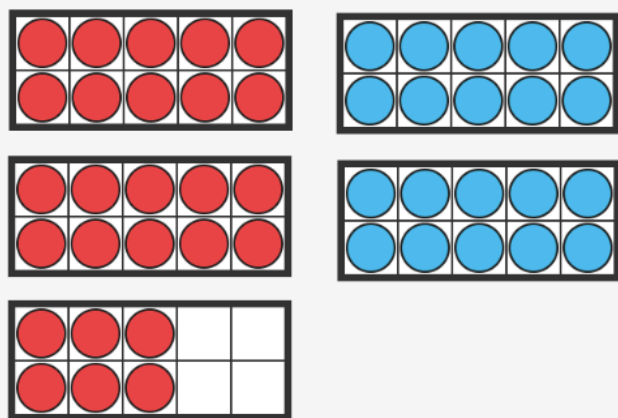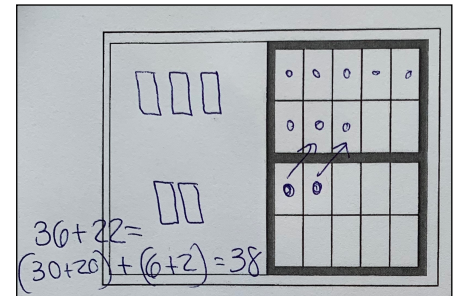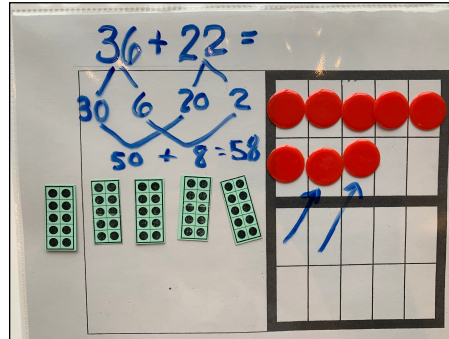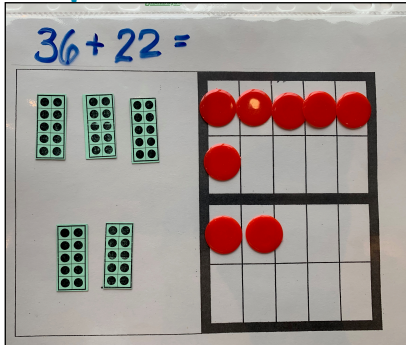
$27+20=$

$(20+7)+20=$

$(20+20)+7=$

$48-20=$

$(40+8)-20=$

$(40-20)=20$

$20+8=28$

20

- Using the Place Value boards, the mini ten-frames and counters, provide several experiences for students to add/subtract tens and ones without regrouping. Begin with adding a single-digit quantity to a 2-digit quantity. The full ten frames go on the left, and counters are used on the right. Students can also use the recording sheets to pictorially and abstractly represent their thinking.

- Using the Place Value boards, the mini ten-frames and counters, provide several experiences for students add/subtract tens and ones with regrouping. When adding, some students may add the tens first then the ones and others may add the ones first and then the tens. There is no "right" way to add. Please accept all strategies. Ask students to explain how they added the quantities. Ask which numbers they added first, then second. As the teacher, it will be important for you to symbollically capture their thinking.
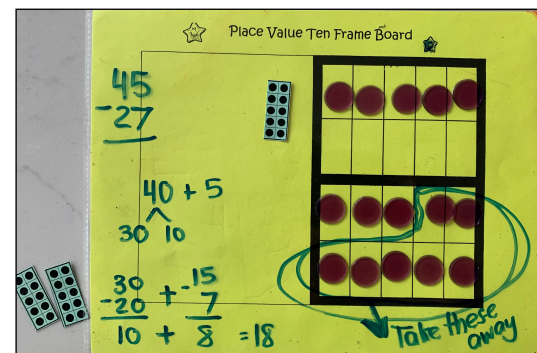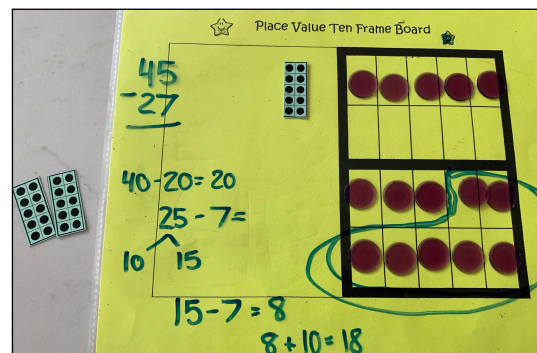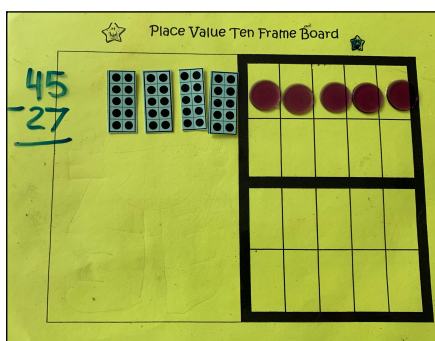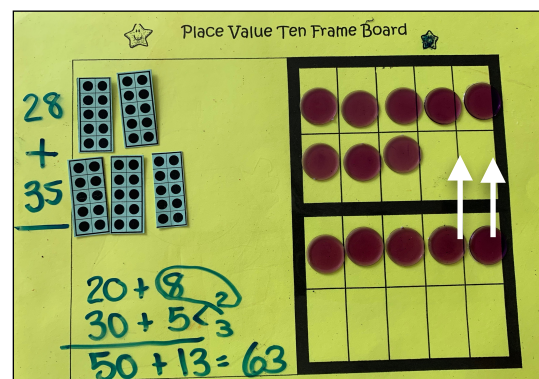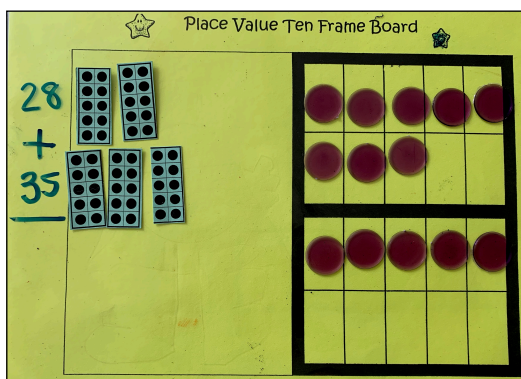
RESOURCES:
- Hundreds Boards that can be used as Quick Images - http://bit.ly/hundredschartimages
- To use digital ten frames that you can Screenshot on your computer: https://www.mathlearningcenter.org/resources/apps
- Carole Fullerton's Sums and Differences books https://mindfull.wordpress.com/visit-the-online-store/ LRS #169298

NOTES: