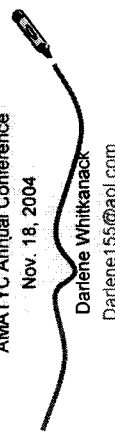




**Using Manipulatives to
Assess Understanding**
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 Darlene Whittanack
Darlene155@aol.com





Principals of Assessment

- Assess what you value
- Assess in multiple ways
- Assess concepts as well as skills
- Assess using the tools of instruction
- Assess communication skills
- Assess reasoning and problem solving



Alternative Assessment Examples

- Addition and Subtraction of Integers
 - Walking the number line
 - Using two color counters
- Multiplication of two digit numbers
 - Using Base ten pieces
- The Standard Division Algorithm
- Multiplication of Polynomials



Addition and Subtraction of Integers

1. Walking the number line
 1. Positive numbers: step forward
 2. Negative numbers: step backwards
3. Addition: walk in the direction facing
4. Subtraction: do a half turn and then walk in the new direction



Try these Problems

- $2 + 3$
- $-2 + 3$
- $-2 + (-3)$
- $2 + (-3)$
- $3 - 2$
- $2 - 3$
- $3 - (-2)$
- $-2 - 3$
- $-3 - 2$
- $2 - (-3)$
- $-3 - (-2)$
- $-2 - (-3)$

Questions

- Does your number line answer match your calculated answer?
- Which problems give the same answers? Explain why?
- Why were there only 4 addition problems, but 8 subtraction problems?
- Which problems were most difficult?

Two Color Counters

- Use the yellow side for positive and the red side for negative numbers. So 2 is 2 yellow counters.
- A red and yellow counter result in zero
- Add by combining piles
- Subtract by 1) Flipping the subtracted number and adding or 2) Taking away the subtracted amount, supplying counters in pairs if the numbers are of opposite signs.



Multiplication of Two digit Numbers

- Lay out a frame by placing the skinnies and bits end to end.
- Fill in the interior grid.
- Compare sections of the grid with partial products
- Trade pieces to determine answer.
- Try this problem: 23×14



The Standard Division Algorithm

- Lay out the pieces and explain the meaning of each number in terms of the problem context in the algorithm
- There are 1245 children going on the field trip. Each plane can carry 175 children. How many planes will we need?
- Six beverages are offered on the flight. If they served about the same number of each beverage, how many of each did it take to provide each child with a beverage?



Multiplication of Polynomials

- Use a different color of the connecting cubes for each variable.
- If the variable is raised to a power, stack that many cubes.
- If there is a coefficient, make that many stacks
- Multiply in a lattice
- Try this problem: $(a + b)(a^2 + ab)$



Assessment Conditions

- Done individually or in small groups
- Ask students to explain what they are doing as they go
- Resist the urge to indicate the correctness by word, facial expression or body language.

