

Signed numbers

Several products are on the market to help students learn signed numbers. Here is a simple exercise that requires very little equipment. You will need several small manipulatives, in two different colors. I use M&Ms or Skittles, in red and green. Since red means stop and green means go, I use red for negative numbers and green for positive. All the other colors become rewards. (I tried marbles but they kept rolling off the desk.)

Separate your markers by color.

Emphasize that each piece is one item. Also emphasize that if we pair a red (-1) and green (+1) marker, the result is zero and these pieces can be removed from play.

Examples:

To add numbers with the same sign, use only one color. So for $+5 + +7$, place 5 green markers on your work area then add 7 more. There is no removal, so you now have 12 items. The same is true for $-5 + -7$, except your final total is now negative.

$$-9 + +7 \quad \begin{array}{c} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \\ \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \end{array} = \textcircled{-} \textcircled{-} = -2$$

$$+12 + -8 \quad \begin{array}{c} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \\ \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \end{array} = \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} = +4$$

Subtraction is sometimes very easy. To do $8 - 5$, just lay out eight green markers, then remove five of them.

$$\textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} = +3$$

Subtracting a negative from a negative is very similar. $-12 - -5$ looks like this:

$$\textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} = -7$$

It's hard to remove what you don't have, however. If we want to subtract negative 6 from positive 9 ($9 - -6$), we start by placing nine green markers in the work area. Our board looks like:

$$\textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+}$$

We cannot "take away" six red markers because we don't have any red markers in the work area. We resolve this problem by adding twelve more markers (six red and six green) to the work area. Each pair of red and green is equal to zero! So we have added zero (six times) to the work area. Our board now looks like this:

$$\begin{array}{c} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \\ \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \textcircled{-} \end{array}$$

We now remove the six negative (red) markers (After all, minus and "take-away" both indicate removal). That leaves us this:

$$\textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} \textcircled{+} = +15$$

Now try:

$$-6 - -10$$

$$4 - 9$$

$$-3 - 4$$

$$\text{and } 5 - -2$$