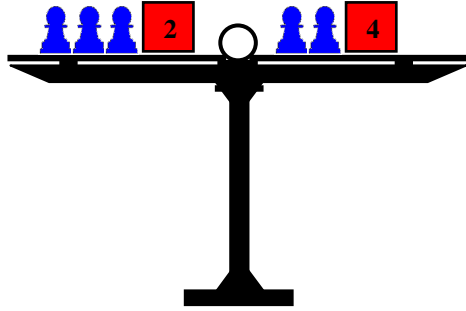
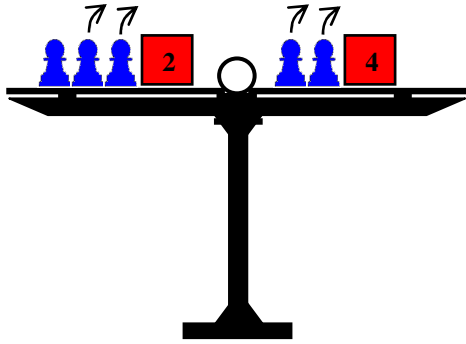
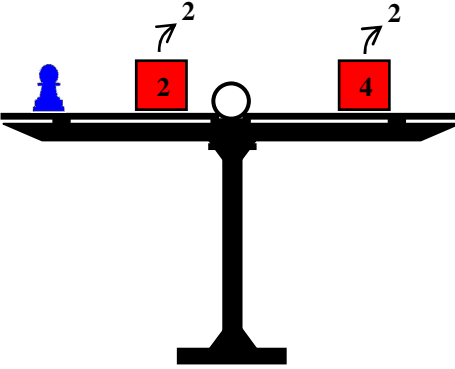
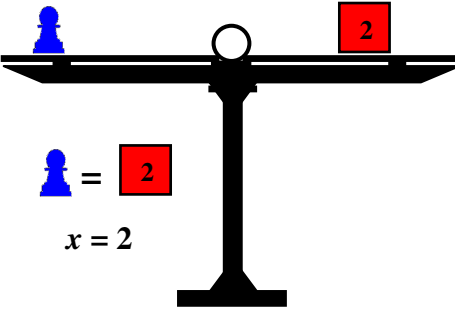
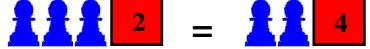
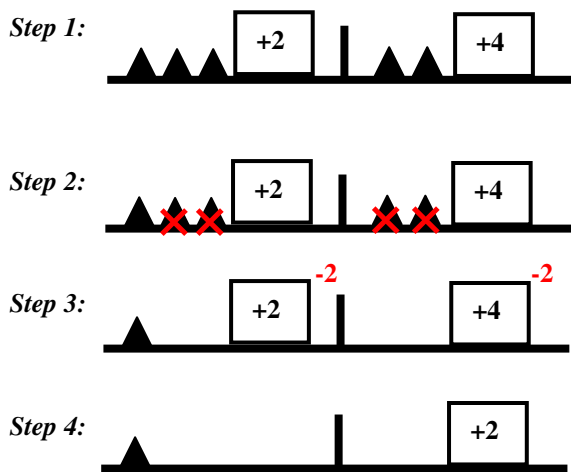


“Hands-On Equations” MODEL for SOLVING EQUATIONS

Solve the equation $3x + 2 = x + 4$:

<p><i>Step 1:</i> Set up the equation.</p>	<p><i>Step 2:</i> Remove (subtract) two blue pawns from each side of the scale.</p>	<p><i>Step 3:</i> Remove (subtract) a value of 2 from each side of the scale.</p>	<p><i>Step 4:</i> A blue pawn has a value of 2.</p>
			
<p><i>Step 5:</i> Check your solution by substituting 2 back into the original set up.</p>		 $2 + 2 + 2 + 2 = 2 + 2 + 4$ $8 = 8$	<p>$x = 2$ is the correction solution.</p>

Students simultaneously draw the model (from above) and solve algebraically:

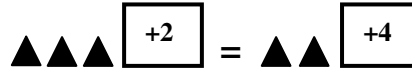


Algebraically:

$$3x + 2 = 2x + 4$$

$$\begin{array}{r} -2x \quad -2x \\ \hline 1x + 2 = 4 \\ -2 \quad -2 \\ \hline x = 2 \end{array}$$

Step 5: Check your solution.



$$2 + 2 + 2 + 2 = 2 + 2 + 4$$

$$\underline{\hspace{10em}}$$

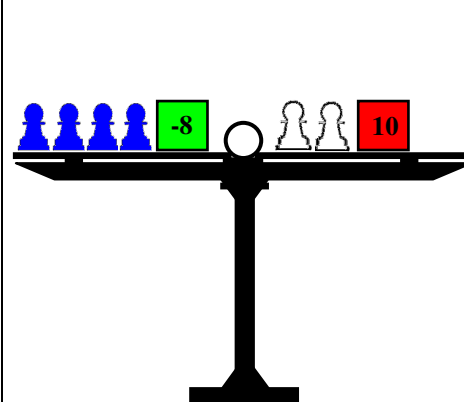
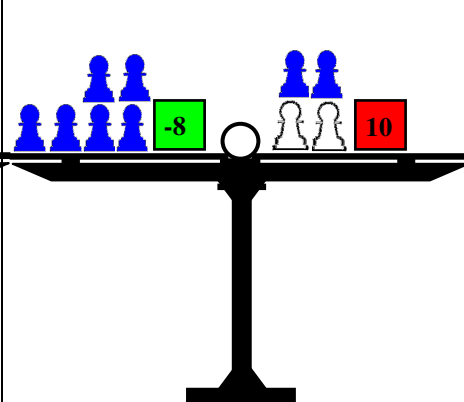
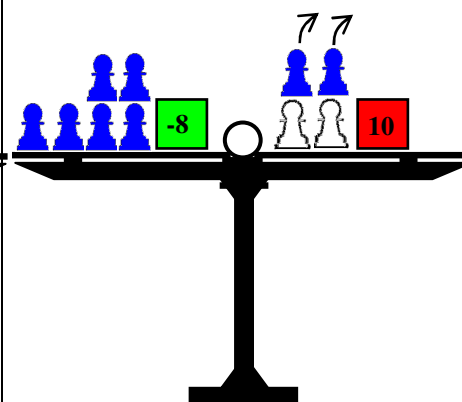
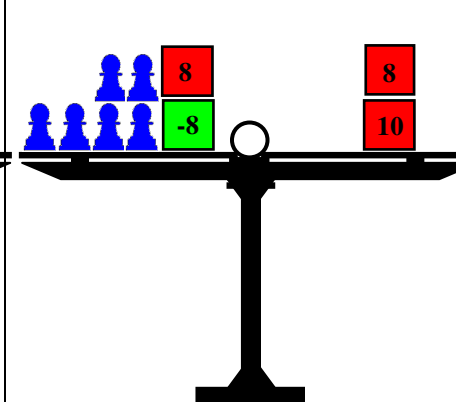
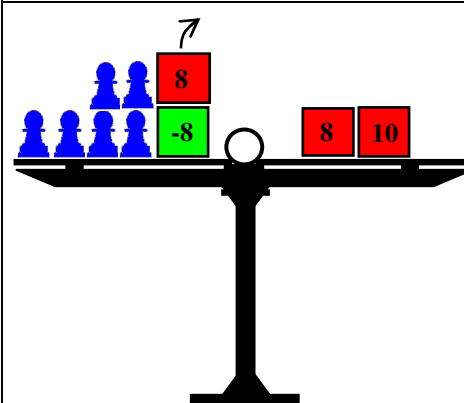
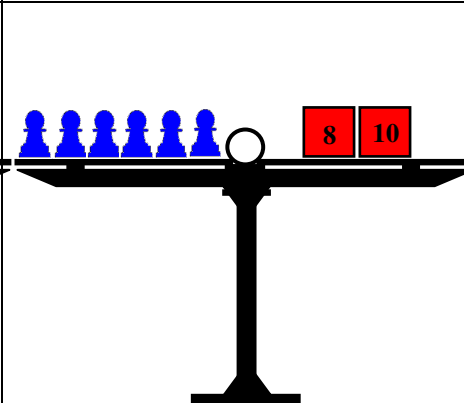
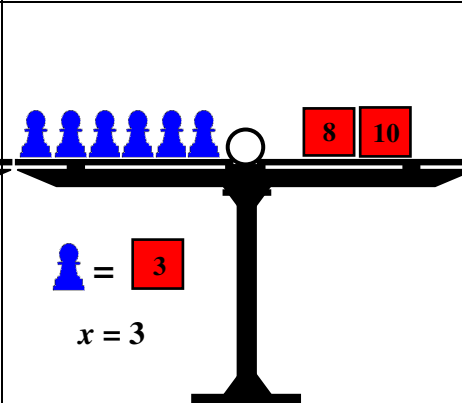
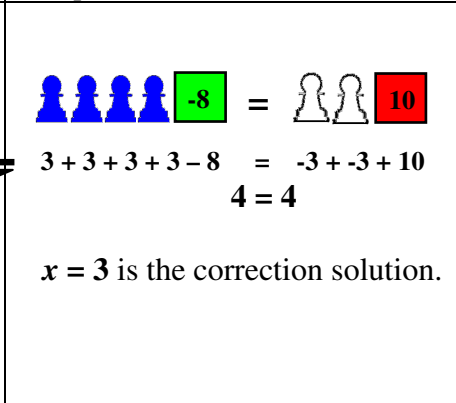
$$8 = 8$$

$$3 \cdot 2 + 2 = 2 \cdot 2 + 4$$

$$6 + 2 = 4 + 4$$

$$8 = 8$$

Solve the equation $4x - 6 = -2x + 10$:

<p><i>Step 1:</i> Set up the equation.</p>	<p><i>Step 2:</i> Add two blue pawns to each side of the scale to create zero pairs.</p>	<p><i>Step 3:</i> Remove the zero pairs from the left side of the scale.</p>	<p><i>Step 4:</i> Add 8 to each side of the scale to create a zero pair.</p>
			
<p><i>Step 5:</i> Remove the zero pair from the right side of the scale.</p>	<p><i>Step 6:</i> Divide 18 evenly among each of the 6 blue pawns.</p>	<p><i>Step 7:</i> Each blue pawn has a value of 3.</p>	<p><i>Step 8:</i> Check your solution by substituting 3 back into the original set up.</p>
		 <p>$x = 3$</p>	 $3 + 3 + 3 + 3 - 8 = -3 + -3 + 10$ $4 = 4$ <p>$x = 3$ is the correction solution.</p>

Students might benefit from thinking about solving equations as “backwards” Order of Operations

BACKWARDS

$$10 = 2x + 4$$

steps (what was done to x)	undo	$x = 3$
$\cdot 2$	$\div 2$	6
$+ 4$	$- 4$	10

$$\frac{-3x + 4}{2} = 11$$

steps (what was done to x)	undo	$x = -6$
$\cdot (-3)$	$\div (-3)$	18
$+ 4$	$- 4$	22
$\div 2$	$\cdot 2$	11

BALANCE

$$10 = 2x + 4$$

$$\begin{array}{r} -4 \quad -4 \\ \hline \end{array}$$

$$\frac{6}{2} = \frac{2x}{2}$$

$$3 = x$$

$$2 \cdot \frac{-3x + 4}{2} = 11 \cdot 2$$

$$-3x + 4 = 22$$

$$\begin{array}{r} -4 \quad -4 \\ \hline \end{array}$$

$$\frac{-3x}{-3} = \frac{18}{-3}$$

$$x = -6$$

