14 - Using a Chip Model

HW - ACE #1: (36-48 & 76-77) 
starts on Page 20

Black Chip - +1 
Red Chip - -1 
Zero pair - 1B, 1B (1 + -1 = 0)

Use ideas about black and red chips to answer each question. Then write a number sentence.

A. Use this chip board below as the starting value for each part.

![Chip Board Image]

Write a number sentence to show the total value on the chip board for each move,

1. original chip board \[8 + (-12) = -4\]
   \[-4 + 5 = +1\]
2. add 5 black chips \[-4 + 5 = +1\]
3. remove 5 red chips \[-4 - 5 = +1\]
4. remove 3 black chips \[-4 + 3 = -7\]
5. add 3 red chips \[-4 + (-3) = -7\]

6. What patterns do you see?

   **Adding a neg. = Subtracting a pos**
   \[(- \text{black} = + \text{red})\]
B. Start with the original chip board from Question A.

1. Describe three ways to get a total value of -2.
   \[ -4 + 2 = -2 \] (ADD 2 BLACKS)
   \[ -4 - 2 = -2 \] (REMOVE 2 REDS)

2. Describe three ways to get a total value of 0.
   \[ -4 + 4 = 0 \] (ADD 4 BLACKS)
   \[ -4 - 4 = 0 \] (REMOVE 4 REDS)

3. Describe three ways to get a total value of -4
   \[ -4 + 1 + (-1) = -4 \] (ADD 1 ZERO PAIR)
   \[ -4 + 2 + (-2) = -4 \] (ADD 2 ZERO PAIRS)

C. Give three combinations of red and black chips (using at least one of each color) that will equal each value.

1. 0
   \[ \text{# red } \frac{3}{7} \ # \text{black } \frac{3}{25} \]
   \[ \text{# red } \frac{7}{25} \ # \text{black } \frac{2}{25} \]

2. +12
   \[ \text{# red } \frac{2}{4} \ # \text{black } \frac{14}{30} \]
   \[ \text{# red } \frac{4}{30} \ # \text{black } \frac{16}{40} \]

3. -7
   \[ \text{# red } \frac{7}{9} \ # \text{black } \frac{0}{2} \]
   \[ \text{# red } \frac{9}{15} \ # \text{black } \frac{2}{8} \]

4. -125
   \[ \text{# red } \frac{125}{130} \ # \text{black } \frac{0}{25} \]
   \[ \text{# red } \frac{130}{150} \ # \text{black } \frac{5}{25} \]
D. Find the missing part for each chip problem. Write a number sentence for each problem.

<table>
<thead>
<tr>
<th>Start With</th>
<th>Rule</th>
<th>End With</th>
<th>Number Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 3 3 3</td>
<td>Add 5</td>
<td>3 3 3</td>
<td>$-3 + 5 = +2$</td>
</tr>
<tr>
<td>2. 3 3 3</td>
<td>Subtract 3</td>
<td>3 3 3</td>
<td>$-1 - 3 = +2$</td>
</tr>
<tr>
<td>3. 3 3 3</td>
<td>Subtract 4</td>
<td>3 3 3</td>
<td>$-6 - 4 = -2$</td>
</tr>
<tr>
<td>4. 3 3 3</td>
<td>Subtract 3</td>
<td>3 3 3</td>
<td>$-1 - 3 = 4$</td>
</tr>
</tbody>
</table>

E. Describe a chip board display that matches each number sentence. Find the missing value in each case.

1. $+3 - +2 = +1$
   
   Start w/ 3 REDS
   Subtract 2 REDS
   3 3 3

2. $-4 - +2 = -6$
   
   Start w/ 4 REDS
   Add 2 REDS
   Subtract 2 REDS
   3 3 3

3. $-4 - +2 = -2$
   
   Start w/ 4 REDS
   Subtract 2 REDS
   3 3 3

4. $+7 + -6 = +1$
   
   Start w/ 7 BLACKS
   Add 6 REDS
   3 3 3
5. \(-3 - 5 = -8\)

Start w/ 3 Red
And 5 Zero Pairs
Subtract 5 Black

\[
\begin{array}{ccc}
\text{R} & \text{R} & \text{B} \\
\text{B} & \text{R} & \text{B} \\
\end{array}
\]

6. \(4 - (-2) = +6\)

Start w/ 4 Black
And 2 Zero Pairs
Subtract 2 Reds

\[
\begin{array}{ccc}
\text{B} & \text{B} & \text{B} \\
\text{B} & \text{B} & \text{B} \\
\end{array}
\]

F. Nadie has a chip board with 4 red chips. She needs to subtract 2 black chips, but there are no black chips on the board. Nadie says, "It is impossible to subtract 2 black chips. There are none on the board!" What can Nadie do to the chip board so that she can subtract 2 black chips? Explain your reasoning.

And a Zero Pair for Each Black Chip She Needs

\[
\begin{array}{ccc}
\text{R} & \text{R} & \text{X} \\
\text{R} & \text{R} & \text{X} \\
\end{array}
\]

\[= -6\]

(6 Reds)