Analyzing & Representing Multiplication Problems

Example:  14 x 12

- **Estimate** Size Using Arrays. First estimate how big or how small the answer is likely to be using an array approach. Think about how you could break apart an array to make easier-to-solve equations. Next, make an array and break it apart into smaller arrays. Then solve each equation in the array. Add the totals for each array together to find the answer.

  First, I know that a 14 x 12 array would contain at least one 10 x 10 array that equals 100. So, the number must be bigger than 100. Since each number in the equation is smaller than 20, the total is probably less than 200.

  **Solve Equations for Each Array:**
  
  \[
  \begin{align*}
  10 \times 10 &= 100 \\
  4 \times 10 &= 40 \\
  2 \times 10 &= 20 \\
  2 \times 4 &= + 8 \\
  &\text{So I know that } 14 \times 12 = 168
  \end{align*}
  \]

- **Make a Picture of Equal Groups.** First, think about what the equation means or represents. We know that 14 x 12 means that you need to make 14 groups of 12. Then, split the groups up to create easier-to-solve equations: 10 groups of 12 = 120 and 4 groups of 12 = 48. Next, add the values together: 120 + 48 = 168.

  The answer:  14 x 12 = 168
• **Use a Multiple Tower.** Make the tower using repeated addition, or multiplication facts, or both to show that 14 x 12 or 14 groups of 12 is equal to 168:

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• **Use Math Boxes.** First, break apart each number in the original equation into their place value values. Next, multiply each side number by each top number (write answers in box as shown). Last, add together all the values inside the box to show that the answer to 14 x 12 equals 168:

\[
\begin{array}{c|c}
10 & 2 \\
\hline
10 & 10 x 10 \\
100 & 10 x 2 \\
40 & 4 x 10 \\
8 & 4 x 2 \\
\hline
120 \quad + \quad 48
\end{array}
\]

168

• **Use Clusters.** Use work completed as part of the Math Box strategy to help break apart the original equation, into its proper cluster equations. Then, solve each cluster equation and add those values together to find the answer to the original equation.

Clusters:

\[
\begin{align*}
10 \times 10 &= 100 \\
10 \times 2 &= 20 \\
4 \times 10 &= 40 \\
4 \times 2 &= 8 \\
168 \quad So \quad I \quad know \quad that \quad 14 \times 12 &= 168
\end{align*}
\]