This type of problem is an extension of the limit problems. The "FIXED + VARIABLE" (or a slight variation) is on both sides of the equation.

\[
\text{FIXED + VARIABLE} = \text{FIXED + VARIABLE}
\]

Two different choices will be looked at to decide which one is "better," (usually less cost or more pay for a given period of time).

Decide between 2 photoprinters:

<table>
<thead>
<tr>
<th>HP</th>
<th>Lexmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>$419 cost</td>
<td>$299 cost</td>
</tr>
<tr>
<td>$.14/photo printed (ink and paper)</td>
<td>$.18/photo printed</td>
</tr>
</tbody>
</table>

How many photos will be printed for the cost of the 2 printers and the photos to be the same amount?

Long Method - You don't want to do this!

\[
\begin{array}{c}
$419.00 \\
+ \quad .14 \\
\hline 
$419.14 \\
+ .14 \\
\hline 
$419.28 \\
+ .14 \\
\hline 
$419.42
\end{array}
\]

\[
\begin{array}{c}
$299.00 \\
+ \quad .18 \\
\hline 
$299.18 \\
+ .18 \\
\hline 
$299.36 \\
+ .18 \\
\hline 
$299.54
\end{array}
\]

This method would take forever!

The shortcut for repeated addition is multiplication.

The lexmark is less expensive to buy, but the HP is less expensive to operate. The number of photos to be printed would help make the decision which one to buy if the quality of the printers and prints is equal.

Let \( n \) = number of prints to be printed

\[
\text{Fixed + Variable for HP} = \text{Fixed + Variable for Lex}.
\]

\[
$419 + .14n = $299 + .18n
\]

This equation will be solved on the next page.
$419 + .14n = 299 + .15n
- .14n
- .14n

$419 = 299 + .04n
- 299
- 299

120 = .04n

\[
\frac{120}{.04} = \frac{.04}{.04}
\]

3000 = n

The total cost would be the same when 3000 photos were printed.

Check:

HP

<table>
<thead>
<tr>
<th>3000</th>
<th>3000</th>
</tr>
</thead>
<tbody>
<tr>
<td>x .14</td>
<td>x .18</td>
</tr>
</tbody>
</table>

Plan 1

$298.90 to buy
$65.70 monthly cost

The cost to buy is **FIXED**.
The monthly cost is **VARIABLE**

Plan 2

$0 nothing to buy
$74.80 monthly cost

How long (in months) will it take for the total cost (buying and monthly costs) of the 2 choices to be equal?
Let \( x \) = number of months for equal cost

**Plan 1**

\[
\text{Fixed} + \text{Variable} = \text{Cost to buy} + \text{Monthly cost}
\]

\[
\$298.90 + \$68.70 \cdot x = 0 + \$74.80 \cdot x
\]

(This plan has no cost to buy anything)

\[
298.90 + 68.70x = 74.80x
\]

\[
-68.70x = -68.70x
\]

\[
298.90 = 6.10x
\]

\[
\frac{298.90}{6.10} = \frac{6.10x}{6.10}
\]

\[
49 = x
\]

The total cost would be the same after 49 months.

**Check: Plan 1**

\[
\$68.70 \times 49 = \$3,366.30 \quad \text{monthly cost}
\]

\[
\$298.90 \quad \text{cost to buy}
\]

\[
\$3,665.20
\]

**Plan 2**

\[
\text{Fixed} + \text{Variable} = \text{Cost to buy} + \text{Monthly cost}
\]

\[
0 + \$74.80 \cdot x
\]

Look at the side with the variable. (Move 68.70x)

\[
298.90 = 6.10x
\]

\[
\frac{298.90}{6.10} = \frac{6.10x}{6.10}
\]

\[
49 = x
\]

So the cost after 49 months is equal for both choices.

For this type of problem, the "fixed" part might be missing from one side of the equation (as in this last example).