


# Multiplication Methods

## Partial Products

You can use place-value to multiply. Find the product for  $3 \times 14$ .

What You Show	What You Write
 <p> <math>3 \times 10 = 30</math> <math>3 \times 4 = 12</math>  <math>30 + 12 = 42</math> </p>	$\begin{array}{r} 14 \\ \times 3 \\ \hline 12 \\ + 30 \\ \hline 42 \end{array}$ <p> <math>3 \times 4</math> ones  <math>3 \times 1</math> ten                 </p>

## Open Array

You can use an open array to multiply. Find the product for  $3 \times 14$ .

	10	+	4	
3	(3 x 10)  <b>30</b>	(3 x 4)  <b>12</b>		$\begin{array}{r} 30 \\ + 12 \\ \hline 42 \end{array}$

These methods can be applied to multi-digit numbers.

Open Array:

	40	+	2	
30	(30 x 40)  <b>1200</b>	(30 x 2)  <b>60</b>		1200 60 40
+				$\begin{array}{r} + 2 \\ \hline \end{array}$
1	(1 x 40)  <b>40</b>	(1 x 2)  <b>2</b>		<b>1302</b>

Partial Products:

$$\begin{array}{r} 42 \\ \times 31 \\ \hline 2 \text{ (1 x 2)} \\ 40 \text{ (1 x 40)} \\ 60 \text{ (30 x 2)} \\ \underline{1200 \text{ (30 x 40)}} \\ \mathbf{1302} \end{array}$$

# Division Methods

## Ladder or Forgiving Method

The ladder method allows students to think about division by using factors that are easy for them to work with, such as tens or multiples of tens. Students' work using this method may vary, but they can efficiently get the same answer as the traditional algorithm. Here are two examples:

$$\begin{array}{r} 276 \\ 3 \overline{)828} \\ \underline{-600} \quad 200 \times 3 \\ 228 \\ \underline{-210} \quad 70 \times 3 \\ 18 \\ \underline{-18} \quad 6 \times 3 \\ 0 \quad 276 \end{array}$$

$$\begin{array}{r} 3 \overline{)828} \\ \underline{-300} \quad 100 \times 3 \\ 528 \\ \underline{-300} \quad 100 \times 3 \\ 228 \\ \underline{-150} \quad 50 \times 3 \\ 78 \\ \underline{-60} \quad 20 \times 3 \\ 18 \\ \underline{-18} \quad 6 \times 3 \\ 0 \end{array} \quad 100+100+50+20+6=276$$

## Column Division

By dividing the problem into place-value columns, you can do a series of smaller division problems to find the answer.

$$\begin{array}{r|l|l} 1 & 3 & 6 \\ 5 \overline{)6} & 8 & 3 \\ \hline -5 & 18 & 33 \\ \hline 1 & -15 & -30 \\ \hline & 3 & 3 \end{array}$$

## Multiplying Up

You can divide by thinking of the related multiplication fact. For example,  $270 \div 18 = ?$  can be thought of as  $18 \times ? = 270$ . You can multiply up until you get to 270.

$10 \times 18 = 180$  and  $20 \times 18 = 360$ , so the answer is between 10 and 20

$$5 \times 18 = 90$$

$$90 + 180 = 270$$

so  $18 \times 15 = 270$  and  $270 \div 18 = 15$

Here is an array model showing this method:

		18	
10		$10 \times 18 = 180$	$\begin{array}{r} 180 \\ +90 \\ \hline 270 \end{array}$
5		$5 \times 18 = 90$	