MULTIPLICATION STRATEGIES

Traditional Algorithm
New Options:
    Partial Products
    Area Model (Array)
    Lattice Method

Review - Distributive Property

5 x 39 = ?

39 = 30 + 9

5 x 39 = (5 x 30) + (5 x 9)

= 150 + 45

= 195

Review - Expanded Form

53 = 50 + 3

639 = 600 + 30 + 9

4,315 = 4,000 + 300 + 10 + 5

Traditional – 1 by 3

$$\begin{array}{r} {\color{red}1\ 4} \\ 639 \\ \times\ \ 5 \\ \hline 3{,}195 \end{array}$$

Partial Products – 1 by 3

$$639 = 600 + 30 + 9$$

$$
\begin{array}{r}
639 \\
\times \ 5 \\
\hline
45 \\
150 \\
+ \ 3000 \\
\hline
3{,}195
\end{array}
$$

5×9

5×30

5×600

Area Model – 1 by 3

5 x 639 = ?

x   600   +   30   +   9

	600	30	9
5	3,000	150	45

$$3,000$$
$$150$$
$$+ \ 45$$
$$\overline{3,195}$$

5 x 639 = 3,195

Lattice Method – 1 by 3

5 x 639
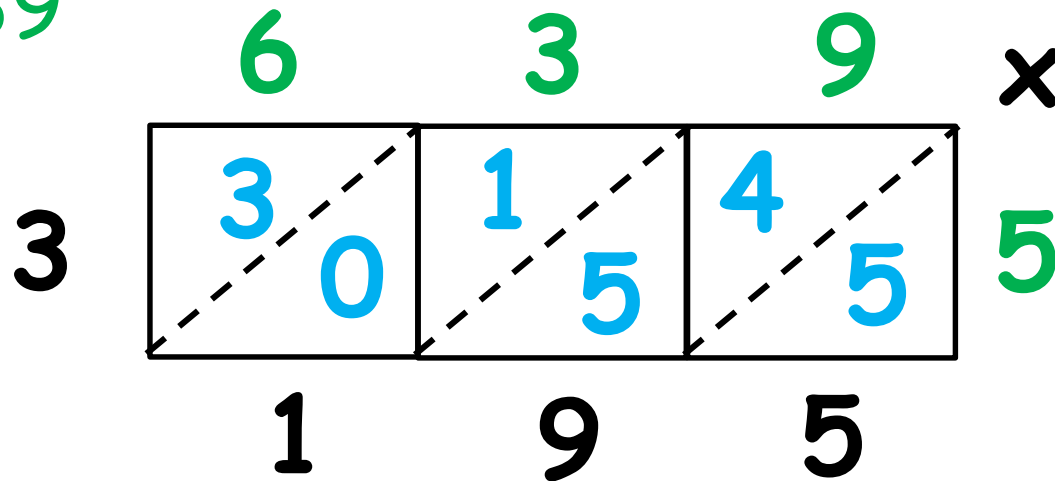
5 x 639 = 3,195

Traditional – 2 by 2

$$
\begin{array}{r}
\overset{2}{}\overset{1}{} \\
45 \\
\times\ 53 \\
\hline
135 \\
+\ \ 225\ \ \\
\hline
2,385
\end{array}
$$

Students in the upper grades will learn this algorithm.

Partial Products – 2 by 2

$$45$$
$$\times\ 53$$
$$15$$
$$120$$
$$250$$
$$+\ 2,000$$
$$2,385$$

3	×	5
3	×	40
50	×	5
50	×	40

Area Model 2 by 2

45 x 53 = ?

x	50	+	3
40	2,000		120
5	250		15
	2,250		135

$$\begin{array}{r} 2{,}250 \\ +\ 135 \\ \hline 2{,}385 \end{array}$$

45 x 53 = 2,385

Lattice Method – 2 by 2

45 x 53 = ?
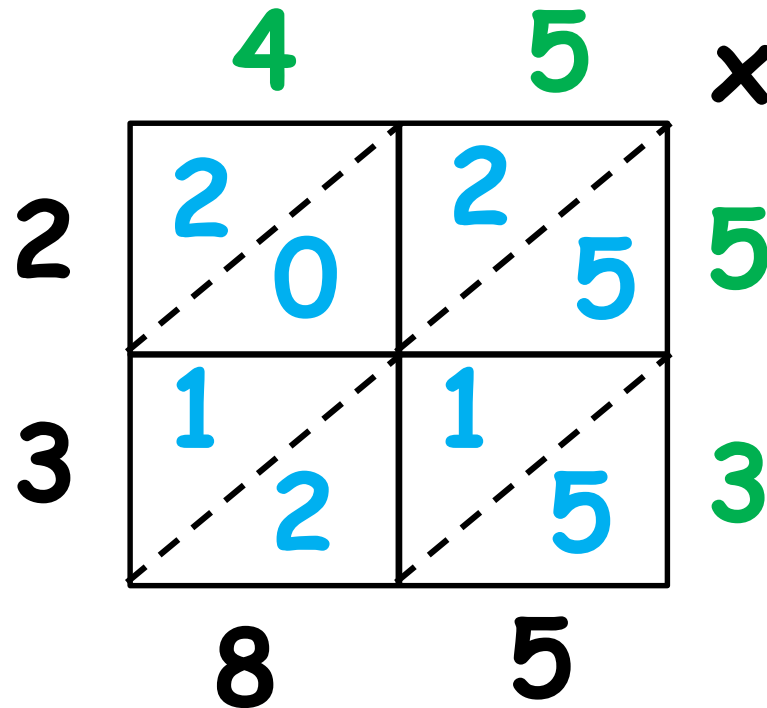
45 x 53 = 2,385

Lattice Method with More Digits

Traditional

Lattice

```
  2 1
  4 2
 453

x  48
 3 6 2 4
+ 1 8 1 2 0
 2 1,7 4 4
```
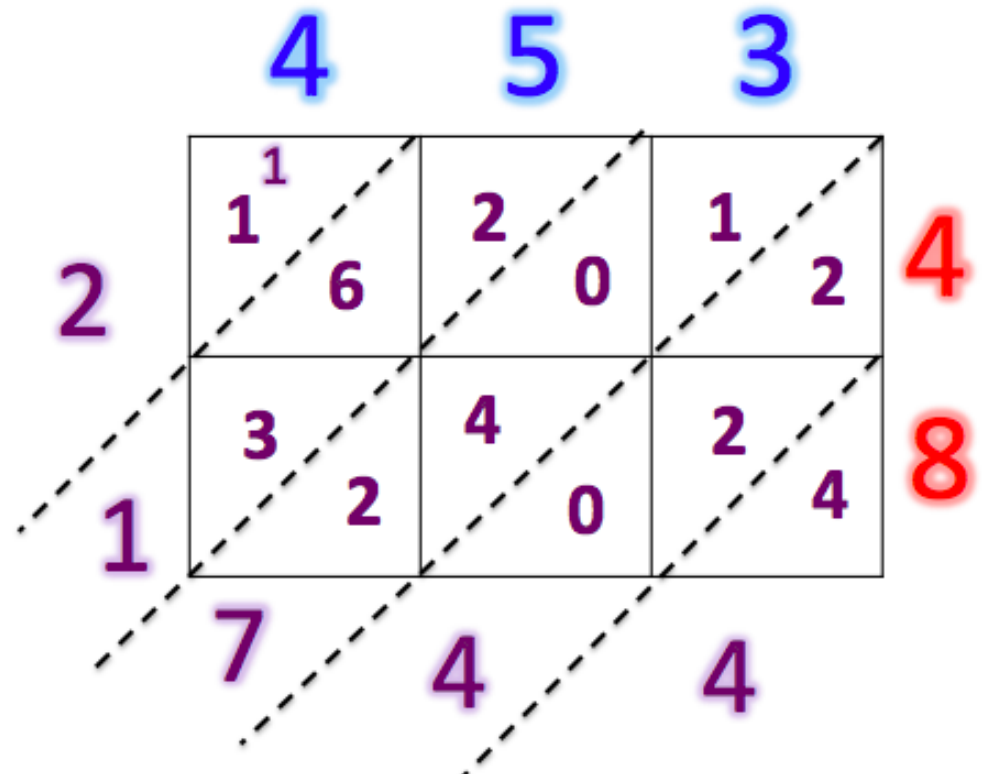
Khan Academy.org:
LATTICE MULTIPLICATION DEMO
(length~7:15)

https://www.khanacademy.org/math/arithmetic/multiplication-division/lattice_multiplication/v/lattice-multiplication

LATTICE MULTIPLICATION: WHY IT WORKS

https://www.khanacademy.org/math/arithmetic/multiplication-division/lattice_multiplication/v/why-lattice-multiplication-works

Your Turn

Solve the following using a method other than the traditional algorithm.

35 x 24

Bonus -Distributive Property
Helps with Math Facts

$6 \times 7 = (6 \times 5) + (6 \times 2)$

$\qquad = \quad 30 \quad + \quad 12 \quad = 42$

$5 \times 12 = (5 \times 10) + (5 \times 2)$

$\qquad = \quad 50 \quad + \quad 10 \quad = 60$

$8 \times 12 = (8 \times 10) + (8 \times 2)$

$\qquad = \quad 80 \quad + \quad 16 \quad = 96$

DIVISION STRATEGIES

Traditional Algorithm
New Options:
     Partial Quotients
     Modeling
     Chunking
     Distributive Property

Division Strategies

Traditional ⟶ D. M S B R C.
i u u r e h
v l b i p e
i t t n e c
d i r g a k
e p a D t
l c o
y t w
n

```
        51
    ┌─────────
  5 │ 255
    - 25
    ─────
          5
        - 5
        ─────
          0
```

Check:

```
        51
   X    5
   ─────────
       255
```

Division Strategies

Use Partial Quotients

Quotients

```
6 | 738
  - 600   | 100
    138
  - 120   |  20
     18
  -  18   | + 3
      0   | 123
```
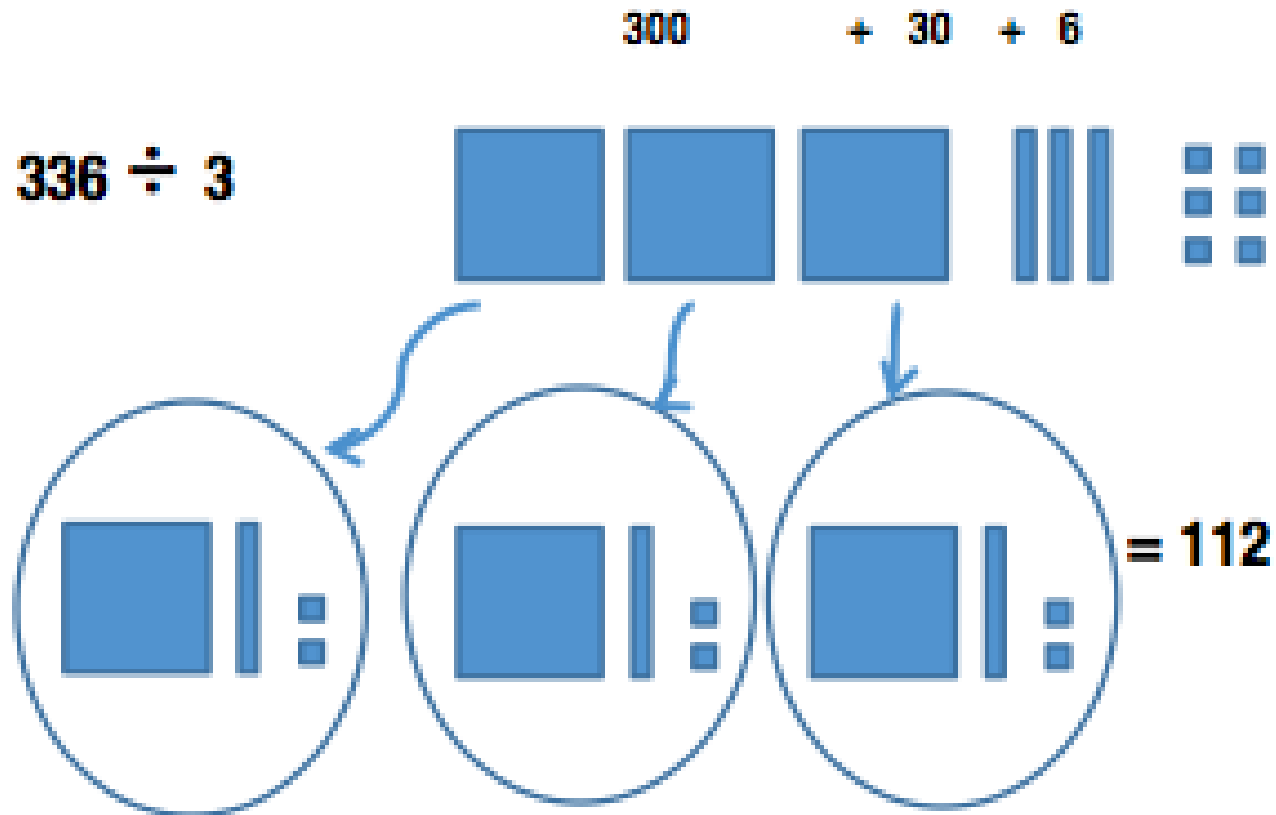
Check:

$100 \times 6 = 600$

$20 \times 6 = 120$

$3 \times 6 = \underline{\quad 18}$

738

http://learnzillion.com/lessons/28-solve-division-problems-with-remainders-using-partial-quotient

https://www.khanacademy.org/math/arithmetic/multiplication-division/partial_quotient_division/v/partial-quotient-division

Division Strategies

Use a Model

$$336 \div 3$$

$$300 \quad + \quad 30 \quad + \quad 6$$

= 112

Division Strategies

Chunking

$72 \div 3 =$

$$
\begin{array}{r}
72 \\
- \quad 30 \quad (10 \times 3) \\
\hline
42 \\
- \quad 30 \quad (10 \times 3) \\
\hline
12 \\
- \quad 12 \;(4 \times 3) \\
\hline
0
\end{array}
$$

$72 \div 3 = 24$

$(10 + 10 + 4) = 24$

Division Strategies

Use the Distributive Property

$336 \div 3 =$

$(300 + 30 + 6) \div 3 =$

$300 \div 3 = 100$

$30 \div 3 = 10$

$6 \div 3 = + 2$

112

Check:

X	100	10	2
3	300	30	6

300

30

+ 6

336

So...369 ÷ 3 = 112

Your Turn

Solve the following using a method other than the traditional algorithm.

$$6944 \div 31$$