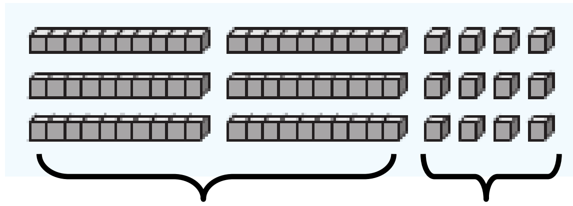
Fifth Grade: Mathematics

Unit 2: Math Strategies

Place Value Strategies for Multi-Digit Multiplication

Use of Tools

The examples below show how to use an array of place value blocks to model 3 x 24.
3 x 24 means 3 rows of 2 tens and 4 ones:

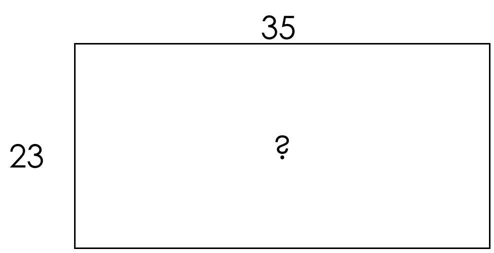


6 tens = 60   12 ones = 12

60 + 12 = 72

Area Model

The factors will be the length and width of the rectangle and the product will be the area.
For 23 x 35, 23 will be the width and 35 will be the length.



Break the factors into its place value and partition the rectangle. It's easier to multiply these numbers mentally.

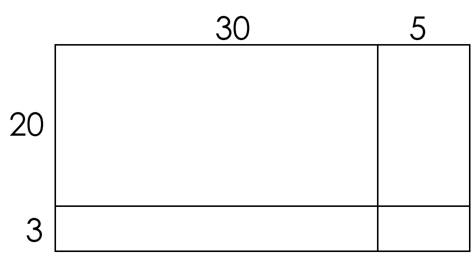
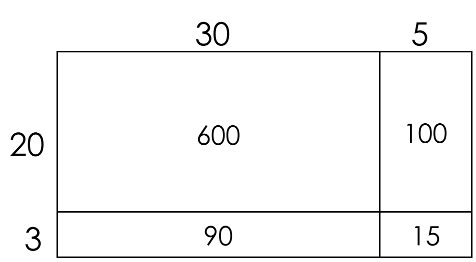


Figure out the area of each partition by multiplying the width and length for each partition.
So 3 x 5 is 15; 3 x 30 is 90; 20 x 5 is 100; 20 x 30 is 600.



Add up all of the areas for the partitions to get the total area of the whole figure.
600 + 100 + 90 + 15 = 805

Partial Products

For Partial Products, the factors are decomposed to its place value.
For 23 x 35, 23 will be decomposed to 20 and 3. 35 will be decomposed to 30 and 5.

$$\underbrace{23}_{20 + 3} \times \underbrace{35}_{30 + 5}$$

Next, each part of the first factor needs to be multiplied to each part of the second factor.

$$\underbrace{23}_{(20 + 3)} \times \underbrace{35}_{(30 + 5)}$$

3 x 5 = 15
3 x 30 = 90
20 x 5 = 100
20 x 30 = 600

The partial products are added together to get the product for 23 and 35.
15 + 90 + 100 + 600 = 805

Place Value Strategies for Multi-Digit Division

Multiplying Up

Multiplying Up is used to reach the dividend. It allows students to use multiplication problems that are comfortable and easy to use such as multiplying by tens and ones.

For 384 ÷ 6: the divisor (6) will be multiplied with other numbers to reach the dividend (384).

6 x 50 = 300
6 x 10 = 60
6 x 4 = 24

The factors are then added together to get the answer.
50 + 10 + 4 = 64

Partial Quotients

For this strategy you need to work your way toward the quotient by using friendly multipliers such as tens, fives, and twos without having to immediately find the largest quotient.
For 384 ÷ 6: the divisor (6) will be multiplied with other numbers to reach the dividend (384).

6 x 50 is **300**. **50** will go on the top since it's part of the quotient.
300 will be subtracted from 384 to see how much more is needed to reach the dividend.

$$\begin{array}{r} \mathbf{50} \\ 6)\overline{384} \\ \underline{-\,\mathbf{300}} \\ 84 \end{array}$$

6 x 10 is 60. 10 will go on the top since it's part of the quotient.
60 will be subtracted from 84 to see how much more is needed to reach the dividend.

$$\begin{array}{r} 50\ \mathbf{+\ 10} \\ 6)\overline{384} \\ \underline{-\,300} \\ 84 \\ \underline{-\,\mathbf{60}} \\ 24 \end{array}$$

6 x 4 is 24. 4 will go on the top since it's part of the quotient. **24** will be subtracted from 24 to get 0 which means the dividend is reached. All of the partial quotients are added to get the quotient, which is 64.

$$\begin{array}{r} \mathbf{50 + 10 + 4 = 64} \\ 6)\overline{384} \\ \underline{-\,300} \\ 84 \\ \underline{-\,60} \\ 24 \\ \underline{-\,\mathbf{24}} \\ \mathbf{0} \end{array}$$

Area Model (Open Array)

Using the Area Model for division requires you to "think multiplication."

For 384 ÷ 6, you can think "6 times what number gives me 384?"

The 6 will be the width and the area of the rectangle will be 384. The unknown is the length of the rectangle.

	?
6	384

To find the length, multiply up with 6 until you reach 384.
6 x 50 is 300, so the rectangle will be partitioned to show that amount.

	50	
6	**300**	

Continue to multiply up with 6 until 384 is reached.
6 x 10 is 60, so the rectangle will be partitioned to show that amount.

	50	**10**	
6	300	**60**	

Continue to multiply up with 6 until 384 is reached.
6 x 4 is 24, so the rectangle will be partitioned to show that amount.

	50	10	**4**
6	300	60	**24**

The last step is to add up the parts of the length to get the total length.

	50	**+ 10**	**+ 4**	**= 64**
6	300	60	24	

Since 6 x **64** is 384, 384 ÷ 6 is **64**.