

Multi-Digit Multiplication: Decimals x Whole Numbers

Unit Form & Place Value Understanding

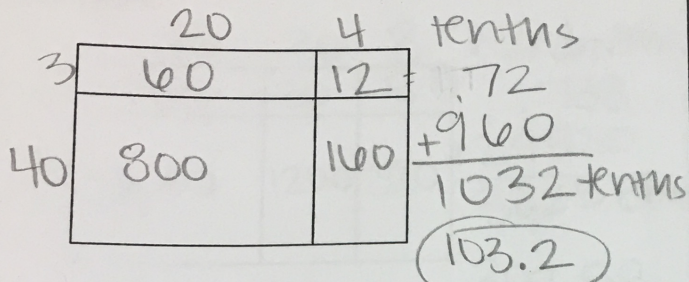
M2 L10-12

$$43 \times 2.4$$

estimate: $40 \times 2 = 80$

translate in unit form: $43 \times 24 \text{ tenths}$

Area Model:



Algorithm:

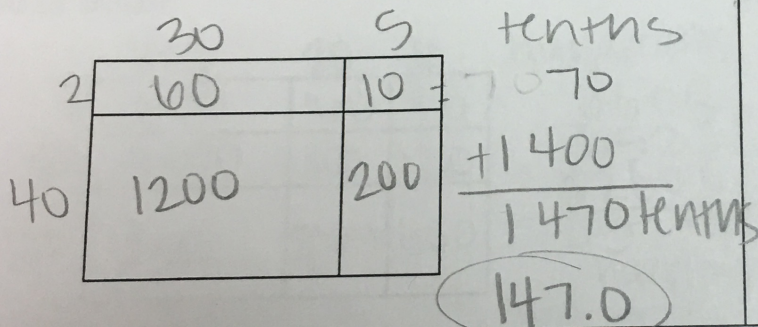
$$\begin{array}{r} 1 \\ 43 \\ \times 24 \text{ tenths} \\ \hline 172 \\ + 860 \\ \hline 1032 \text{ tenths} \\ \hline 103.2 \end{array}$$

$$3.5 \times 42$$

estimate: $4 \times 40 = 160$

translate in unit form: $35 \text{ tenths} \times 42$

Area Model:



Algorithm:

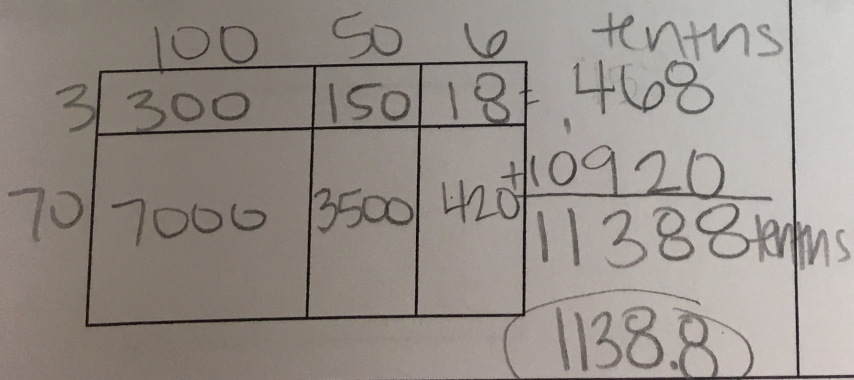
$$\begin{array}{r} 2 \\ 35 \text{ tenths} \\ \times 42 \\ \hline 70 \\ + 1400 \\ \hline 1470 \text{ tenths} \\ \hline 147.0 \end{array}$$

$$15.6 \times 73$$

estimate: $16 \times 70 = 1120$

translate in unit form: $156 \text{ tenths} \times 73$

Area Model:



Algorithm:

$$\begin{array}{r} 34 \\ + + \\ 156 \text{ tenths} \\ \times 73 \\ \hline 10920 \\ + 1468 \\ \hline 11388 \text{ tenths} \\ \hline 1138.8 \end{array}$$

$$7.38 \times 41$$

estimate: $7 \times 40 = 280$

translate in unit form: 738 hundredths $\times 41$

Area Model:

	700	30	8	hundredths
1	700	30	8	738
40	28,000	1200	320	+ 29520
				<u>30,258</u> hundredths
				302.58

Algorithm:

$$\begin{array}{r} \overset{13}{738} \text{ hundredths} \\ \times 41 \\ \hline 738 \\ + 29520 \\ \hline 30258 \text{ hundredths} \\ 302.58 \end{array}$$

$$8.26 \times 128$$

estimate: $8 \times 100 = 800$

translate in unit form: 826 hundredths $\times 128$

Area Model:

	8	0.2	0.06	
8	64	1.6	0.48	66.08
20	160	4	1.2	+ 165.20
100	800	20	6	+ 826
				<u>1057.28</u>

Algorithm:

$$\begin{array}{r} \overset{24}{8.26} \\ \times 128 \\ \hline 66.08 \\ + 165.20 \\ + 826.00 \\ \hline 1057.28 \end{array}$$

$$82.51 \times 63$$

estimate: $82 \times 60 = 4920$

translate in unit form: 8251 hundredths $\times 63$

Area Model:

	80	2	0.5	0.01	
3	240	6	1.5	0.03	247.53
60	4800	120	30	0.60	+ 4950.60
					<u>5198.13</u>

Algorithm:

$$\begin{array}{r} \overset{13}{82.51} \\ \times 63 \\ \hline 247.53 \\ + 4950.60 \\ \hline 5198.13 \end{array}$$

$$\begin{array}{r} 2.31 \\ \times 22 \\ \hline 462 \\ + 4620 \\ \hline 50.82 \end{array}$$

$$\begin{array}{r} 2.31 \\ \times 221 \\ \hline 231 \\ 4620 \\ + 46200 \\ \hline 510.51 \end{array}$$

$$\begin{array}{r} 2.31 \\ \times 201 \\ \hline 231 \\ + 46200 \\ \hline 464.31 \end{array}$$

What patterns do you notice?

Partial Products (1st product is same & 2 is in 2nd product)

$$\begin{array}{r} 495 \\ \times 1.11 \\ \hline 495 \\ 4950 \\ + 49500 \\ \hline 549.45 \end{array}$$

$$\begin{array}{r} 495 \\ \times 11.1 \\ \hline 495 \\ 4950 \\ + 49500 \\ \hline 5,494.5 \end{array}$$

$$\begin{array}{r} 49.5 \\ \times 111 \\ \hline 495 \\ 4950 \\ + 49500 \\ \hline 5,494.5 \end{array}$$

What patterns do you notice?

The digits in the products & partial products are the same. Place value is determined by the factor

$$\begin{array}{r} 2.5 \times 51 \\ \begin{array}{r} 2.5 \\ \times 51 \\ \hline 2.5 \\ + 125.0 \\ \hline 127.5 \end{array} \end{array}$$

$$\begin{array}{r} 0.25 \times 51 \\ \begin{array}{r} 0.25 \\ \times 51 \\ \hline 0.25 \\ + 12.50 \\ \hline 12.75 \end{array} \end{array}$$

$$\begin{array}{r} 25 \times 5.1 \\ \begin{array}{r} 25 \\ \times 5.1 \\ \hline 2.5 \\ + 125.0 \\ \hline 127.5 \end{array} \end{array}$$

What patterns do you notice?

Same as previous 3 expressions. Also, it doesn't matter which factor has a decimal, the product will