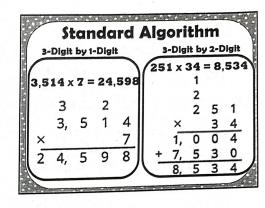# Unit 4 Math Home Resources.

Partial Products Area Diagram

$43 \times 67 = 2,881$

43 × 67	60	+ 7
40	$40 \times 60 = 2,400$	$40 \times 7 = 280$
+ 3	$3 \times 60 = 180$	$3 \times 7 = 21$

$$\begin{array}{r} +1 \\ 2,400 \\ 280 \\ 180 \\ + 21 \\ \hline 2,881 \end{array}$$

Standard Algorithm

3-Digit by 1-Digit

$3,514 \times 7 = 24,598$

$$\begin{array}{r} 3 \quad 2 \\ 3,514 \\ \times \quad\quad 7 \\ \hline 24,598 \end{array}$$

3-Digit by 2-Digit

$251 \times 34 = 8,534$

$$\begin{array}{r} 1 \\ 2 \\ 251 \\ \times \quad 34 \\ \hline 1,004 \\ + 7,530 \\ \hline 8,534 \end{array}$$

Expanded Notation

$43 \times 67 = 2,881$

$43 = 40 + 3$	→	43
$\times\ 67 = 60 + 7$		$\times\ 67$
$40 \times 60 = 2,400$		2,400
$40 \times 7 = 280$		280
$3 \times 60 = 180$		180
$3 \times 7 = 21$		21
2,881		2,881

chéng fǎ 乘法

$145 \times 15 = 2,175$

$\frac{1}{3} \times 5 = \frac{5}{3} = 1\frac{2}{3}$

$0.5 = 5 \times 0.1$

yīn shù 因数

$18 = 3 \times 6$

$5 \times 4 = 20$

chú shù 除数

$\frac{3}{2} \div \frac{1}{2} = ?$

bèi chú shù 被除数

$\frac{3}{2} \div \frac{1}{2} = ?$

děng shì 等式

用等号(=)把数字和算式连接起来,等号(=)的两边相等。

$0 = 0$ $18 / 2 = 9$ $36 = 4 \times 9$

suàn shì 算式

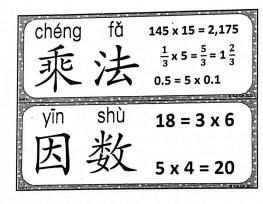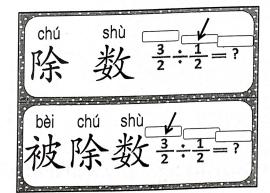用加号(+),减号(−),乘号(×),除号(÷)等符号连接数字的式子。
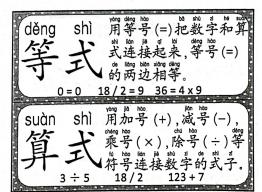
$3 \div 5$ $18 / 2$ $123 + 7$

Name: _____

3-digit by 2-digit Multiplication.

Step A: Label the name of each place value on top of the factor and draw lines to seperate each place.

Standard Algorithm:

thousands	hunds	tens	ones
	Z	8	5
X		4	8
	2,2	8	0
1	1,4	0	0
1	3,6	8	0

step B:
① 5 × 8 = 40
② 80 × 8 = 640
③ 200 × 8 = 1,600

Add up ① ② ③
```
  +1
  1, 6 0 0
     6 4 0
+      4 0
  2, 2 8 0
```

step C:
④ 5 × 40 = 200
⑤ 80 × 40 = 3,200
⑥ 200 × 40 = 8,000

Add up ④ ⑤ ⑥
```
  8, 0 0 0
  3, 2 0 0
+      2 0 0
 11, 4 0 0
```

Step B: show your thinking on the right side as ① ② ③... about how you get the first partial product: 285 × 8

Step C: show your thinking on the right side as ④ ⑤ ⑥... about how you get the second partial product: 285 × 40

Step D: Complete your equation: 285 × 48 = 13,680

shāng

商

$4 = 8 \div 2$

$1 \div 2 = \frac{1}{2} = 1/2$

---

jī

积

$6 = 2 \times 3$

$\frac{1}{2} \times 3 = \frac{3}{2} = 1\frac{1}{2} = 3/2$

---

multiplication

The operation that tells you the total number of objects when you have a certain number of equal groups.

$145 \times 15 = 2,175$

$\frac{1}{3} \times 5 = \frac{5}{3} = 1\frac{2}{3}$

$0.5 = 5 \times 0.1$

---

factor

When we multiply two whole numbers to get a product, each of those numbers is a factor of the product.

$18 = 3 \times 6$

$5 \times 4 = 20$

Divisor

the number we are dividing by which can represent the size of the groups or the number of groups.

$\underset{\text{Dividend}}{\frac{3}{2}} \div \underset{\text{Divisor}}{\frac{1}{2}} = \underset{\text{Quotient}}{?}$

Dividend

a number to be divided by another number.

$\underset{\text{Dividend}}{\frac{3}{2}} \div \underset{\text{Divisor}}{\frac{1}{2}} = \underset{\text{Quotient}}{?}$

Equation

A statement that includes an equal sign (=). It tells us that what is on one side of the sign is equal to what is on the other side.

$0 = 0 \qquad 18 / 2 = 9 \qquad 36 = 4 \times 9$

Expression

An expression has at least 2 numbers and at least one math operation (such as addition, subtraction, multiplication and division).

$3 \div 5 \qquad 18 / 2 \qquad 123 + 7$

---

quotient

The result in a division equation.

$4 = 8 \div 2$

$1 \div 2 = \frac{1}{2} = 1/2$

---

product

The result of multiplying some numbers.

$6 = 2 \times 3$

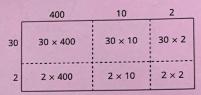$\frac{1}{2} \times 3 = \frac{3}{2} = 1\frac{1}{2} = 3/2$

Family Support Materials

Wrapping Up Multiplication and Division with Multi-Digit Numbers

In this unit, students multiply and divide multi-digit whole numbers using place value understanding, properties of operations, and the relationship between multiplication and division. They use the standard algorithm to multiply multi-digit whole numbers and partial quotients algorithms to divide whole numbers up to four digits by two digits. They then apply these skills as they solve problems involving volume.
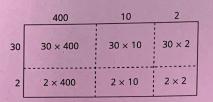
Section A: Multi-digit Multiplication Using the Standard Algorithm

Students begin this unit by estimating products and quotients in a real-world context. Students use their understanding of place value, and their understanding of powers of 10 to make reasonable estimates. Students connect multiplication strategies, like partial products, to the standard multiplication algorithm. This is the partial products area diagram for 412×32.

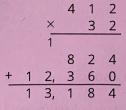|	400	10	2
30	30 × 400	30 × 10	30 × 2
2	2 × 400	2 × 10	2 × 2

They find partial products using area diagrams, and then translate that to a series of equations. These equations are compared against the steps in the standard algorithm to learn how the steps are based on place value reasoning and why the algorithm works. This table shows the connection between an algorithm using partial products and the standard algorithm.
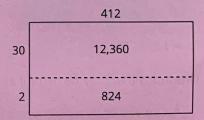
Partial Products Area Diagram

	400	10	2
30	30 × 400	30 × 10	30 × 2
2	2 × 400	2 × 10	2 × 2

Standard Algorithm

```
      4  1  2
  ×      3  2
      1
      8  2  4
+  1  2, 3  6  0
   1  3, 1  8  4
```

Area Diagram Aligned to Standard Algorithm

	412
30	12,360
2	824

Section B: Multi-digit Division Using Partial Quotients

Students begin the work on whole number division by deepening their understanding of division expressions and the effect that changing the divisor or dividend has on the value of the

quotient. In a progression that leads to students engaging in algorithms using partial quotients, students estimate quotients and write partial quotient equations that match their own methods for finding the value of the quotient. Once students understand that they can find the value of the quotient by decomposing the dividend into multiples of the divisor, students learn to express this decomposition using equations and then an algorithm using partial quotients.

Decomposition of the Dividend

$$448 \div 16 = (320 \div 16) + (80 \div 16) + (48 \div 16)$$

$$448 \div 16 = 20 + 5 + 3$$

$$448 \div 16 = 28$$

An Algorithm Using Partial Quotients

$$
\begin{array}{r}
\boxed{28} \\
3 \\
5 \\
20 \\
16\,\overline{)448} \\
-320 \quad (20 \times 16) \\
\hline
128 \\
-\,\,\,80 \quad (5 \times 16) \\
\hline
48 \\
-\,\,\,48 \quad (3 \times 16) \\
\hline
0
\end{array}
$$

Section C: Let's Put it to Work

Students practice their multiplication and division skills as they solve problems involving volume. Students are using the volume formulas ($V = l \times w \times h$ and $V = b \times h$) to practice the multiplication and division work of the previous sections. Students engage with relatively large numbers to multiply and divide using these volume formulas, developing fluency with the standard algorithm for multiplication and the algorithm using partial quotients.

Try it at home!

Near the end of the unit, ask your student to solve the following problems:

- 219×52

- $868 \div 14$

Questions that may be helpful as they work:

- Can you draw a diagram to help you solve the problem?
- Can you explain the steps of your algorithm?