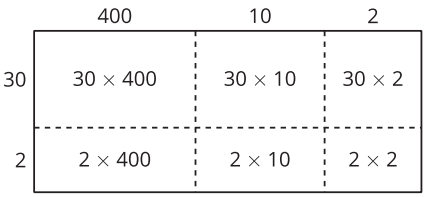
Unit 4 Family Support Materials

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 to solve problems involving volume.

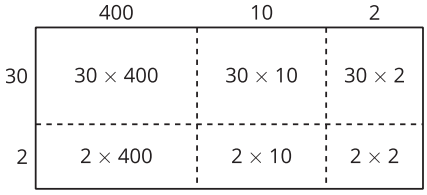
Section A: Multi-digit Multiplication Using the Standard Algorithm

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.



Students find partial products, using area diagrams, and then translate that to a series of equations. These equations are compared to 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 a partial-products algorithm and the standard algorithm.

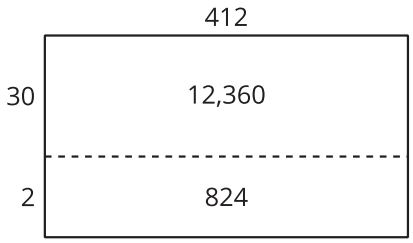
Partial-Products Area Diagram



Standard Algorithm

$$\begin{array}{r} 4\ 1\ 2 \\ \times\quad 3\ 2 \\ \hline 1 \\ 8\ 2\ 4 \\ +\ 1\ 2,\ 3\ 6\ 0 \\ \hline 1\ 3,\ 1\ 8\ 4 \end{array}$$

Area Diagram Aligned to Standard Algorithm



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 partial-quotients algorithms, students estimate quotients and write partial-quotient equations that match their own methods for finding the value of the quotient. Once they 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 a partial-quotients algorithm.

Decomposition of the Dividend

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

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

$448 \div 16 = 28$

A Partial-Quotients Algorithm

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

Section C: Let's Put it to Work

Students practice their multiplication and division skills as they solve problems involving volume. They are using the volume formulas ($V = l \times w \times h$ (volume equals length times width times height) and $V = b \times h$ (volume equals base area times height)) 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 partial-quotients algorithm.

CC BY NC 2024
Illustrative Mathematics®

Try it at home!

Near the end of the unit, ask your fifth grader 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?

Solution:

- 11,388
- 62

Sample response:

- A partial-products area diagram that solves the expression 219×52.
- First, I multiplied 14 by 60 to get 840. Then, I subtracted: $868 - 840 = 28$. I know that $14 \times 2 = 28$. I subtracted 28 from 28 to get 0. Then, I added my partial quotients: $60 + 2 = 62$.

CC BY NC 2024
Illustrative Mathematics®