



Unit 9: Multiplication and Division

In Unit 9, children will develop a variety of strategies for multiplying whole numbers. They will begin by using mental math (computation done by counting fingers, drawing pictures, and making diagrams, as well as by computing in one's head). Later in this unit, children will be introduced to two specific algorithms, or methods, for multiplication: the partial-products algorithm and the lattice method.

Partial-Products Algorithm

The partial-products algorithm is a variation of the traditional multiplication algorithm that most adults learned as children. Note that the multiplication is done from left to right and emphasizes place value in the numbers being multiplied.

$$\begin{array}{r} 28 \\ \times 4 \\ \hline \end{array}$$

Multiply 4×20 . \rightarrow 80 First, calculate 4 [20s].
 Multiply 4×8 . \rightarrow + 32 Then calculate 4 [8s].
 Add the two partial products. \rightarrow 112 Finally, add the two partial products.

It is important that when children verbalize this method, they understand and say "4 [20s]," not " 4×2 ." In doing so, they gain a better understanding of the magnitude of numbers along with better number sense.

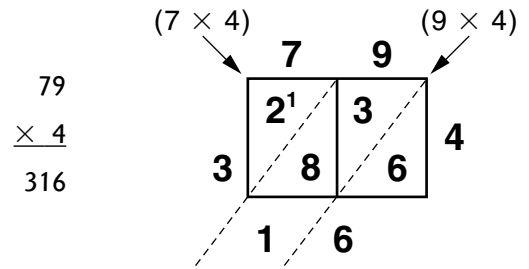
$$\begin{array}{r} 379 \\ \times 4 \\ \hline \end{array}$$

Multiply 4×300 . \rightarrow 1200 First, calculate 4 [300s].
 Multiply 4×70 . \rightarrow 280 Second, calculate 4 [70s].
 Multiply 4×9 . \rightarrow + 36 Then calculate 4 [9s].
 Add the three partial products. \rightarrow 1516 Finally, add the three partial products.

Check that when your child is verbalizing this strategy, he or she says "4 [300s]," not " 4×3 ," and "4 [70s]," not " 4×7 ." Using this strategy will also help to reinforce your child's facility with the basic multiplication facts and their extensions.

Lattice Method

Third Grade Everyday Mathematics introduces the lattice method of multiplication for several reasons: This algorithm is historically interesting; it provides practice with multiplication facts and addition of 1-digit numbers; and it is fun. Also, some children find it easier to use than other methods of multiplication.



Step 1 Write the factors on the outside of the lattice.

Step 2 Multiply each digit in one factor by each digit in the other factor.

Step 3 Write each product in one small box; ones place digits in the bottom-right half; tens place digits in the upper-left half. When the product is a single-digit answer, write a zero in the upper-left half.

Step 4 Add the numbers inside the lattice along each diagonal. If the sum on a diagonal exceeds 9, add the excess 10s in the next diagonal.

The lattice method and the partial-products algorithm help prepare children for a division algorithm they will learn in fourth grade. Children will choose the algorithms that work best for them.

Also in this unit, children will...

- Write and solve multiplication and division number stories involving multiples of 10, 100, and 1,000.
- Solve division number stories and interpret the remainders.
- Increase their understanding of positive and negative numbers.

Vocabulary

Important terms in Unit 9:

algorithm A step-by-step set of instructions for doing something—carrying out a calculation, solving a problem, and so on.

percent, % Per hundred; times $\frac{1}{100}$; times 0.01; 1 one-hundredth. For example, 15% means $\frac{15}{100}$ or 0.15 or 15 one-hundredths.

degree Celsius (°C) A unit for measuring temperature on the Celsius scale. 0° Celsius is the freezing point of water. 100° Celsius is the boiling point of water.

degree Fahrenheit (°F) A unit for measuring temperature on the Fahrenheit scale. 32° F is the freezing point of water. 212° F is the boiling point of water.

negative number A number less than or below zero; a number to the left of zero on a number line.

factor of a number N A whole number that can be multiplied by another whole number, so that the product is the number N. For example, 12 is a factor of 60, because $5 \times 12 = 60$. Alternatively, a factor of N is a whole number that divides N evenly (without a remainder); for example, 12 is a factor of 60, because $60 \div 12 = 5$.

Do-Anytime Activities

To work with your child on the concepts taught in this unit and in previous units, try these interesting and rewarding activities:

- 1 As the class proceeds through the unit, give your child multiplication problems related to the lessons covered, such as 9×23 , 3×345 , 20×65 , and 43×56 .
- 2 Continue to work on multiplication and division facts by using Fact Triangles and fact families, or by playing games.
- 3 Play *Baseball Multiplication*, *Factor Bingo*, and other games described in the *Student Reference Book*.
- 4 Write decimals for your child to read, such as 0.82 (eighty-two hundredths); 0.7 (seven tenths); 0.348 (three hundred forty-eight thousandths); and so on. Ask your child to identify digits in various places—the tenths place, hundredths place, thousandths place.
- 5 Practice extended multiplication and division facts, such as $3 \times 7 = ?$, $3 \times 70 = \underline{\quad}$, and $3 \times 700 = \underline{\quad}$; $18 \div 6 = \underline{\quad}$, $180 \div 6 = \underline{\quad}$, and $1,800 \div 6 = \underline{\quad}$.

As You Help Your Child with Homework

As your child brings home assignments, you may want to go over the instructions together, clarifying them as necessary. The answers listed below will guide you through this unit's Home Links.

Home Link 9.2

1. 56; 56; 560; 560; 7 [8s] in 56; 70 [8s] in 560; 8 [7s] in 56; 8 [70s] in 560
2. 63; 63; 630; 630; 7 [9s] in 63; 70 [9s] in 630; 9 [7s] in 63; 9 [70s] in 630
3. 40; 40; 400; 400; 50 [8s] in 400; 50 [80s] in 4,000; 8 [50s] in 400; 80 [50s] in 4,000

Home Link 9.3

- | | | |
|---------------|-----------|---------------------|
| 1. 7 raccoons | 2. 500 lb | 3. 100 foxes |
| 4. 600 lb | 5. 400 lb | 6. 60 beluga whales |

Home Link 9.4

- | | | |
|--------|----------|--------|
| 1. 93 | 2. 375 | 3. 765 |
| 4. 258 | 5. 1,134 | |

Home Link 9.5

1. yes; $\$0.79 \times 7 = \5.53
2. $\$12.72$; $\$2.12 \times 6 = \12.72
3. $\$0.90$; Sample answer: 10 cards is $\$6.00$ times
2. Compare that with $\$1.29$ times 10. Then subtract to find the difference.
4. pack of 10; $\$0.55$; Sample answer: Compare $\$0.55$ times 8 with $\$3.85$. Then subtract to find the difference.

Home Link 9.6

- | | |
|-----------------------|-----------------------|
| 1 row: yes; 18 chairs | 7 rows: no; 0 chairs |
| 2 rows: yes; 9 chairs | 8 rows: no; 0 chairs |
| 3 rows: yes; 6 chairs | 9 rows: yes; 2 chairs |
| 4 rows: no; 0 chairs | 10 rows: no; 0 chairs |
| 5 rows: no; 0 chairs | 18 rows: yes; 1 chair |
| 6 rows: yes; 3 chairs | 1; 18; 2; 9; 3; 6 |

Home Link 9.7

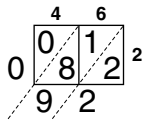
- 1 \$10 bill
 - 9 \$1 bills
 - 1 \$1 bill left over
 - \$0.25
 - \$19.25
 - $\$77.00 \div 4 = \19.25
- 2 \$1 bills
 - 1 \$1 bill
 - 2 \$1 bills left over
 - \$0.66
 - \$21.66
 - $\$65.00 \div 3 = \$21.66 \text{ R}2\text{¢}$

Home Link 9.8

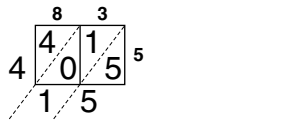
- 8 tables with 1 empty chair
- 7 cartons with 1 egg left over
- 10 packs with 7 extra markers
- 12 packages of buns with 6 buns left over

Home Link 9.9

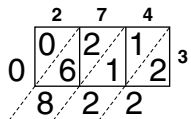
1. 92



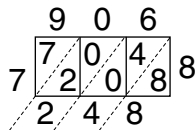
2. 415



3. 822

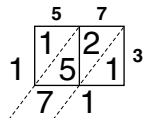


4. 7,248

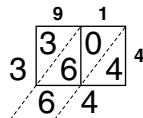


Home Link 9.10

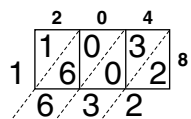
1. 171



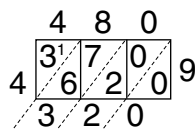
2. 364



3. 1,632

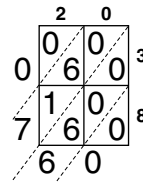


4. 4,320

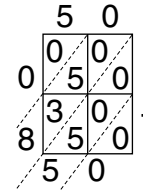


Home Link 9.11

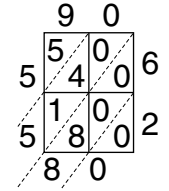
1. 760



2. 850



3. 5,580

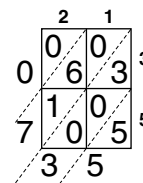


4. 1,120

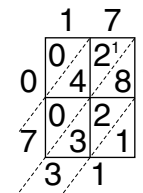
5. 2,100

Home Link 9.12

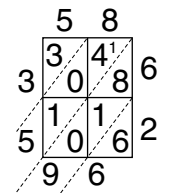
1. 735



2. 731



3. 3,596



4. 2,695

5. 3,003

Home Link 9.13

- $-40^\circ\text{F}; -40^\circ\text{C}$
- $220^\circ\text{F}; 104^\circ\text{C}$
- 10°C
- 18° colder
- yes; no; It would be about 86°F outside.
- yes; no; Water freezes at 0°C , so it would be cold enough to ice-skate.