Unit Summary:
In this unit, students will continue to understand and explore the relationship between multiplication and division of whole numbers, now using multi-digit numbers. Through exploration of multiple strategies, students will gain understanding of the traditional algorithms for multi-digit multiplication and long division. It is important to allow students to build understanding based on their knowledge of place value and properties of operations. Connections between place value and algorithms such as partial-products, lattice multiplication, the forgiving method, etc. are necessary and important for students understanding.

By the conclusion of this unit, students should have a strong foundation of the understanding of multiplication and division of multi-digit numbers and how place value and properties relate to the traditional algorithms.

Essential Skills:
- Describe numbers based on their properties.
- Identify factors and multiples of numbers.
- Identify patterns of 0 and powers of ten.
- Multiply multi-digit numbers.
- Divide multi-digit dividends by divisors.
- Apply strategies for multiplication and division to real-life problems.

Unit Vocabulary:
- algorithm
- place value
- array
- power of ten
- commutative property
- composite number
- dimension
- prime number
- distributive property
- divisible
- product
- divisibility
- quotient
- dividend
- ratio table
- divisor
- sharing
- exponent
- square number
- factors
- square root
- factor pair
- strategy
- grouping
- multiple
Number Characteristics we will study:

**Prime numbers** – Numbers greater than 1 that can be divided evenly **only** by 1 or itself.

**Composite Numbers** - Whole numbers greater than 1 that can be divided evenly by numbers other than 1 or itself.

**Square Numbers** - Numbers you get when you multiply an integer by itself. Example: 16 is a square number because $4 \times 4 = 16$.

**Square Root** - The square root of a number is a value that, when multiplied by itself, gives the number. Example: $4 \times 4 = 16$, so the square root of 16 is 4.

**Power** - The power of a number shows you how many times to use the number in a multiplication, as designated by its exponent.

**Exponent** - Written as a small number to the right and above the base number it tells how many times the base will be multiplied by itself.

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**Additional Resources:**

- **Multiplication games**: [http://www.multiplication.com/games/all-games](http://www.multiplication.com/games/all-games)
- **Skills Practice**: [http://www.ixl.com/math/grade-5](http://www.ixl.com/math/grade-5)
Multiplication Strategies:

Lattice Multiplication

Area/Array Model

Traditional
Division Strategies:

**Partial Quotient**

Start “Partial Quotient” division by estimating your answer. Check by multiplying and subtraction. The better your estimate, the fewer the steps you will have.

1. Estimate how many 6’s are in 577. (90)

\[ \begin{array}{c|cc|c}
 & 577 & \text{Subtract} & 96 \text{ R1} \\
\hline
6 & 540 & & 90 \times 6 = 540 \text{ (1st estimate)} \\
\hline
& 37 & \text{Subtract} & 6 \times 6 = 36 \text{ (2nd estimate)} \\
\hline
& 36 & & \\
\hline
& 1 & & 96 \text{ (Add the estimates)}
\end{array} \]

2. Estimate how many 6’s are in 37. (6)

3. Because 1 is less than 6, you have finished dividing and you now need to add the estimates to get your answer and the 1 left over is your remainder.

\[ \text{(* also referred to as the Forgiving method)} \]

**Traditional Long Division:**

\[ \begin{array}{c|c|c|c|c|c}
& 24 & 864 & \text{Put up your 3} \\
\hline
& 72 & \text{Put the 72 under the 86} & 3 & \frac{24}{72} \\
\hline
& 14 & \text{Take away 72 from 86 to get remainder} & \frac{24}{72} \\
\end{array} \]