



Understanding Division With Remainders

Key Content from This Unit:

Students use the relationship between multiplication and division to solve division problems. They use multiple strategies to understand the process of division. In order to explain their calculations, they use equations, rectangular arrays, and/or area models. Students will also multiply and divide to solve word problems. They will solve multistep word problems that will include division problems with remainders that need to be interpreted. It is important that students check the reasonability of their answers using mental computation and estimation including rounding.

Vocabulary to Know:

Dividend: the amount you want to divide up

Divisor: the number you divide by

Quotient: the answer when one number is divided by another

Remainder: the number left over when one integer is divided by another

What came before this:

In third grade, students used multiplication and division within 100 to solve word problems. Students used rectangular arrays and area models to understand multiplication. They have experience with division using the inverse operation. For example, to find $32 \div 8$, students can find the number that makes 32 when multiplied by 8.

What comes after this:

In fifth grade, students will find whole-number quotients of whole numbers up to 4-digit dividends and 2-digit divisors. They continue to use multiple to solve division problems. They build off their understanding of multiplication and division of whole numbers to multiply and divide fractions and decimals.

What is a Multiplicative Comparison Problem?

Multiplicative comparisons focus on comparing two quantities by showing that one quantity is a specified number of times larger or smaller than the other.

Examples:

Unknown Product: A blue scarf costs \$3. A red scarf costs 6 times as much. How much does the red scarf cost? ($3 \times 6 = p$)

Group Size Unknown: A book costs \$18. That is 3 times more than a DVD. How much does a DVD cost? ($18 \div p = 3$ or $3 \times p = 18$)

Number of Groups Unknown: A red scarf costs \$18. A blue scarf costs \$6. How many times as much does the red scarf cost compared to the blue scarf? ($18 \div 6 = p$ or $6 \times p = 18$)

Common Core Focus:

- Find whole number quotients and remainders with up to 4-digit dividends and 1-digit divisors.
- Solve division problems using strategies based on place value, properties of operations, and/or the relationship between multiplication and division.
- Illustrate and explain division calculations using equations, arrays, and/or area models.
- Solve multiplicative comparison word problems
- Solve multistep word problems where remainders must be interpreted.
- Represent multistep word problems with equations where a letter stands for the unknown quantity.
- Use estimation and mental computation strategies, including rounding, to assess reasonableness of an answer.

4.OA.2, 4.OA.3, 4.NBT.6

KEY MATHEMATICAL STRATEGIES of the COMMON CORE Partial Quotient

Division Strategies

Partition the Dividend

1. Partition the dividend into multiples of the divisor.
2. Add the partial quotients.

Example:

$$7225 \div 6 \quad \frac{1000 + 200 + 4_{R1}}{6 \sqrt{6000 + 1200 + 25}} = 1204_{R1}$$

Partial Quotients

1. Subtract from the dividend an easy multiple of the divisor. (Think FRIENDLY NUMBERS: $\times 1000$, $\times 100$, $\times 10$, $\times 2$) Record the partial quotient in the right column.
2. Repeat until the dividend has been reduced to zero or the remainder is less than the divisor.
3. Add the partial quotients.

Example:

$$\begin{array}{r} 1204_{R1} \\ 6 \overline{) 7225} \\ \underline{-6000} \quad (1000 \times 6) \\ 1225 \\ \underline{-1200} \quad (200 \times 6) \\ 25 \\ \underline{-24} \quad (4 \times 6) \\ 1 \quad \text{Remainder} \end{array}$$

Spotlight on the Math Practices

Reason Abstractly and Quantitatively

Mathematically proficient students can recognize that a number represents a specific quantity. They connect the quantity to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities.

In this unit, students *reason abstractly and quantitatively* when they:

- Write equations to represent division word problems.
- Write word problems to represent division equations.

How Can You Help?

- Have students share division strategies they learned that may be different than the way you learned.
- Continue to practice multiplication facts and relate these facts to division.
- Practice multiplicative comparison problems using examples above.

Some Resources to Help at Home

- <http://www.mathplayground.com/WordProblemsWithKatie2.html> - solve various types of multiplication and division word problems.
- <http://www.fun4thebrain.com/division.html> - these games will help you master your division facts
- <http://resources.woodlands-junior.kent.sch.uk/maths/division.htm> - interactive division games
- <http://www.k-5mathteachingresources.com/support-files/division-strategy-partial-quotients-ver.1.pdf> - "Partial Quotient" math game
- <http://www.k-5mathteachingresources.com/support-files/estimate-the-quotient-ver.1.pdf> - "Estimate the Quotient" math game
- <http://www.k-5mathteachingresources.com/support-files/multiplicativecomparisonproblems.pdf> - more examples of multiplicative comparison problems