

Division Strategies

In order to solve division problems efficiently, students need to understand the meaning of division and have a good mental model of the problem. They need to look at the problem as a whole, think about the relationships of the numbers in the problem, and choose an approach they can carry out easily and accurately.

Most students think about solving division problems in one of two basic ways, both of which are emphasized in this unit.

1. Using groups of the divisor

Students think of the division problem as a question about the number of groups. For example, if the problem were $159 \div 13 = \underline{\quad}$, the student thinks, "How many 13s are in 159?" Then the student uses multiplication to create groups of the divisor, keeping track of what part of the problem remains to be solved. In this problem, a student might first think about 10 groups of 13 (10×13), subtract the product of 10×13 from 159 mentally, and recognize that 2 more groups of 13 can "fit" into 159.

$$\begin{aligned} 10 \times 13 &= 130 \\ 159 - 130 &= 29 \\ 2 \times 13 &= 26 \\ 29 - 26 &= 3 \\ 2 + 10 &= 12 \\ 12 R3 \end{aligned}$$

2. Breaking the dividend into parts

In this strategy, students think about the dividend first, and how it can be broken up into numbers that are easier to divide. For example, for the problem $159 \div 13 = \underline{\quad}$, the student thinks, "How can I break 159 apart to make easier problems to solve?" The student might think of the problem as $159 \div 13 = (130 \div 13) + (29 \div 13)$.

$$\begin{aligned} 159 \div 13 &= \\ 130 \div 13 &= 10 \\ 26 \div 13 &= 2 \\ 3 \text{ left over} \\ \text{answer: } 12 \text{ with } 3 \text{ left over} \end{aligned}$$

The actual computations are closely related to those used in the first strategy. The difference is that students thinking about groups of the divisor usually multiply, and students using the second strategy think of the dividend first. Both of these methods depend on the distributive property of multiplication, just as many of the multiplication methods do. For more information about the distributive property, see **Teacher Note 1: Algebra Connections in This Unit**.

There are at least two other strategies students use, although they are not emphasized in this unit.

3. Making an equivalent problem

A division problem can be changed into an equivalent problem by dividing both numbers by the same number, thus maintaining the ratio between them. In the following problem, both numbers were divided by 7:

$$1,400 \div 35 = 200 \div 5 = 40$$

4. Solving an easier, related problem and then compensating

Students solve a related problem for which they already know the answer and then adjust the result. For example, when solving $159 \div 13$, one student "just knew" that $13 \times 13 = 169$ and reasoned that subtracting 13 from 169 is 156, the closest multiple of 13 to 159. $12 \times 13 = 156$, 3 less than 159, so the answer is 12 R3.