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 is 159 ÷ 13 = ____, 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. The student might first think about 10 groups of 13, or 10 × 13. Then the student would subtract the product of 10 × 13 from 159 mentally and recognize that 2 more groups of 13 can "fit" into what is left over, 29.

Help students use story contexts or representations.

Alex is thinking about teams. We have 159 students and want to make teams of 13. Janet's first step is to multiply 10 and 13. How can you explain her first step by using this story? What would be the next step?

Story contexts can be particularly useful in helping students understand the meaning of remainders in division.

What does a remainder of 3 mean?

Use some story contexts in which the divisor represents the number in a group, as in the example above. At other times, use stories such as the one below, in which the divisor represents the number of groups.

Here's a different story about 159 divided by 13. I have 159 oranges that I want to put into 13 bags. I want to know how many oranges I can put in each bag if I want to have the same number in each bag. Now how can you explain Janet's first step of 10 times 13 using this story?

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 ÷ 13 = ____, the student thinks, "How can I break 159 apart to make easier problems to solve?" The student might think of the problem as 159 ÷ 13 = (130 ÷ 13) + (29 ÷ 13).

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, just as many of the multiplication methods do. For more information about the distributive property, see **Algebra Connections in This Unit,** page 16.

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 ÷ 13, one student "just knew" that 13 × 13 = 169 and reasoned that subtracting 13 from 169 is 156, the closest multiple of 13 to 169. 12 × 13 = 156, 3 less than 159, so 159 ÷ 3 = 12 R3.