



# Solving Problems Involving Fractions

Let's add, subtract, multiply, and divide fractions.

## 16.1 Operations with Fractions

Without calculating, order the expressions according to their values from least to greatest. Be prepared to explain your reasoning.

$$\frac{3}{4} + \frac{2}{3}$$

$$\frac{3}{4} - \frac{2}{3}$$

$$\frac{3}{4} \cdot \frac{2}{3}$$

$$\frac{3}{4} \div \frac{2}{3}$$



**16.2****Situations with  $\frac{3}{4}$  and  $\frac{1}{2}$** 

Here are four situations that involve  $\frac{3}{4}$  and  $\frac{1}{2}$ .

- Before calculating, estimate if each answer is greater than 1 or less than 1.
  - Write a multiplication equation or division equation for the situation.
  - Answer the question. Show your reasoning. Draw a tape diagram, if needed.
1. There was  $\frac{3}{4}$  liter of water in Andre's water bottle. Andre drank  $\frac{1}{2}$  of the water. How many liters of water did he drink?
  2. The distance from Han's house to his school is  $\frac{3}{4}$  kilometer. Han walked  $\frac{1}{2}$  kilometer. What fraction of the distance from his house to the school did Han walk?



3. Priya's goal was to collect  $\frac{1}{2}$  kilogram of cans to recycle. She collected  $\frac{3}{4}$  kilogram of cans. How many times her goal was the amount of cans she collected?

4. Mai's class volunteered to clean a park with an area of  $\frac{1}{2}$  square mile. Before they took a lunch break, the class had cleaned  $\frac{3}{4}$  of the park. How many square miles had they cleaned before lunch?



## 16.3

## Pairs of Problems

Here are two sets of problems.

A1. Lin's bottle holds  $3\frac{1}{4}$  cups of water. She drank 1 cup of water. What fraction of the water in the bottle did she drink?

A2. Lin's bottle holds  $3\frac{1}{4}$  cups of water. After she drank some, there were  $1\frac{1}{2}$  cups of water in the bottle. How many cups did she drink?

B1. Plant A is  $\frac{16}{3}$  feet tall. This is  $\frac{4}{5}$  as tall as Plant B. How tall is Plant B?

B2. Plant A is  $\frac{16}{3}$  feet tall. Plant C is  $\frac{4}{5}$  as tall as Plant A. How tall is Plant C?

C1.  $\frac{8}{9}$  kilogram of berries is put into a container that already has  $\frac{7}{3}$  kilograms of berries. How many kilograms are in the container?

C2. A container with  $\frac{8}{9}$  kilogram of berries is  $\frac{2}{3}$  full. How many kilograms can the container hold?

D1. The area of a rectangle is  $14\frac{1}{2}$  sq cm and one side is  $4\frac{1}{2}$  cm. How long is the other side?

D2. The side lengths of a rectangle are  $4\frac{1}{2}$  cm and  $2\frac{2}{5}$  cm. What is the area of the rectangle?

E1. A stack of magazines is  $4\frac{2}{5}$  inches high. The stack needs to fit into a box that is  $2\frac{1}{8}$  inches high. How many inches too high is the stack?

E2. A stack of magazines is  $4\frac{2}{5}$  inches high. Each magazine is  $\frac{2}{5}$ -inch thick. How many magazines are in the stack?



1. Take turns with your partner to write equations to represent the situations.
  - For each equation that you write, explain to your partner how you know it describes the situation correctly.
  - For each equation that your partner writes, listen carefully to their explanation. If you disagree, discuss your thinking and work to reach an agreement.
  
2. Your teacher will assign 2 or 3 questions for you to answer. For each question:
  - Estimate the answer before calculating it.
  - Find the answer, and show your reasoning.



## 16.4 Making Ornaments

Mai, Kiran, and Clare are making dough ornaments together. To make one batch of the dough, they need  $\frac{3}{4}$  cup of flour and  $\frac{1}{3}$  cup of salt. They each brought the ingredients they had at home.

- Mai brought 2 cups of flour and  $\frac{1}{4}$  cup of salt.
- Kiran brought 1 cup of flour and  $\frac{1}{2}$  cup of salt.
- Clare brought  $1\frac{1}{4}$  cups of flour and  $\frac{3}{4}$  cup of salt.



If the students have plenty of the other ingredients in the recipe, how many whole batches of ornaments can they make? Explain your reasoning.

### Lesson 16 Summary

We can add, subtract, multiply, and divide both whole numbers and fractions. Here is a summary of how we add, subtract, multiply, and divide fractions.

- To add or subtract fractions, we often look for a common denominator so the pieces involved are the same size. This makes it easy to add or subtract the pieces.
- To multiply fractions, we often multiply the numerators and the denominators.
- To divide a number by a fraction  $\frac{a}{b}$ , we can multiply the number by  $\frac{b}{a}$ , which is the reciprocal of  $\frac{a}{b}$ .

$$\frac{3}{2} - \frac{4}{5} = \frac{15}{10} - \frac{8}{10}$$

$$\frac{3}{8} \cdot \frac{5}{9} = \frac{3 \cdot 5}{8 \cdot 9}$$

$$\frac{4}{7} \div \frac{5}{3} = \frac{4}{7} \cdot \frac{3}{5}$$