7. Suppose the ratio of desktop to laptop computers in a school is 3 to 4. Give three different scenarios that would result in the school having this ratio of computers. For each scenario, write the ratio of desktop to laptop computers and then simplify it.

8. If a school has 70 computers in the ratio of 3 desktops for every 4 laptops, how many are desktops? Explain how you answered this question. Did you use a picture?

9. A baby panda born at a national zoo weighed 8 ounces at birth and reached 75 pounds at one year of age. What was the panda's growth rate per month? Per week?

1.6 Part and Whole

Explore

1. At a particular college, half of all freshmen start in developmental math. Of those who start at this level, $\frac{4}{5}$ of them start in beginning algebra. Knowing this, what is the chance that a freshman at this college starts in beginning algebra? Give your answer as a percent. Do not use a calculator to answer this question!

Remember?

Percent means "out of one hundred."

Discover

A picture is often helpful for making sense of fraction operations. Let's try to solve the problem in the *Explore* using a picture. Follow the steps to create the picture.

Step 1: Consider all the freshmen to be the "whole" and represent them with a rectangle. Since the problem states that half of all freshmen place into developmental math, cut the rectangle in half and let the left side represent the freshmen placing into developmental math.

Step 2: Since four-fifths of the developmental math freshmen place into beginning algebra, cut that half into fifths and shade four pieces.

Step 3: Now the shaded part of the rectangle represents the freshmen who place into beginning algebra out of the whole freshmen class. To determine the fraction of the whole that is represented by this shaded area, we need to cut the whole rectangle into equally sized pieces.

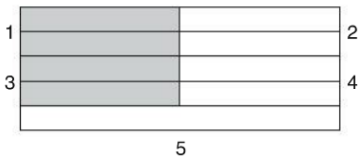
Now, since _____ equally sized pieces are shaded and there are _____ pieces total, the shaded part represents _____ of the total freshmen. The simplest way to write this fraction is _____.

Let's recap.

Write the calculation that was done with the fractions in the original problem.

What is the procedure for multiplying fractions?

It is common practice to list a fractional answer in its simplest form. The picture can be used to simplify the fraction as well. Group the pieces in groups of 2. Then there are _____ shaded pieces and _____ total pieces.



So we have simplified $\frac{4}{10}$ to $\frac{2}{5}$. What is the procedure for doing this without a picture?

To find the percent that this fraction represents, we need to write it with a denominator of 100. This can be accomplished by multiplying the numerator and denominator of the fraction $\frac{2}{5}$ by _____ to get _____. So _____ % of the freshmen place into beginning algebra.

Suppose at another college, $\frac{1}{3}$ of the freshmen start in beginning algebra and $\frac{1}{5}$ of the freshmen start in intermediate algebra.

2. What fraction of the freshman class will start in one of these two developmental math classes?

3. Draw a picture to represent the work you did with the fractions.

4. What percent of the freshman class does this fraction represent? What method do you need to use to convert the fraction to a percent?

How it works

Working with fractions:

Always check to see if a fraction can be simplified before you write the final answer.

1. An equivalent fraction can be written with a different denominator by multiplying or dividing the numerator and denominator of a fraction by the same nonzero number.

$$\text{Examples: } \frac{2 \cdot 5}{3 \cdot 5} = \frac{10}{15} \qquad \frac{24}{36} = \frac{24 \div 12}{36 \div 12} = \frac{2}{3}$$

2. To add fractions with the same denominator, add the numerators and keep the same denominator.

$$\text{Example: } \frac{3}{8} + \frac{2}{8} = \frac{5}{8}$$

3. To add or subtract fractions with different denominators, first get a common denominator. Then add or subtract the fractions by adding or subtracting the numerators and keeping the same denominator.

$$\text{Example: } \frac{5}{8} + \frac{1}{12} = \frac{5 \cdot 3}{8 \cdot 3} + \frac{1 \cdot 2}{12 \cdot 2} = \frac{15}{24} + \frac{2}{24} = \frac{17}{24}$$

4. To multiply fractions, multiply the numerators and multiply the denominators. Simplify the fraction either before or after doing the multiplication.

$$\text{Example: } \frac{2}{5} \cdot \frac{7}{4} = \frac{14}{20} = \frac{7}{10}$$

5. To divide two fractions, multiply the first fraction by the reciprocal of the second fraction.

$$\text{Example: } \frac{2}{5} \div \frac{7}{4} = \frac{2}{5} \cdot \frac{4}{7} = \frac{8}{35}$$

6. To change a fraction to a decimal, first write it with a denominator that is a power of ten, or use your calculator to divide the numerator by the denominator.

$$\text{Examples: } \frac{2}{25} = \frac{2 \cdot 4}{25 \cdot 4} = \frac{8}{100} = 0.08$$

$$\frac{6}{7} = 6 \div 7 \approx 0.857$$

tech TIP

Learn how your particular calculator performs fraction operations.

Connect

5. Suppose a student stands with her back against one of the classroom walls. She walks halfway to the opposite wall and then stops. She then walks half the remaining distance to the wall and stops. What fraction of the length of the room has she walked after doing this process four times? Will she ever technically reach the opposite wall?

Reflect

lesson WRAP-UP

What's the point?

You will encounter fractions repeatedly in this course and in all your future math courses (as well as in life). It is crucial that you can work with them accurately and efficiently.

What did you learn?

How to write equivalent fractions
How to add, subtract, multiply, and divide fractions
How to solve applied problems involving fractions

Cycle 1 Question: What can be learned?

To add and subtract fractions, you must have a common denominator. Why?

1.6 Homework

Skills

MyMathLab

- Write an equivalent fraction.
- Add, subtract, multiply, and divide fractions.
- Solve applied problems involving fractions.

1. Perform each fraction operation and write the answer in simplest form.

a. $\frac{2}{15} + \frac{1}{9} =$

b. $\frac{4}{21} - \frac{1}{12} =$

2. Perform each fraction operation and write the answer in simplest form.

a. $\frac{2}{15} \cdot \frac{3}{8} =$

b. $\frac{2}{15} \div \frac{1}{9} =$

Concepts and Applications

- Solve applied problems involving fractions.

3. A school has two pathways through their math program. $\frac{2}{3}$ of students follow the first path; the rest take the second path. During one semester, 75% of the students who follow the first path pass it, while 90% of the students who follow the second path pass it. Follow the steps to find what fraction of students will pass math this semester.

a. Find the fraction of students who take the first path and pass:

b. Find the fraction of students who take the second path and pass:

c. Add the two fractions:

4. A cookie recipe calls for $\frac{2}{3}$ of a cup of flour and makes 2 dozen cookies.

a. If you plan to make 8 dozen cookies, how many cups of flour will you need?

b. How many cookies can you make if you have 10 cups of flour and want to use it all?

5. a. What operation is implied between the whole-number and fraction parts of the mixed number $4\frac{2}{3}$?

b. What is the procedure for changing a mixed number to an improper fraction?

c. Illustrate the procedure by changing $4\frac{2}{3}$ to an improper fraction.

d. Enter the mixed number $4\frac{2}{3}$ into your calculator and get the decimal equivalent. Enter the improper fraction you found on your calculator and get the decimal equivalent. Are they the same?

e. Draw a picture to illustrate the mixed number $4\frac{2}{3}$.

f. Use your picture to show how this mixed number can be written as an improper fraction.

6. Is it easier to add or multiply fractions? Explain your answer and give an example of each.

7. Fraction multiplication can be illustrated with an area model.

For example, consider $\frac{2}{3} \cdot \frac{4}{5}$.

First draw a picture to illustrate $\frac{4}{5}$ by dividing a whole into fifths and shading four of them.

Next, take $\frac{2}{3}$ of the shaded portion by dividing into thirds and shading two of the thirds.

Finally, find the answer to $\frac{2}{3} \cdot \frac{4}{5}$ by counting the number of sections that were shaded twice and dividing by the total number of sections. In other words, $\frac{2}{3} \cdot \frac{4}{5} = \frac{8}{15}$.

Find the answers to the following fraction multiplication problems by drawing an area model for each.

a. $\frac{3}{5} \cdot \frac{1}{2}$

b. $\frac{1}{4} \cdot \frac{5}{7}$