

## Connect Percents, Ratios, Fractions and Decimals

What is the connection between decimals, fractions and percents?

Students create sets of 100 blocks and identify parts of the whole set. They identify these parts as ratios and as fractions of 100. They find equivalent decimals and percents for the fractions.

### Objectives

- To understand the percents and the words and symbols for them
- To write any number as a fraction, a decimal or a percent

### Materials

Each group will need:

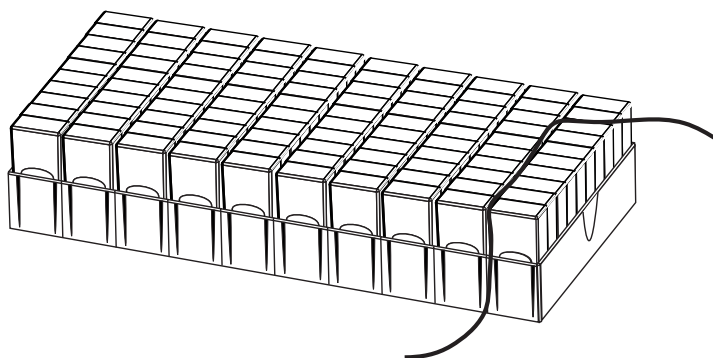
- 100 blocks and small holders
- 2 pieces of dental floss or very fine string
- 1 calculator (optional)
- 1 *Percent, Percent, Percent* activity sheet **per student**

### ◆ Class Introduction

20 MIN.

- Have students create a  $10 \times 10$  array of single blocks using 10 open blocks-of-10 placed side-by-side (see figure).

Ask students to use floss to identify a subset of 8 blocks in their array.



**How many blocks are in your array altogether? (100) How many blocks are in your rectangle? (8)**

**What fraction could we write to describe the blocks in your rectangle? ( $8/100$ )**

Write the fraction on the board:

$$\frac{8}{100}$$

Discuss with students that  $8/100$  is a fraction. When we are describing the relationship of a part of a group to the whole thing, we also call this a ratio. The ratio “8 out of 100” can be expressed as  $8/100$ .

Emphasize the part-to-whole relationship: the 8 is part of the 100, not added to it.

Review the prefixes from the metric system:

deci-

centi-

milli-

Explain that people have a custom of comparing ratios as “so much out of 100:” “25 out of 100,” “99 out of 100.”

**There is even a word to describe “so much out of 100,” percent.**

**Why do you think we use this word?** (*Because the stem -cent means hundredth, just like a centimeter is 1/100 of a meter.*)

Discuss the symbol, %, that is used to abbreviate the word percent.

$$\frac{8}{100} = \text{“eight percent”} = 8\%$$

- Now write the decimal number 0.08 on the board.

**How do we read this?** (*Eight hundredths*)

**What fraction is equivalent to this?** (*8/100*)

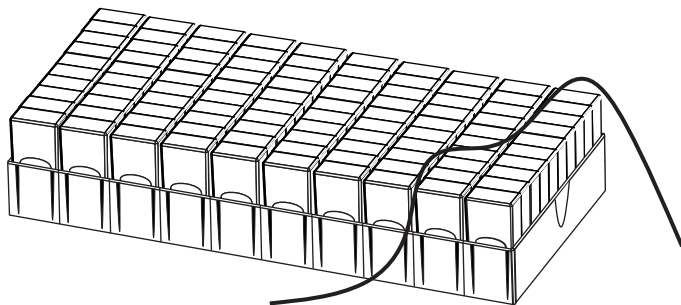
Discuss how this is the same fraction we were just talking about and that it can be read “8 percent.”

$$0.08 = \frac{8}{100} = 8\%$$

Help student see the reverse connection:

**What fraction is equivalent to 14%?** (*14/100*)

**And what decimal can we write for 14/100?** (*0.14*)



$$14\% = \frac{14}{100} = 100 \div 14 = 0.14$$

Have students use floss to show 14% of their arrays.

- Have a discussion to explain the usefulness of percents.

**If a teacher gives a quiz with 12 questions and you get 9 correct, how can we express that score?** ( $9/12$ )

**And if the next quiz has 25 questions, and you get 20 questions correct, how can we express the score?** ( $20$  out of  $25$  or  $20/25$ )

**Are your scores getting better or worse?**

Discuss that it is hard to tell, because it is difficult to compare fractions that have different denominators like these.

Ask students to divide these two fractions to find their decimal equivalents:

$$9/12 = 0.75$$

$$20/25 = 0.8$$

Now ask students to express the same numbers as fractions and percents:

$$0.75 = 75/100 = 75\%$$

$$0.8 = 80/100 = 80\%$$

**Now that we have converted these numbers to percents—which are just fractions of 100—we can easily compare them and conclude that your scores are getting better!**

- Finally, ask students to consider the fraction  $7/8$ . Have them divide  $7 \div 8$  using blocks, arithmetic or calculators to get the decimal equivalent,  $0.875$ .

**How do we express this as a percent? (87.5%)**

Point out that expressing a decimal as a percent is the same as reading that decimal to the hundredths place—there are 87.5 hundredths in  $0.875$ , which is the same as  $87.5\%$ .

### ◆ Group Activity

20 MIN.

- Students work in groups on the worksheet, identifying fractions of sets and converting fractions to decimals and percents.
- While students are working, help them think as flexibly as possible about the various equivalent forms of these numbers:

**What fraction would be equivalent to that number?**

**What would that number be expressed as a percent?**

**What is the decimal equivalent of that percent (or fraction)?**

## ◆ Closure

10 MIN.

- Ask the class if they have ever seen a news headline like this:

**2002 Rainfall is 123% of Last Year's Level**

**What does that mean, 123%?**

Explain that it is an improper fraction,  $123/100$  which could be reduced to  $1 + 23/100$ .

**Why would someone talk about a percent greater than 100?**

**What if 2002 rainfall had been less than the previous year? The headline would have read:**

**2002 Rainfall is Only 88% of Last Year's Level**

Explain that since we are accustomed to using percents to express ratios, people continue to use percents even when the ratio is greater than 1.

## ◆ Assessment

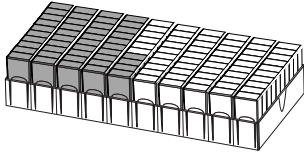
- Do students see the connection between fractions of a set, ratios, and the decimal and percentage equivalents of these?
- Do students see that reading a percentage is the same as reading a number to the hundredths place?

Name .....

# Percent, Percent, Percent

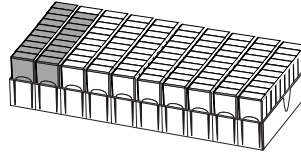
Write the equivalent numbers to represent the shaded or circled part of each collection of blocks:

1.



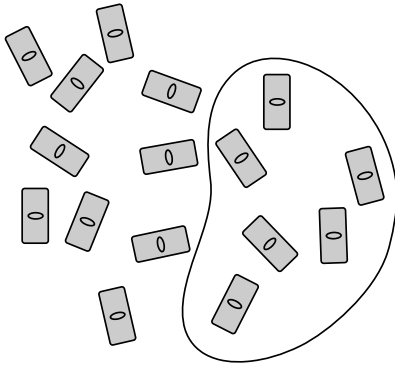
fraction: \_\_\_\_ / 100    decimal: \_\_\_\_  
percent: \_\_\_\_ %

2.



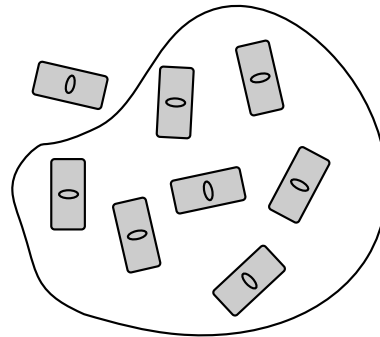
fraction: \_\_\_\_ / 100    decimal: \_\_\_\_  
percent: \_\_\_\_ %

3.



fraction: \_\_\_\_ / \_\_\_\_    decimal: \_\_\_\_  
percent: \_\_\_\_ %

4.



fraction: \_\_\_\_ / \_\_\_\_    decimal: \_\_\_\_  
percent: \_\_\_\_ %

5. Fill in the fractions in this table, then find the equivalent percents. Use the percents to help you answer the questions below.

Report of the Traveling Weather Station				
City	Number of Days Weather Was Recorded	Number of Rainy Days During Period	Fraction of Rainy Days	% of Rainy Days
Atlanta	12	8	8/12	75%
Boston	30	18		
Calgary	15	6		
Denver	50	12		
Evanston	25	5		

6. Which city was rainiest during the observation period? Why do you think so?

7. In which city would you expect it to rain 20 out of 100 days?