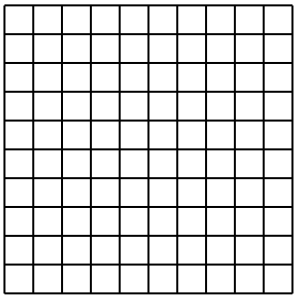
PERCENT AS A NUMBER

We will use an area model, money references, the multiplicative identity (referred to as the Big 1), and division to explore fraction, decimal, and percent concepts.

GETTING STARTED

1. Find <u>percent</u> in section 2.5 and explain what it means in My Word Bank. Make sure to include the percent symbol.

2. Shade $\frac{1}{2}$ of this grid.



Shading will vary. There must be 50 small squares shaded.

The shading shows that $\frac{1}{2} = \frac{50}{100}$.

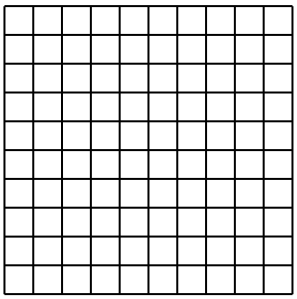
Write $\frac{1}{2}$ of a dollar in cents. 50 ¢

Write $\frac{1}{2}$ as a percent. 50%

Write $\frac{1}{2}$ of a dollar in dollars. $0.50

Write $\frac{1}{2}$ as a decimal. 0.50

3. Shade $\frac{1}{4}$ of this grid.



Shading will vary. There must be 25 small squares shaded.

The shading shows that $\frac{1}{4} = \frac{25}{100}$.

Write $\frac{1}{4}$ of a dollar in cents. 25 ¢

Write $\frac{1}{4}$ as a percent. 25%

Write $\frac{1}{4}$ of a dollar in dollars. $0.25

Write $\frac{1}{4}$ as a decimal. 0.25

4. How is writing fractions in terms of money the same as writing fractions as decimals?
The value written as dollars is the same as the decimal.

5. How is writing fractions in terms of money the same as writing fractions as percents?
The value written in cents is the same as the percent.

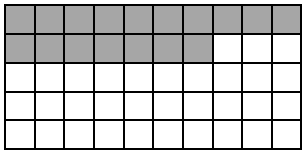
FRACTION GARDENS

We will use an area model to explore percents. Each drawing represents a garden. The shaded part represents the portion that is planted. Answer all problem parts based on the given garden for that problem. Shading will vary.

1.

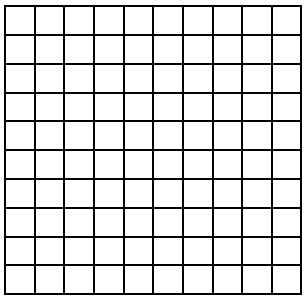
a. What fractional part is planted?

$\frac{17}{50}$



b. Shade this garden so that the same fractional part is planted.

34 small squares shaded



c. The shading shows:

$\frac{17}{50} = \frac{34}{100}$

d. Complete this equation.

$\frac{17}{50} \cdot \frac{2}{2} = \frac{34}{100}$

e. Write this fraction as a decimal.

0.34

f. Write this fraction as a percent.

34%

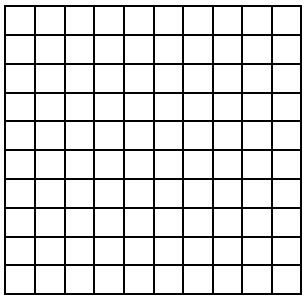
2.

a. What fractional part is planted?

$\frac{3}{4}$

b. Shade this garden so that the same fractional part is planted.

75 small squares shaded



c. The shading shows:

$\frac{3}{4} = \frac{75}{100}$

d. Complete this equation.

$\left(\frac{3}{4}\right) \cdot \frac{25}{25} = \frac{75}{100}$

e. Write this fraction as a decimal.

0.75

f. Write this fraction as a percent.

75%

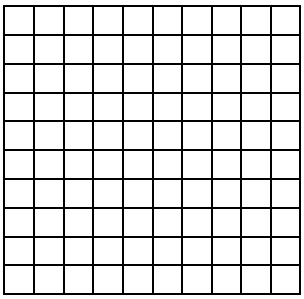
3.

a. What fractional part is planted?

$\frac{3}{5}$

b. Shade this garden so that the same fractional part is planted.

60 small squares shaded



c. The shading shows:

$\frac{3}{5} = \frac{60}{100}$

d. Complete this equation.

$\left(\frac{3}{5}\right) \cdot \frac{20}{20} = \frac{60}{100}$

e. Write this fraction as a decimal.

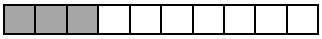
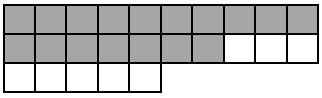
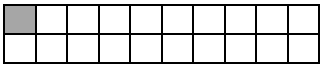
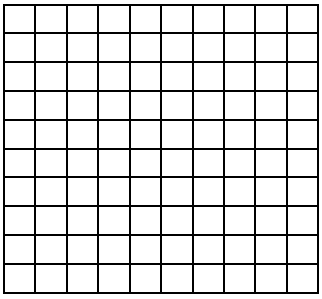
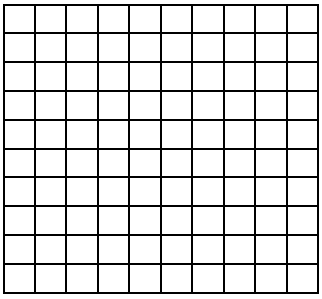
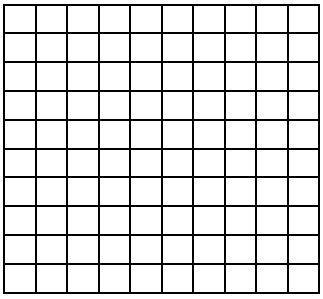
0.60 or 0.6

f. Write this fraction as a percent.

60%

FRACTION GARDENS
(Continued)

Shading will vary.

4.	5.	6.
a. What fractional part is planted? $\frac{3}{10}$ 	a. What fractional part is planted? $\frac{17}{25}$ 	a. What fractional part is planted? $\frac{1}{20}$ 
b. Shade this garden so that the same fractional part is planted. 30 small squares shaded 	b. Shade this garden so that the same fractional part is planted. 68 small squares shaded 	c. Shade this garden so that the same fractional part is planted. 5 small squares shaded 
c. My shading shows: $\frac{3}{10} = \frac{30}{100}$	c. My shading shows: $\frac{17}{25} = \frac{68}{100}$	c. My shading shows: $\frac{1}{20} = \frac{5}{100}$
d. Complete this equation. $\left(\frac{3}{10}\right) \cdot \frac{10}{10} = \frac{30}{100}$	d. Complete this equation. $\left(\frac{17}{25}\right) \cdot \frac{4}{4} = \frac{68}{100}$	d. Complete this equation. $\left(\frac{1}{20}\right) \cdot \frac{5}{5} = \frac{5}{100}$
e. Write this fraction as a decimal. 0.30 or 0.3	e. Write this fraction as a decimal. 0.68	e. Write this fraction as a decimal. 0.05
f. Write this fraction as a percent. 30%	f. Write this fraction as a percent. 68%	f. Write this fraction as a percent. 5%

7. Refer to section 2.5 (The Big 1). Put a Big 1 around each fraction in "part d" above that represents a form of 1. What happens to a fraction when it is multiplied by a "Big 1" fraction?
   1 is the multiplicative identity. Multiplying a number by any form of 1 does not change its value.

PRACTICE 1

Each drawing represents a garden. The shaded part is planted.

Shading will vary.

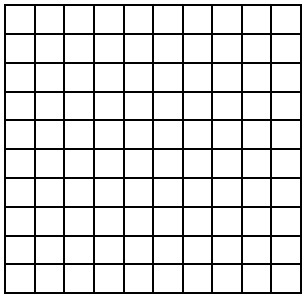
1.

a. What fractional part is planted?

$\frac{2}{5}$

b. Shade the hundred square so that the same fractional part is planted.

40 small squares shaded



a. My shading shows:

$\frac{2}{5} = \frac{40}{100}$

c. Complete this equation. Show the Big 1.

$\frac{2}{5} \cdot \frac{20}{20} = \frac{40}{100}$

e. Write this fractional as a decimal.

0.40 or 0.4

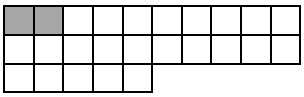
f. Write this fraction as a percent.

40%

2.

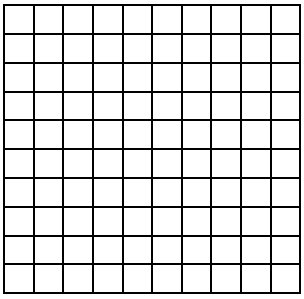
a. What fractional part is planted?

$\frac{2}{25}$



c. Shade the hundred square so that the same fractional part is planted.

8 small squares shaded



c. My shading shows:

$\frac{2}{25} = \frac{8}{100}$

d. Complete this equation. Show the Big 1.

$\frac{2}{25} \cdot \frac{4}{4} = \frac{8}{100}$

e. Write this fraction as a decimal.

0.08

1. Write this fraction as a percent.

8%

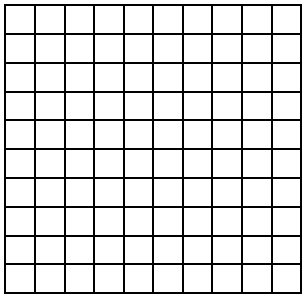
3.

a. What fractional part is planted?

$\frac{4}{4}$

b Shade the hundred square so that the same fractional part is planted.

100 small squares shaded



b. My shading shows:

$\frac{4}{4} = \frac{100}{100}$

d. Complete this equation. Show the Big 1.

$\frac{4}{4} \cdot \frac{25}{25} = \frac{100}{100}$

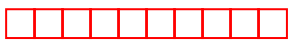
e. Write this fraction as a decimal.

1.00 or 1

f. Write this fraction as a percent.

100%

4. Draw a garden with 10 total parts with no parts planted. Then write this shaded amount as a fraction and as a percent. Drawings will vary.



$\frac{0}{10}$ = 0%

PARTS OF A DOLLAR

Lesson Notes

Follow your teacher's directions for problems 1-5.

1. six cents	2. \$0.06, 6¢, $\frac{6}{100}$	3. A few possibilities: 1 quarter and 1 dime, 35 pennies, 7 nickels
4. 0.35 of a dollar	5. 35% of a dollar	

6. Complete the table using these coins.

A B C D E F

Coin	Who is on the coin?	Value (in cents) and name of coin	Value (as fraction of a dollar)	Value (as percent of a dollar)	Value (as decimal)
A	President George Washington	25¢ quarter	$\frac{25}{100} = \frac{1}{4}$	25%	0.25
B	President Abraham Lincoln	1¢ penny	$\frac{1}{100}$	1%	0.01
C	President Thomas Jefferson	5¢ nickel	$\frac{5}{100} = \frac{1}{20}$	5%	0.05
D	Lead Woman's Suffrage Susan B. Anthony	100¢ dollar	$\frac{100}{100} = \frac{1}{1}$	100%	1.00
E	President John F. Kennedy	50¢ half-dollar	$\frac{50}{100} = \frac{1}{2}$	50%	0.50 = 0.5
F	President Franklin D. Roosevelt	10¢ dime	$\frac{10}{100} = \frac{1}{10}$	10%	0.10 = 0.1

7. Complete the table. Use your knowledge of money to help you. Do not use a calculator.

Fraction*	$\frac{3}{5}$	$\frac{3}{10}$	$\frac{9}{20}$	$\frac{3}{100}$	$\frac{8}{8}$	$\frac{2}{4}$	$\frac{3}{20}$	$\frac{87}{100}$
Decimal	0.6	0.3	0.45	0.03	1.00	0.5	0.15	0.87
Percent	60%	30%	45%	3%	100%	50%	15%	87%

* Equivalent fractions are acceptable.

PARTS OF A DOLLAR: LESSON NOTES

On PowerPoint slides, blue italic text suggests discussion; blue numbered text suggests written responses.

Use slides to help students connect to prior knowledge about money and percents, and to spark discussion.

- Slide 1: Reveal questions one at a time and discuss how the value of a quarter connects to representations for fractions, decimals, and percents.

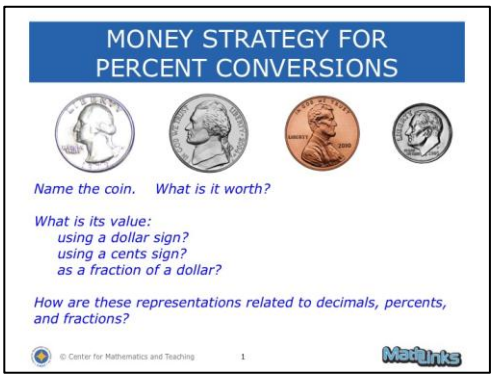
  A quarter is twenty-five cents. Percent means "per hundred."

  25¢ → 25% of a dollar

  25¢ = $0.25 → 0.25

  A quarter of a dollar → $\frac{25}{100} = \frac{1}{4}$

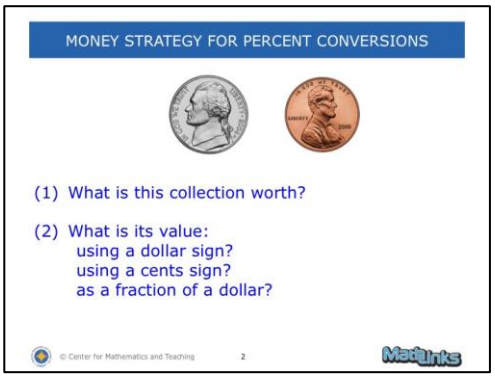
  Continue the discussion using the animated slide. Repeat questions for nickels, pennies, and dimes.



- Slide 2: For (1), ask students to find the value of the coins together. For (2), ask students to connect this value to fraction, decimal, and percent representations.

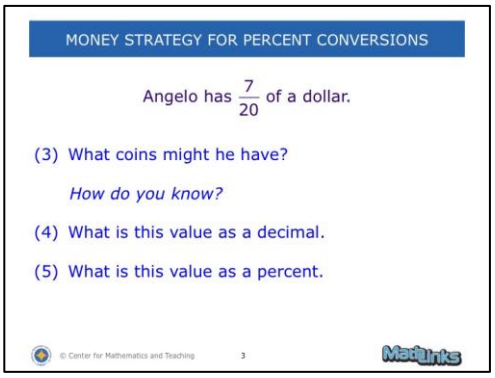
  Emphasize the importance of zero as a place holder in the decimal for 6¢ (0.06).

  The fraction may also be simplified ($0.06 = \frac{3}{50}$), which represents $\frac{3}{50}$ of a dollar.



- Slide 3: For (3-5), challenge students to record some possible coins that represent $\frac{7}{20}$ of a dollar, orally explain how they know, and write this value as a decimal and percent. Answers will vary.

  If they are stuck, remind students that percent means "per hundred," and how they used the 100-square to find percents (i.e., $\frac{7}{20}\left(\frac{5}{5}\right) = \frac{35}{100}$).



PRACTICE 2

Complete the table.

	Fraction	Decimal (number)	Decimal (words)	Percent
1	$\frac{1}{4}$	0.25	twenty-five hundredths	25%
2	$\frac{29}{100}$	0.29	twenty-nine hundredths	29%
3	$\frac{7}{10}$ or $\frac{70}{100}$	0.7 or 0.70	seven tenths (or seventy hundredths)	70%
4	$\frac{4}{25}$	0.16	sixteen hundredths	16%
5	$\frac{7}{100}$	0.07	seven hundredths	7%
6	$\frac{13}{20}$	0.65	sixty-five hundredths	65%
7	$\frac{4}{10}$ or $\frac{2}{5}$	0.4 or 0.40	four tenths (or forty hundredths)	40%
8	$\frac{1}{2}$	0.5 or 0.50	five tenths (or fifty hundredths)	50%

9. Enrique got 17 questions correct out of 20 on his math test. What percent of the test did he get correct?

$\frac{17}{20}\left(\frac{5}{5}\right) = \frac{85}{100} = 85\%$

10. A 25-person dance crew includes 9 boys. What percent of the crew are girls?

If 9 are boys, then 16 are girls.

$\frac{16}{25}\left(\frac{4}{4}\right) = \frac{64}{100} = 64\%$

11. Li noticed that 8 out of 40 classmates were left-handed. What percent of the class was left-handed? Do you think you would expect to see left-handedness in the general population at this same rate? _____ Support your claim with evidence.

$\frac{8}{40} = \frac{4}{20}\left(\frac{5}{5}\right) = \frac{20}{100} = 20\%$. Therefore 20% of the class is left-handed.

According to multiple internet sources, about 10% of the population is left handed. So Li's class is probably NOT typical of the general population. However, with such a small sample size, this kind of variation is not particularly unusual.

12. Circle methods for renaming fractions, decimals, and percents that make sense to you.

Draw a picture Use the Big 1 Think about money

USING DIVISION TO FIND DECIMALS AND PERCENTS

1. Ronni wanted to rename $\frac{3}{8}$ as a decimal and percent. She divided as shown to the right. Use Ronni's work to complete each equation.

$$8\overline{)3.000}$$
$$-24$$
$$60$$
$$-56$$
$$40$$
$$-40$$
$$0$$

$\frac{3}{8} = 0.$ 375	$\frac{3}{8} = \frac{375}{1000}$	$\frac{3}{8} = \frac{37.5}{100}$	$\frac{3}{8} =$ 37.5 %

2. Jay divided 3 by 8 on his calculator and got 0.38. Why do you think Jay's result is different than Ronni's?
The calculator was probably set to 2 decimal places, and so it rounded appropriately.

3. Michael wanted to rename $\frac{1}{3}$ as a decimal and as a percent. He divided as shown to the right. Use Michael's work to complete each statement.

$$3\overline{)1.000}$$
$$-9$$
$$10$$
$$-9$$
$$10$$
$$-9$$
$$1$$

$\frac{1}{3} \approx 0.$ 333	$\frac{1}{3} \approx \frac{333}{1000}$	$\frac{1}{3} \approx \frac{33.3}{100}$	$\frac{1}{3} \approx$ 33.3 %

4. Susie divided 1 by 3 on her calculator and got 0.3333333. Why do you think Susie's result is different than Michael's?
The division was not "finished" in the work to the right. In fact, the division will go on infinitely. We call the decimal equivalent of $\frac{1}{3}$ a "repeating decimal" because it ends in repetitions of the same block of digits. You will learn more about repeating decimals in the future.

PRACTICE: Change each fraction to a decimal and a percent. Complete one problem using long division to the right. Use mental math or a calculator for the rest.

5. $\frac{5}{8}$ 0.625 or 0.63 $62\frac{1}{2}$% or 62.5% or 63%	6. $\frac{9}{40}$ 0.225 or 0.23 $22\frac{1}{2}$% or 22.5% or 23%	7. $\frac{2}{3}$ 0.666 or 0.67 66.6 % or 67%	8. $\frac{1}{50}$ 0.02 2%
10. $\frac{1}{6}$ 0.166 or 0.17 16.6% or 17%	11. $\frac{5}{6}$ 0.833 or 0.83 83.3% or 83%	12. $\frac{9}{10}$ 0.9 or 0.90 90%	13. $\frac{7}{25}$ 0.28 28%

Students show one division problem here. Answers will vary.