Name: _____   Date: _____

Student Exploration: Percents, Fractions, and Decimals

Vocabulary: decimal, equivalent, fraction, percent, ratio

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)
Tom owns 5 posters and 4 are "Star Battles." Tina owns 10 posters and 5 are "Star Battles."

1. Who would you guess likes "Star Battles" more? _____ Why? _____

    _____

2. Suppose Tom keeps collecting "Star Battles" posters at the same rate. When he has a total

    of 10 posters, how many will be "Star Battles" posters? _____ Explain. _____

    _____

Gizmo Warm-up
A **ratio** is a comparison of two things by division. There are three main ways to express ratios –
as **percents**, as **fractions**, and as **decimals**. In the *Percents, Fractions, and Decimals* Gizmo,
you can model percents, fractions, and decimals for values from 0 to 1.

The grid can be adjusted to contain from 1 to 300 squares by dragging the
handle at the bottom-right corner. Each square can be shaded or unshaded
by clicking in it. You can also click and drag to shade multiple squares.

1. Create a grid that is 5 squares wide by 2 squares tall. Shade 8 squares, as shown above.

    A. Look at the **shaded:total** row in the Gizmo table. What decimal and percent are

        modeled by the shaded squares? Decimal = _____ Percent = _____
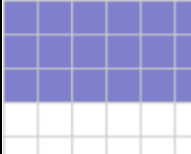
    B. Look at the **unshaded:total** row. What decimal and percent are modeled by the

        unshaded squares?   Decimal = _____ Percent = _____

2. The Gizmo gives two **equivalent** (equal) fractions – simplified and unsimplified – for the
    shaded:total and **unshaded:total** ratios. Record them below. (To see why these are
    equivalent, notice how many shaded and unshaded squares are in each row of the grid.)

    $$\frac{shaded}{total} = \frac{}{} = \frac{}{} \qquad \frac{unshaded}{total} = \frac{}{} = \frac{}{}$$
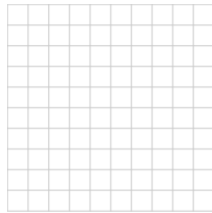
Activity A: Denominators of 100	Get the Gizmo ready: • Click **Clear**. • Create a grid that is 10 squares wide by 10 squares tall (100 squares total).	

1. Shade the number of squares given below, both in the Gizmo and on paper. Then complete the table below. (All values should represent the shaded:total ratio.)

Shade 1 out of 100   Shade 17 out of 100   Shade 100 out of 100

Shaded squares	Ratio (shaded:total)	Fraction	Decimal	Percent
0				
1				
17				
100				

2. Click **Clear**. Create a grid that is 20 squares wide and 5 squares tall. Do any of the answers to question 1 change? _____ Why or why not? _____

_____

3. Click **Clear**. Shade 49 out of the 100 squares in your grid. Then complete the table below.

	Fraction	Decimal	Percent
shaded:total			
unshaded:total			
sum			

A. What is true of all the sums? _____

B. Why is this true? _____

(Activity A continued on next page)

Activity A (continued from previous page)

4. Click **Clear**. Shade the number of squares shown in the first column. Then fill in the table.

Shaded squares	Fraction	Simplified fraction	Decimal	Percent
10				
35				
50				
78				

5. The labels on the number line at the bottom of the Gizmo can be adjusted to show decimals, fractions, or percents. The blue point shows the **shaded:total** ratio. The green point shows the **unshaded:total** ratio.

   A. Use the dropdown menu to the right of the number line to select **Decimals**. Shade in a few more squares on the grid. How do the positions of the points change?

   _____

   _____

   B. What is the distance between the blue point and 0.5? _____

   What is the distance between the green point and 0.5? _____

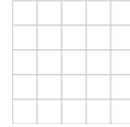   Compare these distances. What do you notice? _____

   _____

6. Complete the table. Then check your answers in the Gizmo.

Ratio	Simplified fraction	Decimal	Percent
9:100			
25:100			
55:100			
98:100			

Activity B: **Denominators other than 100**	Get the Gizmo ready: • Click **Clear**.	shaded : total unshaded : total 0.0 0.1 0.2 0.3

1. Create a 5-by-5 grid like the one at the right.

    A. How many squares are in the grid? _____

    B. Shade 3 squares. What fraction describes the **shaded:total** ratio? _____

    C. What fraction describes the **unshaded:total** ratio? _____

    D. How many 5-by-5 grids would you need to have 100 squares total? _____

    E. Write each fraction as an equivalent fraction with a denominator of 100.

    $$\frac{\text{shaded}}{\text{total}} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}} \qquad\qquad \frac{\text{unshaded}}{\text{total}} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

    F. How do fractions with denominators of 100 help you write the equivalent decimals

    and percents? _____

    _____

2. Click **Clear**. Create a grid with 15 squares.

    A. Shade 5 squares. Complete the equations to show the fractions modeled.

    $$\frac{\text{shaded}}{\text{total}} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}} \qquad\qquad \frac{\text{unshaded}}{\text{total}} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

    B. A fraction can be converted to a decimal by dividing the denominator into the numerator. Use a calculator. Divide to convert the fractions from part A to decimals. Then describe the pattern you see in the decimal.

    shaded:total = _____ Pattern: _____

    unshaded:total = _____ Pattern: _____

    C. The decimals you found in part B are called **repeating decimals**. In the Gizmo, repeating decimals are rounded to two places.

    How does the Gizmo show you that a decimal has been rounded? _____

    _____

(Activity B continued on next page)

Activity B (continued from previous page)

3. Click **Clear**. Create a grid with 150 squares.

   A. Shade 60 squares. Complete the equations to show the fractions modeled.

   $$\frac{\text{shaded}}{\text{total}} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}} \qquad \frac{\text{unshaded}}{\text{total}} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

   B. Are the equivalent decimals and percents for these fractions repeating? _____

   How do you know? _____

   C. Use a calculator. Divide to convert the fractions from part A to decimals.

   shaded:total = _____   unshaded:total = _____

   D. Shade 70 more squares. Complete the equations to show the fractions modeled.

   $$\frac{\text{shaded}}{\text{total}} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}} \qquad \frac{\text{unshaded}}{\text{total}} = \frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

   E. Are the equivalent decimals and percents for these fractions repeating? _____

   How do you know? _____

   F. Use a calculator. Divide to convert the fractions from part D to decimals.
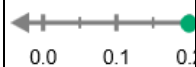
   shaded:total = _____   unshaded:total = _____

4. A friend creates a grid 20 squares wide by 10 squares high. He shades all squares and says 200% are shaded.

   Is he correct? _____ Explain. _____

   _____

5. Complete the table with equivalent fractions, decimals, and percents. Use a calculator as needed. For decimals and percents, round to two places if necessary. Then check your answers in the Gizmo. (Note: The last one cannot be modeled in the Gizmo.)

Ratio	Simplified fraction	Decimal	Percent
48:70			
15:300			
145:500			

Activity C:	Get the Gizmo ready:	
Real-world application	• Click **Clear**.	

1. Ramona owns a collection of 10 CDs. She bought 6 of the CDs and received 4 as gifts. Use the Gizmo to model this situation.

    A. Fill in the blanks with words to describe one of the ratios shown by this model.

    _____ CDs : _____ CDs

    B. Write this ratio as a fraction in simplest form, as a decimal, and as a percent.

    _____

    C. Describe the other ratio in words. _____ : _____

    D. Write this ratio as a fraction in simplest form, as a decimal, and as a percent.

    _____

    E. In your opinion, which best describes this situation: the fraction, decimal, or percent?

    _____ Why? _____

    _____

2. Ramona bought 2 more CDs.

    A. How many CDs does she now own? _____ How many has she bought? _____

    B. Write the ratio of CDs she bought to the total number of CDs as a fraction, as a rounded decimal, and as a rounded percent. Use the Gizmo to check your answers.

    _____

3. Ty received $\frac{3}{5}$ of his CDs as gifts. If he has 60 CDs, how many were gifts? _____

    Explain. _____

4. Five CDs, which is $\frac{1}{8}$ of Lisa's collection, were gifts. How many were not gifts? _____

    Explain. _____