



Two Plus You

Unit

2



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## Percents

**Word to know:**

✓ percent

**A** *percent* is the comparison of any number to 100. Let's take a closer look at percents.

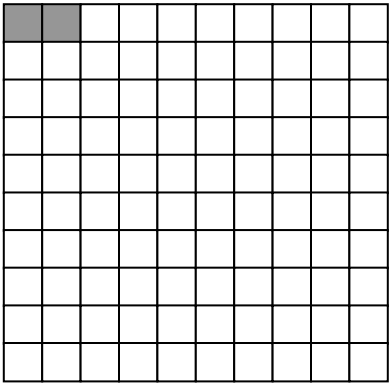
You are at the checkout at the store. You are buying a pack of 3 markers for \$1 and a pack of gum for \$0.32. Your total is \$1.32. You notice a sign that says, "8% *sales tax*". What does this mean? How much will you pay?

Start with 8%. 8% is read as "eight percent."

- ✓ A percent is a comparison of any number to 100. The symbol % means  $\frac{1}{100}$ . Percents can be changed into both fractions and decimals.

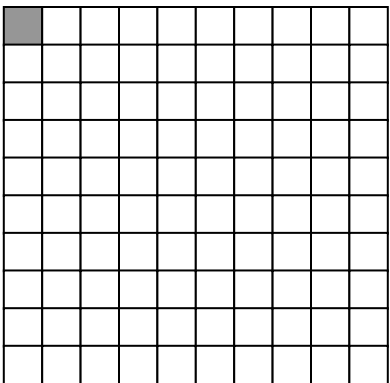
For example, 3% means ,  $\frac{3}{100}$  or .03.

Think about what that means. Percents compare everything to 100. The model below equals 100. It has been divided into 100 equal-sized boxes. How would you show 2?



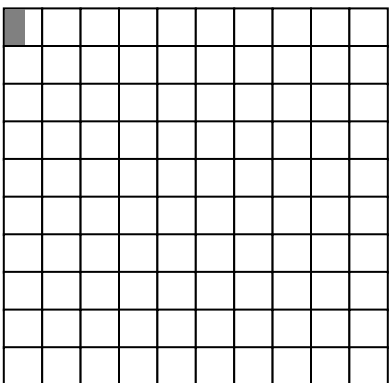
If 100 boxes equal 100, each box is worth 1. To show 2, shade two boxes. The shaded boxes are 2 out of 100. 2 compared to 100 equals 2%. Or, 2 is 2% of 100. The 2 shaded boxes represent 2% of the model.

What if the same model of 100 boxes is equal to 200? How would you show 2?



Now, the model equals 200. Each of its 100 little boxes is worth 2. ( $100 \times 2 = 200$ .) In order to show 2, you only need to shade 1 box. 1 box out of 100 means 1 compared to 100, or 1%. The value of each box is 2. Thus, 2 is 1% of 200.

The model below still equals 200. This time, it shows the value of 1.

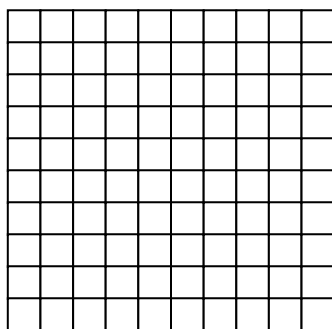


Each little box is worth 2. One is half of 2. It is shown by shading half of a little box. One half compared to 100 equals 0.5%. Thus, 1 is 0.5% of 200.

**Now you try!** For each question below:

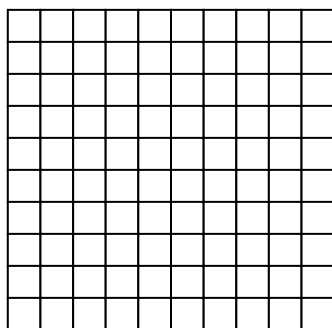
- ✓ Note the value of the whole model.
- ✓ State how much each little box is worth.
- ✓ Shade in the required value based on the model.
- ✓ State the percent it takes up.

1. The whole is 100, so each little square is worth \_\_\_\_\_. Now shade in 37.



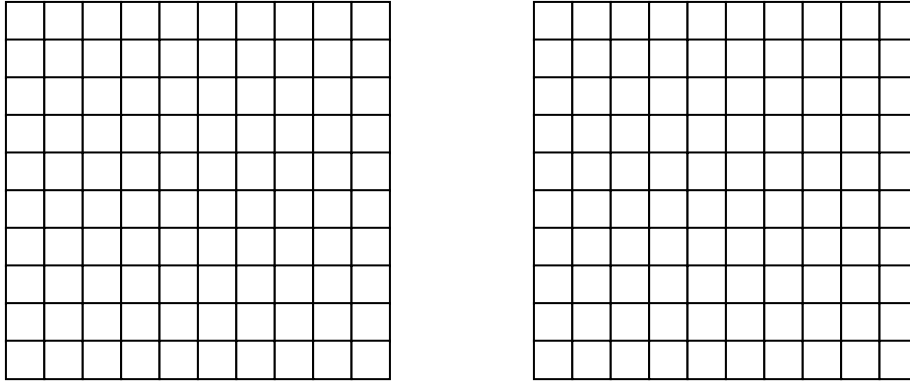
Percent that 37 is of 100: \_\_\_\_\_

2. The whole is 200, so each little square is worth \_\_\_\_\_. Now shade in 75.



Percent that 75 is of 200: \_\_\_\_\_

3. Each whole represents 50. The value of one little box is \_\_\_\_\_.  
 Now shade 60. (*Hint:* There are two wholes because 60 is bigger than 50).

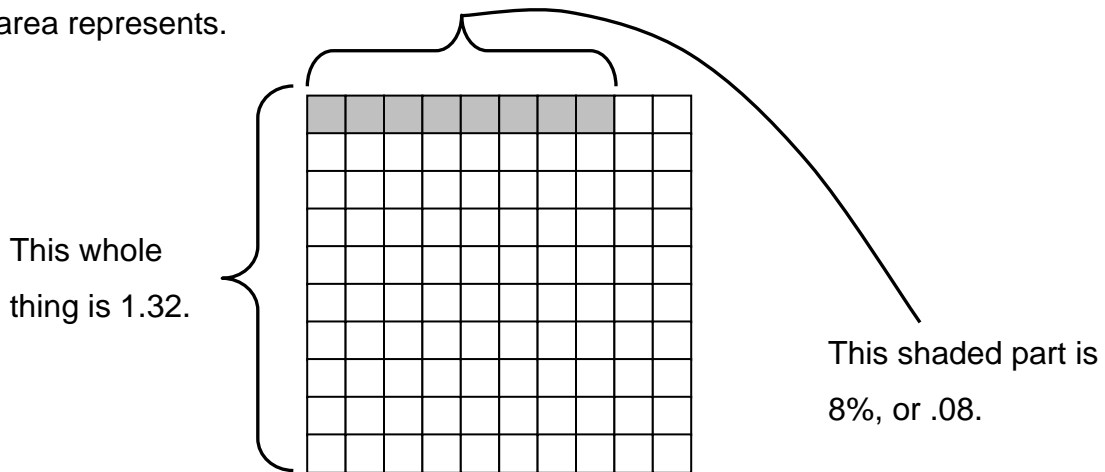


The percent 60 is of 50: \_\_\_\_\_

Now you can figure out the sales tax problem from the beginning of this lesson.  
 There is an 8% sales tax on your \$1.32 purchase of markers and gum.

8% really means  $\frac{8}{100}$  or .08 . So the tax is .08 of 1.32.

The model below represents the whole, 1.32. You want to know how much the shaded area represents.



The 8 shaded boxes represent the tax on the items, or .08 of 1.32 .

**FACT**

The word “of” implies multiplication. For example, half of four

means  $\frac{1}{2} \times 4$ . Thus, .08 of 1.32 =  $.08 \times 1.32$ .

Follow these steps to multiply decimals.

- (1) Count the number of decimal places in each factor and add them together.

$$\begin{array}{r} .08 \\ \text{V} \\ 2 \end{array} \times \begin{array}{r} 1.32 \\ \text{V} \\ 2 \end{array} = 4 \text{ decimal places}$$

- (2) Multiply as if you are multiplying whole numbers.

$$\begin{array}{r} 132 \\ \times 8 \\ \hline 1056 \end{array}$$

- (3) Place the decimal point in your answer by counting from the farthest right digit. Use the answer you found in Step 1.

$$\begin{array}{r} 1056 = .1056 \\ \cdot \swarrow \searrow \swarrow \searrow \swarrow \searrow \\ 4 \quad 3 \quad 2 \quad 1 \\ \text{(decimal places)} \end{array}$$

8% of \$1.32, then, is \$0.1056. Because you are dealing with money, you must round to the nearest cent or hundredth. Rounded to the nearest cent, the sales tax equals \$0.11 .

Find the total cost of your purchase. Add the cost of the items plus the sales tax.

$$1.32 + .11 = 1.43$$

**Total cost of purchase = \$1.43**

When you calculate the amount of sales tax of a purchase, you are taking the percentage of a number. Taking the percentage of a number means multiplying the number by a percent.

**Rule to find a percentage of a number:**

1. Change the percent to a decimal.  
Move the decimal point two places to the left.
2. Multiply the decimal by the number.

Find 13% of 75.

$$13\% = 0.13$$

$$\begin{aligned} 75 \times 0.13 \\ = 9.75 \end{aligned}$$

**Example:** What is 15% of 13?

**Solution**

**Step 1:**  $15\% = 15 \div 100 = 0.15$

**Step 2:**  $0.15 \times 13$

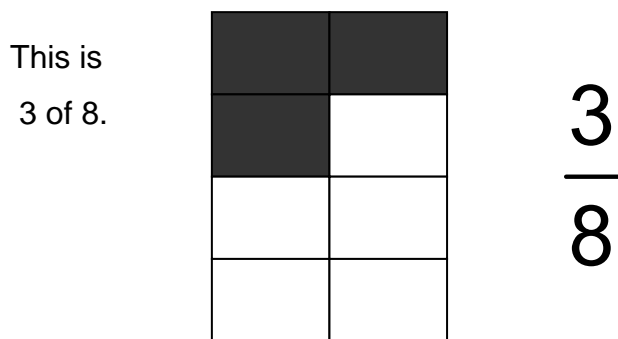
$$\begin{array}{r} 15 \\ \times 13 \\ \hline 45 \\ + 150 \\ \hline 195 \\ 1.95 \end{array}$$



Sometimes, you are given two numbers and asked to find a percent.

**Example:** What percent of 8 is 3?

**Solution:** Flip the words and turn the question into a statement. You want to know what percent 3 is out of 8.



As a decimal, this is

$$\begin{array}{r} .375 \\ 8 \overline{) 3.000} \\ \underline{-2.4} \phantom{0} \\ 60 \\ \underline{-56} \\ 40 \\ \underline{-40} \\ 0 \end{array}$$

Now, you need to convert the decimal to a percent.

Remember: Percents compare numbers to 100.

Multiply the decimal .375 by 100 to get its percent form.

$$\begin{aligned} &.375 \\ &= .375 \times 100\% \\ &= 37.5\% \end{aligned}$$

**You just found that 3 is 37.5% of 8.**

**Rule to find what percent a number is of another number:**

1. Convert the statement into a fraction of the form "is over of," or  $\frac{\text{"is"}}{\text{"of"}}$ .
2. Convert the fraction to a decimal using long division.
3. Convert the decimal to a percentage. Multiply the decimal by 100, and write a % sign at the end of the number.

**Example:** To the nearest percent, what percent of 11 is 3?

**Solution**

**Step 1:**  $\frac{\text{"is"}}{\text{"of"}}$

Here, 3 "is" some percentage "of" 11. So the fraction is  $\frac{\text{"is"}}{\text{"of"}} = \frac{3}{11}$

**Step 2:** Convert to a decimal.

$$\begin{array}{r}
 .272\dots \\
 = 11 \overline{)3.000\dots} \\
 \underline{- 2.2} \phantom{00} \\
 80 \phantom{0} \\
 \underline{- 77} \phantom{0} \\
 30 \phantom{0} \\
 \underline{- 22} \phantom{0} \\
 \dots \\
 = \overline{.27}
 \end{array}$$

**Step 3:** Convert to a percent

$$\begin{aligned} & \overline{.27} \times 100\% \\ & = 27.\overline{27}\% \end{aligned}$$

**Step 4:** Round to the nearest percent

$$27.\overline{27}\% \approx 27\%$$

**Example:** Convert 38% to a decimal.

**Solution:** Going back to the meaning of percent,

$$\begin{aligned} 38\% &= 38 \times \frac{1}{100} \\ &= \frac{38}{100} \\ &= .38 \end{aligned}$$

You simply moved the decimal point two spaces to the left!

<p><b>Rule to convert from a decimal to a percent:</b> Move the decimal point two places to the right Put a % sign at the end.</p>	<p>0.43 43. ↙↘ 43%</p>
<p><b>To convert from a percent to a decimal:</b> Drop the % sign. Move the decimal point two places to the left.</p>	<p>17% 17 0.17 ↙↘</p>

**Now you try!**

4. What percent of 5 is 4?

5. What is 14% of 2,350?

6. Convert the percents to decimals.

a. 10%

b. 25%

c. 19%

d. 61%

e. 72.1%

f. 129%

7. Convert each decimal into a percent.

a. 0.14

b. 0.10

c. 0.78

d. 0.01

e. 1.02

f. 0.75

g. 0.003

h. 2.45

8. Find:

a. 10% of 30

b. 15% of 75

c. 50% of 47

d. 25% of 20

9. Convert the following fractions to percents. Round to the nearest hundredth, if necessary.

a.  $\frac{3}{11}$

b.  $\frac{1}{4}$

c.  $1\frac{1}{5}$

d.  $\frac{7}{8}$

e.  $\frac{2}{12}$

f.  $\frac{9}{10}$

10. Solve the following percent word problems.

a. 5 is what percent of 80?

b. 20 is what percent of 22?

Notes:

☞ End of Unit 2 ☞