

PERCENTS, FRACTIONS, AND DECIMALS

Percents are all around us. Businesses use percents to advertise sales. Banks use percent to offer loans and savings. First we'll look at the meaning of percent. We will print out the document, "Squares to Use for Percent" to display percents.

Percents are just a special way to express fractions and decimals. Fractions may be expressed as percents by finding an equivalent fraction in hundredths. We'll look at writing fractions as percents.

We can also express improper fractions as percents. These percents will be percents greater than 100%.

Sometimes we must compute with percents less than one. Percents less than one can be written as a fraction or a decimal. One-tenth of a percent (0.1%) would be $\frac{1}{1000}$ as a fraction and .001 as a decimal.

Percents can be expressed as decimals or fractions. Fractions can be expressed as decimals or percents. Decimals can be expressed as fractions or percent. We will conclude with looking at the connections between percents, fractions, and decimals.

Introduction to Percent

Models of Percents

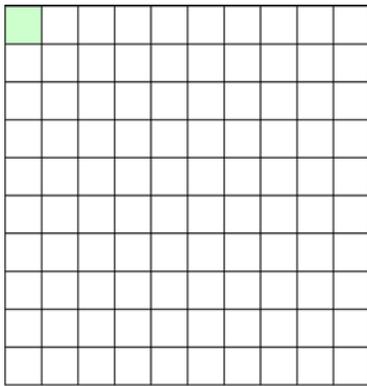
Fractions and decimals can be expressed as percents.

Ten by ten grids may be used to represent percent. The whole grid has 100 squares in it. Each small square represents one percent (%) of the large square.

Let's take a look at some models of percent that are also expressed as decimals and fractions. Each model has a certain percent of the squares shaded.

Example 1: What percent of the squares is shaded green?

1%



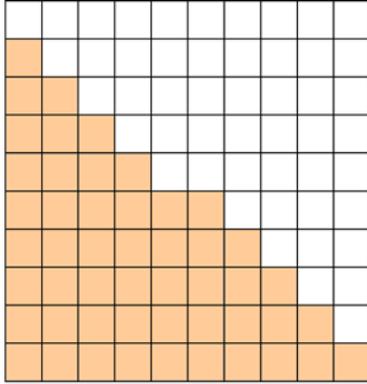
1% means 1 out of 100

$$1\% = \frac{1}{100} = 0.01$$

One percent (1%) of the squares is shaded green.

Example 2: What percent of the squares are shaded orange?

50%



50% means 50 out of 100

$$50\% = \frac{50}{100} = 0.50$$

Fifty percent (50%) of the squares are shaded orange.

Example 3: Write 50% as a fraction and as a decimal in simplest terms.

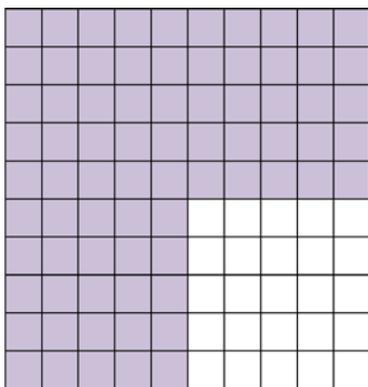
$$50\% = \frac{50}{100} = \frac{5\cancel{0}}{10\cancel{0}} = \frac{5}{10} \div \frac{5}{5} = \frac{1}{2}$$

$$50\% = 0.50 = 0.5\cancel{0} = 0.5$$

Fifty percent (50%) equals 1/2. Fifty percent (50%) equals 0.5.

Example 4: What percent of the squares are shaded purple?

75%



75% means 75 out of 100

$$75\% = \frac{75}{100} = 0.75$$

Seventy-five percent (75%) of the squares are shaded purple.

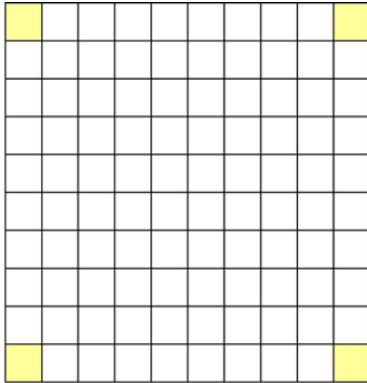
Example 5: Write 75% as a fraction in simplest terms.

$$75\% = \frac{75}{100} \div \frac{25}{25} = \frac{3}{4}$$

Seventy-five percent (75%) equals $\frac{3}{4}$.

Example 6: What percent of the squares are shaded yellow?

4%



4% means 4 out of 100

$$4\% = \frac{4}{100} = 0.04$$

Four percent (4%) of the squares are shaded yellow.

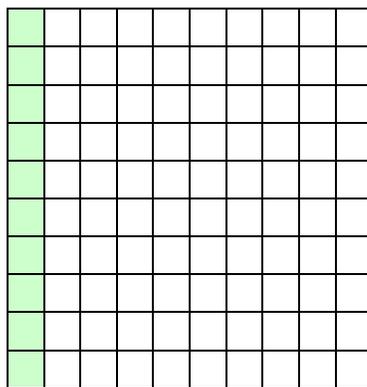
Example 7: Write 4% as a fraction in simplest terms.

$$4\% = \frac{4}{100} \div \frac{4}{4} = \frac{1}{25}$$

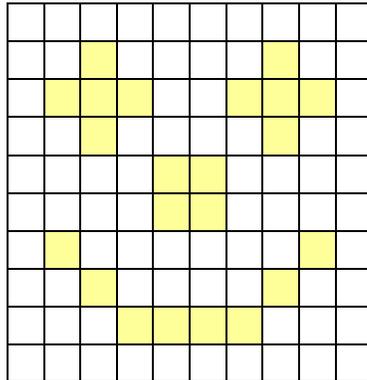
Four percent (4%) equals $\frac{1}{25}$.

Example 8: Study the following graphs. Mentally determine the answer. Look below for answers to see if you are correct.

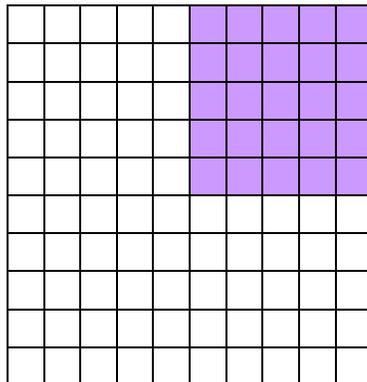
a.) What percent of the squares are shaded green?



b.) What percent of the squares are shaded yellow?



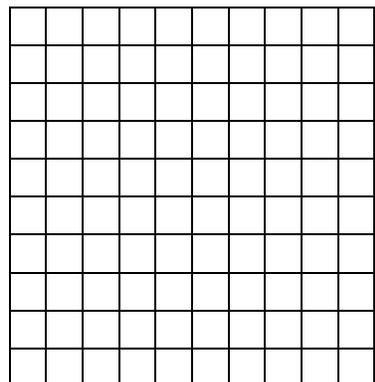
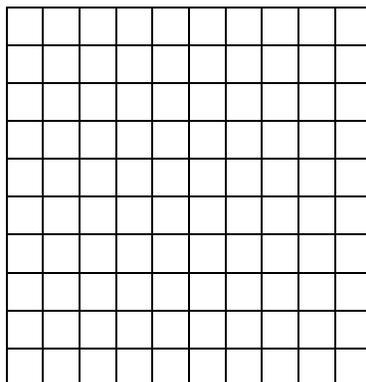
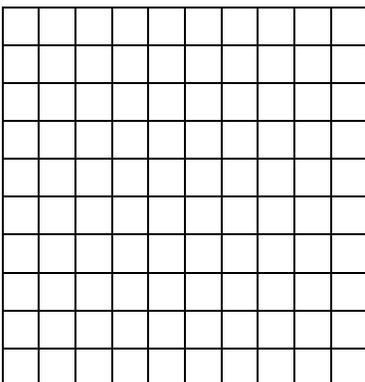
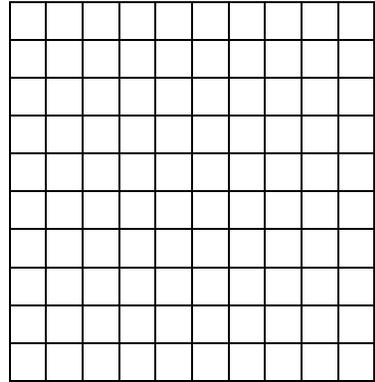
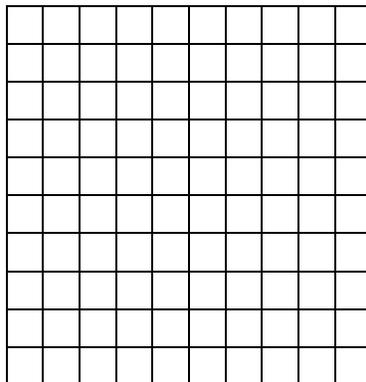
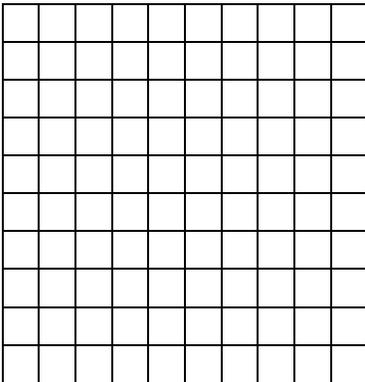
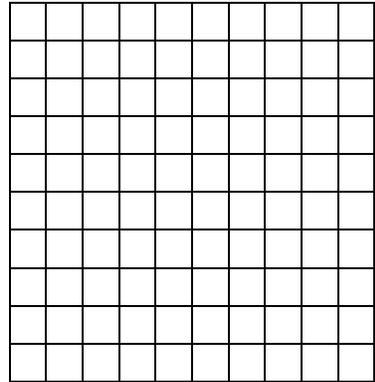
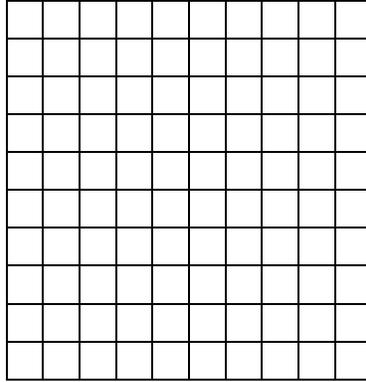
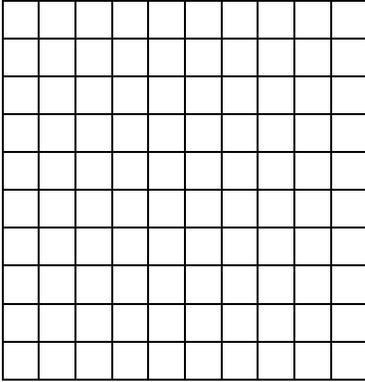
c.) What percent of the squares are shaded purple?



Solutions: a) 10%, b) 22%, c) 25%

Squares to Use for Percent

(There are 100 small squares in the large square.)

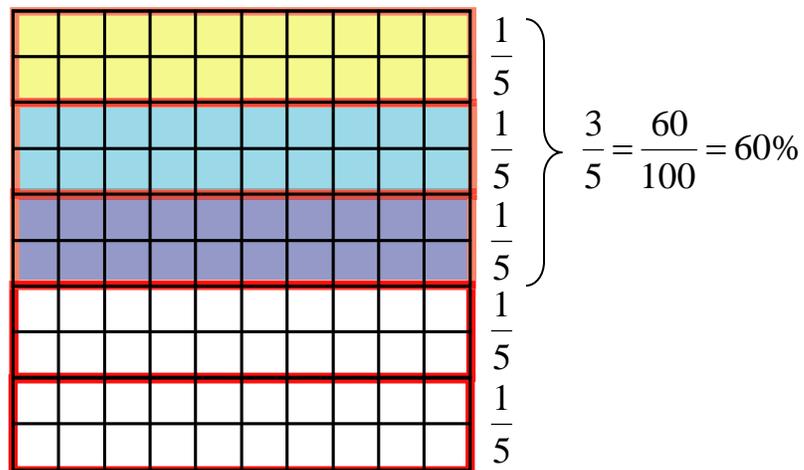


Fractions to Percent



To write $\frac{3}{5}$ as a percent, the fraction must be expressed in hundredths.

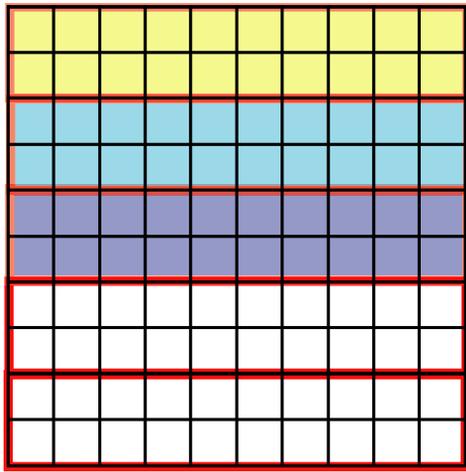
Using a decimal square (10 by 10 square), you could divide the square equally into 5 parts.



Improper Fractions to Percents Over 100

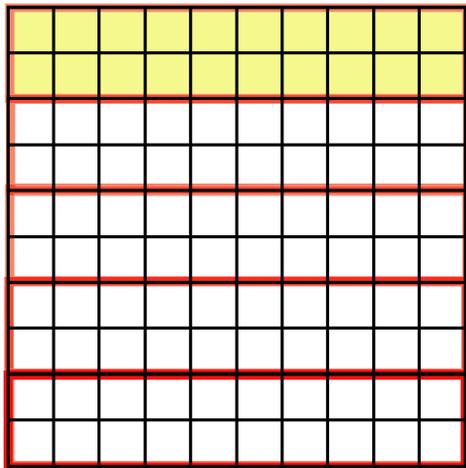
Write $\frac{6}{5}$ as a percent.

Using decimal squares, you could divide the squares equally into 5 parts.



$\frac{1}{5}$
 $\frac{1}{5}$
 $\frac{1}{5}$
 $\frac{1}{5}$
 $\frac{1}{5}$

$$\frac{5}{5} = \frac{100}{100} = 100\%$$



$\frac{1}{5}$
 $\frac{1}{5}$
 $\frac{1}{5}$
 $\frac{1}{5}$
 $\frac{1}{5}$

$$\frac{1}{5} = \frac{20}{100} = 20\%$$

$$\frac{6}{5} = \frac{100}{100} + \frac{20}{100} = 120\%$$

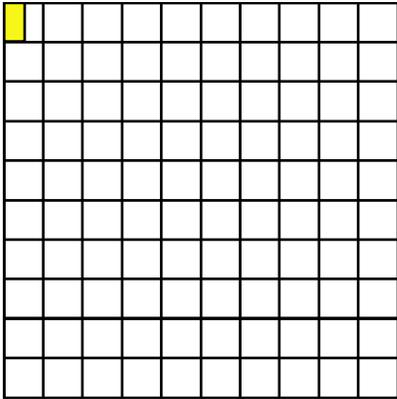


Percents Less Than One

Write $\frac{1}{2}\%$ as a fraction, then a decimal.



Use a decimal square and shade in $\frac{1}{2}$ of 1%.



$$\frac{1}{2} \text{ of } \frac{1}{100} \text{ equals } \frac{1}{2} \times \frac{1}{100} = \frac{1}{200}$$

$$\frac{1}{2}\% = \frac{1}{200} = 0.005$$

To convert a fraction to a decimal, divide the numerator (top number of a fraction) by the denominator (bottom number of a fraction).

$$\begin{array}{r} .005 \\ 200 \overline{)1.000} \\ \underline{1 \ 000} \end{array}$$

1 is a whole number; therefore, 1, written as a decimal, is 1.000. Once you place the decimal point after the 1, you may add zeros as needed. In this case, three zeros are needed for the division to come out even.

Another Way.

Write $\frac{1}{2}\%$ as a complex fraction.

$$\frac{\frac{1}{2}}{100}$$

Remember that the fraction bar can represent division. $\frac{\frac{1}{2}}{100} = \frac{1}{2} \div 100$

Compute.

$$\frac{1}{2} \div \frac{100}{1} = \frac{1}{2} \times \frac{1}{100} = \frac{1}{200} = 0.005$$

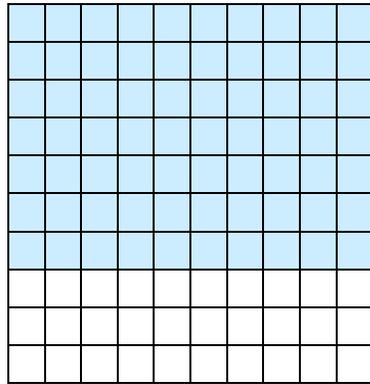
When dividing by a fraction, rewrite as multiplication, and multiply by the inverse.

In this case, $\frac{100}{1}$ is written as its inverse, $\frac{1}{100}$.

Percents, Fractions, and Decimals

Writing Percents as Fractions and Decimals

In the decimal square below, 70% of the squares are shaded blue. Write 70% as a fraction and a decimal in simplest terms.



$$70\% = \frac{70}{100} = \frac{7\cancel{0}}{10\cancel{0}} = \frac{7}{10}$$

$$70\% = 0.70 = 0.7\cancel{0} = 0.7$$

Seventy percent (70%) equals $\frac{7}{10}$. Seventy percent (70%) equals 0.7.

Example 1: Write 30 percent as a decimal and a fraction in simplest terms.

30%	
Decimal	$0.30 = .3\cancel{0} = 0.3$
Fraction	$\frac{30}{100} = \frac{3\cancel{0}}{10\cancel{0}} = \frac{3}{10}$

$$30\% = 0.3 \quad 30\% = \frac{3}{10}$$

Example 2: Write $11/20$ as a percent and a decimal.

$\frac{11}{20}$	
Percent	$\frac{11}{20} \times \frac{5}{5} = \frac{55}{100} = 55\%$
Decimal	$20 \overline{)11.00} = 0.55$

$$11/20 = 55\% \quad 11/20 = 0.55$$

Example 3: Write 0.05 as a fraction and a percent.

0.05	
Fraction	$0.05 = \frac{5}{100} \div \frac{5}{5} = \frac{1}{20}$
Percent	$0.05 = \frac{5}{100} = 5\%$

$$0.05 = 1/20 \quad 0.05 = 5\%$$

Example 4: Write 0.8 as a fraction and a percent.

0.8	
Fraction	$0.8 = \frac{8}{10} \div \frac{2}{2} = \frac{4}{5}$
Percent	$0.8 = \frac{8}{10} \times \frac{10}{10} = \frac{80}{100} = 80\%$

$$0.8 = 4/5 \quad 0.8 = 80\%$$

Example 5: Write 100% as a fraction in simplified form and as a decimal.

100%	
Fraction	$100\% = \frac{100}{100} = 1$
Decimal	$100\% = \frac{100}{100} = 1 = 1.00$

$$100\% = 1 \quad 100\% = 1.00$$