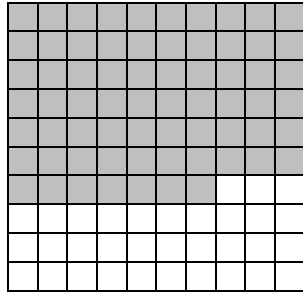


Section 5.2 Percent and decimal formats

A percent means per hundred with the percent symbol % indicating a fraction with a denominator of 100. Thus, sixty seven percent written as 67% indicates 67 per every hundred which is written as $\frac{67}{100}$ in fraction form and as 0.67 in decimal form. Below 67% is illustrated by breaking a square into 100 equal parts with 67 of these equal parts shaded.

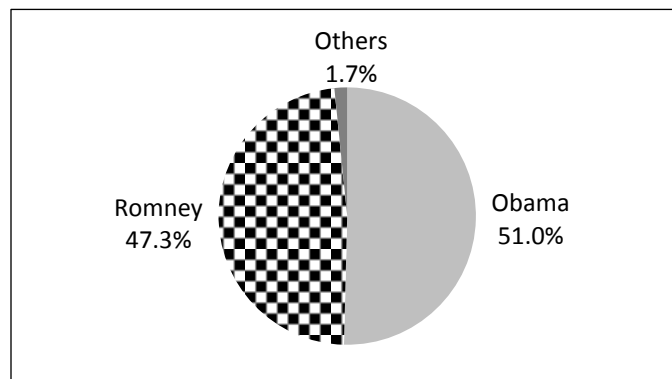


67% Percent form

$\frac{67}{100}$ Fraction form

0.67 Decimal form

A percent is a convenient way to describe numerical data since it is easy to visualize as per hundred. In the 2012 presidential election President Obama received 51.0%, Governor Romney 47.3%, and other candidates 1.7% of the approximately 128 million votes cast nationwide. Romney's 47.3% of the popular vote can be visualized by considering the entire 128 million voters as a single group of 100 voters of which approximately 47 voted for Romney. Be careful when interpreting a percent as out of a 100, for instance Obama received 51% of the total 128 million votes but that does not signify that for every single group of 100 voters there are 51 Obama voters in that particular group it means that if the entire 128 million voters is viewed as a single group of 100 voters approximately 51 voted for Obama.



As the percent symbol % indicates per hundred, for money the cent symbol ¢ indicates a hundredth of a dollar. Below cents are first written as fractional parts of dollars with denominators of one hundred and then in the more recognizable decimal format. This same process is repeated to write a percent in both fraction and decimal formats. When converting cents into fractional dollars or writing a percent as a fraction, the resulting fractions have a denominator of one hundred. Since the denominators of these fraction are one hundred, to convert to a decimal format the shortcut for dividing by one hundred can be applied which moves the decimal point two places to the left.

cent to dollar

$$1¢ = \$\frac{1}{100} = \$0.01$$

$$67¢ = \$\frac{67}{100} = \$0.67$$

$$243¢ = \$\frac{243}{100} = \$2.43$$

percent to decimal

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

$$67\% = \frac{67}{100} = 0.67$$

$$243\% = \frac{243}{100} = 2.43$$

Example 1 Write 3%, 45% and 125% in both fraction and decimal formats

3% is written as 3/100 in fraction format and as 0.03 in decimal format.

$$3\% = \frac{3}{100} = 3 \div 100 = 0.03$$

45% is written as 45/100 in fraction format and as 0.45 in decimal format.

$$45\% = \frac{45}{100} = 45 \div 100 = 0.45$$

125% is written as 125/100 in fraction format and as 1.25 in decimal format.

$$125\% = \frac{125}{100} = 125 \div 100 = 1.25$$

To convert from a percent to a decimal format remove the percent symbol % and divide by 100 which moves the decimal point two places to the left.

In future problems when converting a percent into decimal format simply remove the percent symbol % and move the decimal point two places to the left without actually writing the percent in fraction format.

Example 2 Write the following 8%, 53%, 230%, 4.25% and 100% as decimals

$$8\% = 0.08$$

*Remove % symbol and divide by 100
Move decimal point 2 places to the left*

$$53\% = 0.53$$

*Remove % symbol and divide by 100
Move decimal point 2 places to the left*

$$230\% = 2.30$$

*Remove % symbol and divide by 100
Move decimal point 2 places to the left*

$$4.25\% = 0.0425$$

*Remove % symbol and divide by 100
Move decimal point 2 places to the left*

$$100\% = 1.00$$

*Remove % symbol and divide by 100
Move decimal point 2 places to the left*

Since 100 cents equal \$1 it follows that 100 percent equals the whole number 1.

One hundred percent equaling to one in decimal form serves as the basis for converting a decimal into a percent. Below dollars are converted into cents by using the conversion factor that one dollar equals one hundred cents. This same process is repeated to convert a decimal into a percent by applying the principle that multiplying a number by one, written as 100%, leaves the number unchanged. Both converting dollars into cents and writing a decimal in percent format involve multiplying by one hundred which moves the decimal point two places to the right.

dollar to cent

$$\$0.05 = 0.05(100)\text{¢} = 5\text{¢}$$

$$\$0.86 = 0.86(100)\text{¢} = 86\text{¢}$$

$$\$1.42 = 1.42(100)\text{¢} = 142\text{¢}$$

decimal to percent

$$0.05 = 0.05(100)\% = 5\%$$

$$0.86 = 0.86(100)\% = 86\%$$

$$1.42 = 1.42(100)\% = 142\%$$

To convert from a decimal to a percent format insert the percent symbol % and multiply the decimal by 100 which moves the decimal point two places to the right.

Example 3 Write 0.49, 1.23 and 0.035 in percent format.

To convert the decimal 0.49 to a percent, insert the percent symbol % and multiply 0.49 by 100 which moves the decimal point two places to the right.

$$0.49 = 0.49(\mathbf{100})\% = 49\%$$

To convert the decimal 1.23 to a percent, insert the percent symbol % and multiply 1.23 by 100 which moves the decimal point two places to the right.

$$1.23 = 1.23(\mathbf{100})\% = 123\%$$

To convert the decimal 0.035 to a percent, insert the percent symbol % and multiply 0.035 by 100 which moves the decimal point two places to the right.

$$0.035 = 0.035(\mathbf{100})\% = 3.5\%$$

In the future when converting a decimal to a percent simply insert the percent symbol % and move the decimal point two places to the right without writing the multiplication by 100% step.

Example 4 Write 0.09, 0.39, 0.875 and 1.10 in percent format.

$$0.09 = 9\%$$

*Insert % symbol and multiply by 100
Move decimal point 2 places to the right*

$$0.39 = 39\%$$

*Insert % symbol and multiply by 100
Move decimal point 2 places to the right*

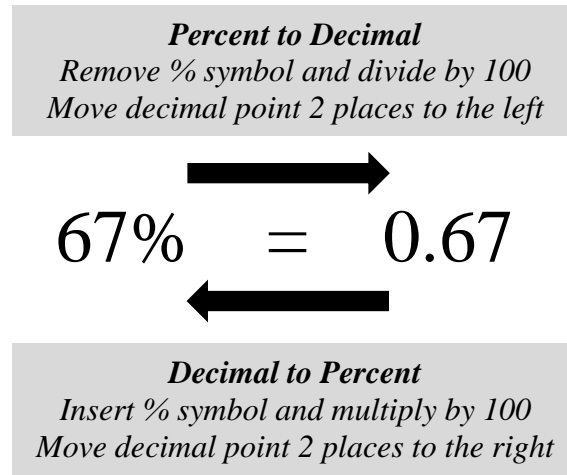
$$0.875 = 87.5\%$$

*Insert % symbol and multiply by 100
Move decimal point 2 places to the right*

$$1.10 = 110\%$$

*Insert % symbol and multiply by 100
Move decimal point 2 places to the right*

To convert a percent into decimal format remove the percent symbol % and divide by 100 which moves the decimal point two spaces to the left. To reverse this process and convert a decimal into percent format insert the percent symbol % and multiply by 100 which moves the decimal point two spaces to the right. The diagram below illustrates the relationship between the percent and decimal formats.



Example 5 Fill in the following table.

73.8% = 0.738

Remove % symbol and divide by 100
Move decimal point 2 places to the left

0.891 = 89.1%

Insert % symbol and multiply by 100
Move decimal point 2 places to the right

160% = 1.60

Remove % symbol and divide by 100
Move decimal point 2 places to the left

0.006 = 0.6%

Insert % symbol and multiply by 100
Move decimal point 2 places to the right

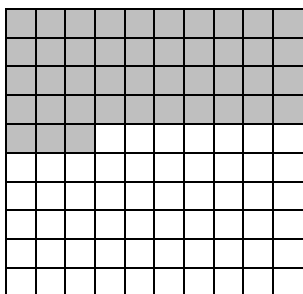
Percent	Decimal
73.8%	
	0.891
160%	
	0.006

Percent	Decimal
73.8%	0.738
89.1%	0.891
160%	1.60
0.6%	0.006

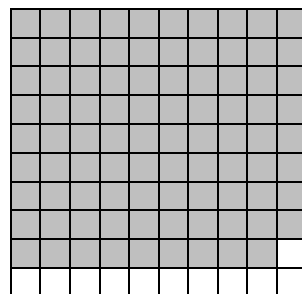
Exercises 5.2

1-2 Write the ratio of shaded to total boxes as a fraction, decimal, and percent.

1.



2.



3-8 Write the following in both fraction and decimal formats.

3. 27%

4. 97%

5. 123%

6. 245%

7. 3%

8. 100%

9-17 Convert from percent to decimal format.

9. 46%

10. 8%

11. 23.5%

12. 8.1%

13. 120%

14. 135%

15. 132.5%

16. 0.9%

17. 27.47%

18-26 Convert from decimal to percent format.

18. 0.75

19. 0.06

20. 0.452

21. 0.9165

22. 1.15

23. 2.5

24. 1.125

25. 0.0025

26. 1

27-29 Fill in the following tables.

27.

Percent	Decimal
12%	
	0.351
140%	
	0.085

28.

Percent	Decimal
45.1%	
	0.009
8.37%	
	2.358

29.

Percent	Decimal
0.7%	
	0.09
23.09%	
	1.5