

# RATIOS AND RATES: PERCENT\*

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## Abstract

This module is from Fundamentals of Mathematics by Denny Burzynski and Wade Ellis, Jr. This module discusses percents. By the end of the module students should understand the relationship between ratios and percents and be able to make conversions between fractions, decimals, and percents.

## 1 Section Overview

- Ratios and Percents
- The Relationship Between Fractions, Decimals, and Percents – Making Conversions

## 2 Ratios and Percents

### Ratio, Percent

We defined a **ratio** as a comparison, by division, of two pure numbers or two like denominate numbers. A most convenient number to compare numbers to is 100. Ratios in which one number is compared to 100 are called **percents**. The word *percent* comes from the Latin word "per centum." The word "per" means "for each" or "for every," and the word "centum" means "hundred." Thus, we have the following definition.

**Percent** means "for each hundred," or "for every hundred."

The symbol % is used to represent the word percent.

### 2.1 Sample Set A

#### Example 1

The ratio 26 to 100 can be written as 26%. We read 26% as "twenty-six percent."

#### Example 2

The ratio  $\frac{165}{100}$  can be written as 165%.

We read 165% as "one hundred sixty-five percent."

#### Example 3

The percent 38% can be written as the fraction  $\frac{38}{100}$ .

#### Example 4

The percent 210% can be written as the fraction  $\frac{210}{100}$  or the mixed number  $2\frac{10}{100}$  or 2.1.

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**Example 5**

Since one dollar is 100 cents, 25 cents is  $\frac{25}{100}$  of a dollar. This implies that 25 cents is 25% of one dollar.

**2.2 Practice Set A**

**Exercise 1**

Write the ratio 16 to 100 as a percent.

*(Solution on p. 7.)*

**Exercise 2**

Write the ratio 195 to 100 as a percent.

*(Solution on p. 7.)*

**Exercise 3**

Write the percent 83% as a ratio in fractional form.

*(Solution on p. 7.)*

**Exercise 4**

Write the percent 362% as a ratio in fractional form.

*(Solution on p. 7.)*

**3 The Relationship Between Fractions, Decimals, and Percents – Making Conversions**

Since a percent is a ratio, and a ratio can be written as a fraction, and a fraction can be written as a decimal, any of these forms can be converted to any other.

Before we proceed to the problems in Section 3.1 (Sample Set B) and Section 3.2 (Practice Set B), let’s summarize the conversion techniques.

**Conversion Techniques – Fractions, Decimals, Percents**

To Convert a Fraction	To Convert a Decimal	To Convert a Percent
To a decimal: Divide the numerator by the denominator	To a fraction: Read the decimal and reduce the resulting fraction	To a decimal: Move the decimal point 2 places to the left and drop the % symbol
To a percent: Convert the fraction first to a decimal, then move the decimal point 2 places to the right and affix the % symbol.	To a percent: Move the decimal point 2 places to the right and affix the % symbol	To a fraction: Drop the % sign and write the number “over” 100. Reduce, if possible.

**Table 1**

**3.1 Sample Set B**

**Example 6**

Convert 12% to a decimal.

$$12\% = \frac{12}{100} = 0.12$$

$$12\% = 12.\% = 0.12$$

Note that 

The % symbol is dropped, and the decimal point moves 2 places to the left.

**Example 7**

Convert 0.75 to a percent.

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

$$\mathbf{0.75 = 75\% = 75.}\%$$

Note that

The % symbol is affixed, and the decimal point moves 2 units to the right.

**Example 8**

Convert  $\frac{3}{5}$  to a percent.

We see in Example 7 that we can convert a decimal to a percent. We also know that we can convert a fraction to a decimal. Thus, we can see that if we first convert the fraction to a decimal, we can then convert the decimal to a percent.

$$\frac{3}{5} \rightarrow \begin{array}{r} .6 \\ 5 \overline{)3.0} \\ \underline{3\ 0} \\ 0 \end{array} \text{ or } \frac{3}{5} = 0.6 = \frac{6}{10} = \frac{60}{100} = 60\%$$

**Example 9**

Convert 42% to a fraction.

$$42\% = \frac{42}{100} = \frac{21}{50}$$

or

$$42\% = 0.42 = \frac{42}{100} = \frac{21}{50}$$

**3.2 Practice Set B**

**Exercise 5**

Convert 21% to a decimal.

*(Solution on p. 7.)*

**Exercise 6**

Convert 461% to a decimal.

*(Solution on p. 7.)*

**Exercise 7**

Convert 0.55 to a percent.

*(Solution on p. 7.)*

**Exercise 8**

Convert 5.64 to a percent.

*(Solution on p. 7.)*

**Exercise 9**

Convert  $\frac{3}{20}$  to a percent.

*(Solution on p. 7.)*

**Exercise 10**

Convert  $\frac{11}{8}$  to a percent

*(Solution on p. 7.)*

**Exercise 11**

Convert  $\frac{3}{11}$  to a percent.

*(Solution on p. 7.)*

**4 Exercises**

For the following 12 problems, convert each decimal to a percent.

**Exercise 12**

0.25

*(Solution on p. 7.)*

**Exercise 13**

0.36

**Exercise 14** (Solution on p. 7.)  
0.48

**Exercise 15**  
0.343

**Exercise 16** (Solution on p. 7.)  
0.771

**Exercise 17**  
1.42

**Exercise 18** (Solution on p. 7.)  
2.58

**Exercise 19**  
4.976

**Exercise 20** (Solution on p. 7.)  
16.1814

**Exercise 21**  
533.01

**Exercise 22** (Solution on p. 7.)  
2

**Exercise 23**  
14

For the following 10 problems, convert each percent to a decimal.

**Exercise 24** (Solution on p. 7.)  
15%

**Exercise 25**  
43%

**Exercise 26** (Solution on p. 7.)  
16.2%

**Exercise 27**  
53.8%

**Exercise 28** (Solution on p. 7.)  
5.05%

**Exercise 29**  
6.11%

**Exercise 30** (Solution on p. 7.)  
0.78%

**Exercise 31**  
0.88%

**Exercise 32** (Solution on p. 7.)  
0.09%

**Exercise 33**  
0.001%

For the following 14 problems, convert each fraction to a percent.

**Exercise 34** (Solution on p. 7.)  
 $\frac{1}{5}$

**Exercise 35**

$$\frac{3}{5}$$

**Exercise 36**

$$\frac{5}{8}$$

**Exercise 37**

$$\frac{1}{16}$$

**Exercise 38**

$$\frac{7}{25}$$

**Exercise 39**

$$\frac{16}{45}$$

**Exercise 40**

$$\frac{27}{55}$$

**Exercise 41**

$$\frac{15}{8}$$

**Exercise 42**

$$\frac{41}{25}$$

**Exercise 43**

$$6\frac{4}{5}$$

**Exercise 44**

$$9\frac{9}{20}$$

**Exercise 45**

$$\frac{1}{200}$$

**Exercise 46**

$$\frac{6}{11}$$

**Exercise 47**

$$\frac{35}{27}$$

For the following 14 problems, convert each percent to a fraction.

**Exercise 48**

80%

**Exercise 49**

60%

**Exercise 50**

25%

**Exercise 51**

75%

**Exercise 52**

65%

**Exercise 53**

18%

**Exercise 54**

12.5%

**Exercise 55**

37.5%

**Exercise 56**

512.5%

*(Solution on p. 7.)**(Solution on p. 7.)**(Solution on p. 8.)**(Solution on p. 8.)**(Solution on p. 8.)**(Solution on p. 8.)**(Solution on p. 8.)**(Solution on p. 8.)**(Solution on p. 8.)**(Solution on p. 8.)**(Solution on p. 8.)*

**Exercise 57**

937.5%

**Exercise 58**9.  $\bar{9}$  %*(Solution on p. 8.)***Exercise 59**55.  $\bar{5}$  %**Exercise 60**22.  $\bar{2}$  %*(Solution on p. 8.)***Exercise 61**63.  $\bar{6}$  %**4.1 Exercises for Review****Exercise 62**( here<sup>1</sup>) Find the quotient.  $\frac{40}{54} \div 8\frac{7}{21}$ .*(Solution on p. 8.)***Exercise 63**( here<sup>2</sup>)  $\frac{3}{8}$  of what number is  $2\frac{2}{3}$ ?**Exercise 64**( here<sup>3</sup>) Find the value of  $\frac{28}{15} + \frac{7}{10} - \frac{5}{12}$ .*(Solution on p. 8.)***Exercise 65**( here<sup>4</sup>) Round 6.99997 to the nearest ten thousandths.**Exercise 66**( here<sup>5</sup>) On a map, 3 inches represent 40 miles. How many inches represent 480 miles?*(Solution on p. 8.)*

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<sup>1</sup>"Introduction to Fractions and Multiplication and Division of Fractions: Division of Fractions" <<http://cnx.org/content/m34929/latest/>>

<sup>2</sup>"Introduction to Fractions and Multiplication and Division of Fractions: Applications Involving Fractions" <<http://cnx.org/content/m34930/latest/>>

<sup>3</sup>"Addition and Subtraction of Fractions, Comparing Fractions, and Complex Fractions: Addition and Subtraction of Fractions with Unlike Denominators" <<http://cnx.org/content/m34935/latest/>>

<sup>4</sup>"Decimals: Rounding Decimals" <<http://cnx.org/content/m34959/latest/>>

<sup>5</sup>"Ratios and Rates: Applications of Proportions" <<http://cnx.org/content/m34982/latest/>>

## Solutions to Exercises in this Module

**Solution to Exercise (p. 2)**

16%

**Solution to Exercise (p. 2)**

195%

**Solution to Exercise (p. 2)**

$\frac{83}{100}$

**Solution to Exercise (p. 2)**

$\frac{362}{100}$  or  $\frac{181}{50}$

**Solution to Exercise (p. 3)**

0.21

**Solution to Exercise (p. 3)**

4.61

**Solution to Exercise (p. 3)**

55%

**Solution to Exercise (p. 3)**

564%

**Solution to Exercise (p. 3)**

15%

**Solution to Exercise (p. 3)**

137.5%

**Solution to Exercise (p. 3)**

27.27%

**Solution to Exercise (p. 3)**

25%

**Solution to Exercise (p. 4)**

48%

**Solution to Exercise (p. 4)**

77.1%

**Solution to Exercise (p. 4)**

258%

**Solution to Exercise (p. 4)**

1,618.14%

**Solution to Exercise (p. 4)**

200%

**Solution to Exercise (p. 4)**

0.15

**Solution to Exercise (p. 4)**

0.162

**Solution to Exercise (p. 4)**

0.0505

**Solution to Exercise (p. 4)**

0.0078

**Solution to Exercise (p. 4)**

0.0009

**Solution to Exercise (p. 4)**

20%

**Solution to Exercise (p. 5)**

62.5%

**Solution to Exercise (p. 5)**

28%

**Solution to Exercise (p. 5)**

49. $\overline{09}$ %

**Solution to Exercise (p. 5)**

164%

**Solution to Exercise (p. 5)**

945%

**Solution to Exercise (p. 5)**

54. $\overline{54}$ %

**Solution to Exercise (p. 5)**

$\frac{4}{5}$

**Solution to Exercise (p. 5)**

$\frac{1}{4}$

**Solution to Exercise (p. 5)**

$\frac{13}{20}$

**Solution to Exercise (p. 5)**

$\frac{1}{8}$

**Solution to Exercise (p. 5)**

$\frac{41}{8}$  or  $5\frac{1}{8}$

**Solution to Exercise (p. 6)**

$\frac{1}{10}$

**Solution to Exercise (p. 6)**

$\frac{2}{9}$

**Solution to Exercise (p. 6)**

$\frac{4}{45}$

**Solution to Exercise (p. 6)**

$\frac{129}{60}$  or  $2\frac{9}{60} = 2\frac{3}{20}$

**Solution to Exercise (p. 6)**

36 inches