Ratios

LEARNING OBJECTIVES

Upon completion of the materials provided in this chapter, you will be able to perform computations accurately by mastering the following mathematical concepts:

1. Changing a proper fraction, decimal fraction, and percent to a ratio reduced to lowest terms
2. Changing a ratio to a proper fraction, a decimal fraction, and a percent

Study the introductory material on ratios. The processes for the calculation of ratio problems are listed in steps. Memorize the steps for each calculation before beginning the work sheet. Review previous chapters on fractions, decimals, and percents as necessary. Complete the work sheet at the end of this chapter, which provides for extensive practice in the manipulation of ratios. Check your answers. If you have difficulties, go back and review the steps for that type of calculation. When you feel ready to evaluate your learning, take the first posttest. Check your answers. An acceptable score as indicated on the posttest signifies that you are ready for the next chapter. An unacceptable score signifies a need for further study before taking the second posttest.

A **ratio** is another way of indicating a relationship between two numbers. In other words, it is another way to express a fraction. A ratio indicates *division*. The numerator is the first number listed.

ALERT

- A ratio is another way to represent a fraction.
- A ratio indicates DIVISION.
- The numerator is the first number listed.

EXAMPLE 1: ¾ written as a ratio is 3 : 4
In reading a ratio, one reads the colon as "is to." The example would then be read as "three is to four."

EXAMPLE 2: 7 written as a ratio is 7 : 1
To express any whole number as a ratio, the number following the colon is *always* 1. The example would be read as "seven is to one."

CHANGING A PROPER FRACTION TO A RATIO REDUCED TO LOWEST TERMS

1. Reduce the fraction to lowest terms.
2. Write the numerator of the fraction as the first number of the ratio.

3. Place a colon after the first number.
4. Write the denominator of the fraction as the second number of the ratio.

EXAMPLE 1: 4/12

Step 1. 4/12 reduced to lowest terms equals 1/3

Step 2. 1/3 written as a ratio is 1 : 3

EXAMPLE 2: 1/1000/1/10

Step 1. $\frac{1}{1000} \div \frac{1}{10} =$

Step 2. $\frac{1}{\cancel{1000}\,100} \times \frac{\overset{1}{\cancel{10}}}{1} = \frac{1}{100}$

Step 3. 1/1000/1/10 reduced to lowest terms equals 1/100

Step 4. 1/100 written as a ratio is 1 : 100

CHANGING A DECIMAL FRACTION TO A RATIO REDUCED TO LOWEST TERMS

1. Express the decimal fraction as a proper fraction reduced to lowest terms.
2. Write the numerator of the fraction as the first number of the ratio.
3. Place a colon after the first number.
4. Write the denominator of the fraction as the second number of the ratio.

EXAMPLE 1: 0.85

Step 1. $\frac{85}{100} = \frac{17}{20}$ (reduced to lowest terms)

Step 2. $\frac{17}{20}$ written as a ratio is 17 : 20

EXAMPLE 2: 0.125

Step 1. $\frac{125}{1000} = \frac{1}{8}$ (reduced to lowest terms)

Step 2. $\frac{1}{8}$ written as a ratio is 1 : 8

CHANGING A PERCENT TO A RATIO REDUCED TO LOWEST TERMS

1. Express the percent as a proper fraction reduced to lowest terms.
2. Write the numerator of the fraction as the first number of the ratio.
3. Place a colon after the first number.
4. Write the denominator of the fraction as the second number of the ratio.

EXAMPLE 1: 30%

Step 1. $\frac{30}{100} = \frac{3}{10}$ (reduced to lowest terms)

Step 2. $\frac{3}{10}$ written as a ratio is 3 : 10

EXAMPLE 2: ½%

Step 1. $\frac{\frac{1}{2}}{100} =$

Step 2. $\frac{1}{2} \div \frac{100}{1} =$

Step 3. $\frac{1}{2} \times \frac{1}{100} = \frac{1}{200}$

Step 4. $\frac{1}{200}$ written as a ratio is 1 : 200

EXAMPLE 3: 3⁹⁄₁₀%

Step 1. $\frac{3\frac{9}{10}}{100} =$

Step 2. $\frac{39}{10} \div \frac{100}{1} =$

Step 3. $\frac{39}{10} \times \frac{1}{100} = \frac{39}{1000}$

Step 4. $\frac{39}{1000}$ written as a ratio is 39 : 1000

CHANGING A RATIO TO A PROPER FRACTION REDUCED TO LOWEST TERMS

1. Write the first number of the ratio as the numerator.
2. Write the second number of the ratio as the denominator.
3. Reduce to lowest terms.

EXAMPLE 1: 9 : 15

$\frac{9}{15} = \frac{3}{5}$ (reduced to lowest terms)

EXAMPLE 2: 11 : 22

$\frac{11}{22} = \frac{1}{2}$ (reduced to lowest terms)

CHANGING A RATIO TO A DECIMAL FRACTION

Divide the first number of the ratio by the second number of the ratio, using long division.

EXAMPLE 1: 4 : 5

Step 1.
$$5\overline{)4.0}\quad 0.8$$
$$\underline{4\ 0}$$

Step 2. 4 : 5 written as a decimal is 0.8

EXAMPLE 2: 3½ : 2¼

Step 1. 3.5 : 2.25

Step 2.
$$2.25\overline{)3.50\wedge 000}\quad 1.555$$
$$\underline{2\ 25}$$
$$1\ 25\ \ 0$$
$$\underline{1\ 12\ \ 5}$$
$$12\ \ 50$$
$$\underline{11\ \ 25}$$
$$1\ \ 250$$
$$\underline{1\ \ 125}$$

Step 3. 3½ : 2¼ written as a decimal is 1.555

CHANGING A RATIO TO A PERCENT

1. Express the ratio as a proper fraction or a decimal fraction, whichever you prefer to work with.
2. Multiply by 100.
3. Add the percent sign (%).

EXAMPLE 1: 3 : 5

Changing to a proper fraction:

Step 1. $\frac{3}{\cancel{5}_{1}} \times \frac{\overset{20}{\cancel{100}}}{1} = \frac{60}{1}$

Step 2. 60%

Changing to a decimal fraction:

Step 1.
$$5\overline{)3.0}\quad 0.6$$
$$\underline{3\,0}$$

Step 2. $0.6 \times 100 = 60$

Step 3. 60%

EXAMPLE 2: 60 : 180

Changing to a proper fraction:

Step 1. $\frac{60}{180} = \frac{1}{3}$

Step 2. $\frac{1}{3} \times \frac{100}{1} = \frac{100}{3} = 33\frac{1}{3}$

Step 3. $33\frac{1}{3}\%$

Changing to a decimal fraction:

Step 1.
$$180\overline{)60.000}\quad 0.333$$
$$\begin{array}{r} 54\,0 \\ \hline 6\,00 \\ 5\,40 \\ \hline 600 \\ 540 \\ \hline 600 \\ 540 \\ \hline 60 \end{array}$$

Step 2. $0.333 \times 100 = 33.3$

Step 3. 33.3%

WORK SHEET

DIRECTIONS: Change the following fractions to ratios reduced to lowest terms.

1. $9/12$ _____ 2. $4/6$ _____ 3. $11/22$ _____

4. $56/100$ _____ 5. $20/50$ _____ 6. $310/1000$ _____

7. $10/16$ _____ 8. $5/6 / 3\frac{1}{3}$ _____ 9. $1\frac{3}{5} / 2\frac{7}{10}$ _____

10. $1/10 / 1/100$ _____ 11. $14/30 / 2$ _____ 12. $3\frac{1}{3} / 3\frac{1}{3}$ _____

DIRECTIONS: Change the following decimal fractions to ratios reduced to lowest terms.

1. 0.896 _____ 2. 0.96 _____ 3. 0.06 _____

4. 0.6 _____ 5. 0.4032 _____ 6. 0.74 _____

7. 0.166 _____ 8. 0.26 _____ 9. 0.492 _____

10. 0.95 _____ 11. 0.235 _____ 12. 0.172 _____

DIRECTIONS: Change the following percents to ratios reduced to lowest terms.

1. 10% _____ 2. $33\frac{1}{3}\%$ _____ 3. $\frac{3}{8}\%$ _____

4. $2\frac{7}{10}\%$ _____ 5. 44% _____ 6. 15.7% _____

7. $7\frac{3}{4}\%$ _____ 8. 0.44% _____ 9. 7.8% _____

10. 1% _____ 11. $\frac{3}{5}\%$ _____ 12. $3\frac{3}{7}\%$ _____

DIRECTIONS: Change the following ratios to fractions reduced to lowest terms.

1. 4 : 64 _____ 2. 4 : 800 _____ 3. 3 : 150 _____

4. $\frac{3}{8} : \frac{1}{4}$ _____ 5. $\frac{8}{12} : \frac{2}{3}$ _____ 6. $2\frac{1}{2} : 7\frac{1}{2}$ _____

7. $\frac{4}{5} : \frac{1}{4}$ _____ 8. $\frac{1}{10} : \frac{4}{20}$ _____ 9. $\frac{4}{75} : \frac{3}{10}$ _____

10. 0.68 : 0.44 _____ 11. 1.85 : 3.35 _____ 12. 1.64 : 2.54 _____

DIRECTIONS: Change the following ratios to decimal numbers.

1. 7 : 14 _____
2. 5 : 20 _____
3. 3 : 8 _____
4. 11 : 33 _____
5. $\frac{5}{8} : \frac{1}{10}$ _____
6. $\frac{1}{1000} : \frac{1}{500}$ _____
7. $\frac{3}{4} : \frac{1}{2}$ _____
8. $\frac{3}{1000} : \frac{3}{100}$ _____
9. 2 : 5 _____
10. $\frac{1}{2} : \frac{5}{9}$ _____
11. 7 : 259 _____
12. $1\frac{2}{5} : \frac{12}{30}$ _____

DIRECTIONS: Change the following ratios to percents.

1. 2 : 4 _____
2. 7 : 231 _____
3. 25 : 250 _____
4. 30 : 150 _____
5. $1\frac{1}{4} : 3\frac{3}{8}$ _____
6. 1 : 1000 _____
7. 0.15 : 0.6 _____
8. $\frac{5}{16} : \frac{3}{5}$ _____
9. 1 : 500 _____
10. $1\frac{8}{12} : 2\frac{3}{6}$ _____
11. 2.5 : 4.5 _____
12. 4 : $\frac{3}{16}$ _____

ANSWERS ON P. 88.

NAME _____

DATE _____

ACCEPTABLE SCORE 29

YOUR SCORE _____

CHAPTER 4
Ratios

POSTTEST 1

DIRECTIONS: Convert to equivalents.

	Ratio	Fraction	Decimal	Percent
1.	42 : 48			
2.			0.004	
3.		$13/20$		
4.				$2\frac{1}{4}\%$
5.			0.35	
6.		$6/25$		
7.	$3/8 : 5/9$			
8.				0.3%
9.			0.205	
10.		$4/11$		

ANSWERS ON P. 88.

NAME _____

DATE _____

ACCEPTABLE SCORE 29

YOUR SCORE _____

POSTTEST 2

DIRECTIONS: Convert to equivalents.

	Ratio	Fraction	Decimal	Percent
1.	7 : 10			
2.		$\frac{5}{16}$		
3.			0.075	
4.				6%
5.				$\frac{3}{8}\%$
6.		$\frac{1}{150}$		
7.			0.007	
8.	6 : 21			
9.			0.322	
10.				18.2%

ANSWERS ON P. 89.

ANSWERS

CHAPTER 4 Ratios—Pretest, p. 75

1. 1/3, 0.3333, 33.33%
2. 143 : 200, 143/200, 71.5%
3. 2 : 5, 0.4, 40%
4. 1 : 8, 1/8, 0.125
5. 1/20, 0.05, 5%
6. 5 : 32, 0.15625, 15.625%
7. 143 : 500, 143/500, 28.6%
8. 5 : 7, 5/7, 0.714
9. 13 : 80, 13/80, 0.1625
10. 231 : 500, 231/500, 46.2%

CHAPTER 4 Ratios—Work Sheet, pp. 81–83

Fractions to Ratios, *p. 81*

1. 3 : 4
2. 2 : 3
3. 1 : 2
4. 14 : 25
5. 2 : 5
6. 31 : 100
7. 5 : 8
8. 1 : 4
9. 16 : 27
10. 10 : 1
11. 7 : 30
12. 1 : 1

Decimals to Ratios, *p. 81*

1. 112 : 125
2. 24 : 25
3. 3 : 50
4. 3 : 5
5. 252 : 625
6. 37 : 50
7. 83 : 500
8. 13 : 50
9. 123 : 250
10. 19 : 20
11. 47 : 200
12. 43 : 250

Percents to Ratios, *p. 82*

1. 1 : 10
2. 1 : 3
3. 3 : 800
4. 27 : 1000
5. 11 : 25
6. 157 : 1000
7. 31 : 400
8. 11 : 2500
9. 39 : 500
10. 1 : 100
11. 3 : 500
12. 6 : 175

Ratios to Fractions, *p. 82*

1. 1/16
2. 1/200
3. 1/50
4. 1 1/2
5. 1
6. 1/3
7. 3 1/5
8. 1/2
9. 8/45
10. 1 6/11
11. 37/67
12. 82/127

Ratios to Decimal Numbers, *p. 83*

1. 0.5
2. 0.25
3. 0.375
4. 0.3333
5. 6.25
6. 0.5
7. 1.5
8. 0.1
9. 0.4
10. 0.9
11. 0.027
12. 3.5

Ratios to Percents, *p. 83*

1. 50%
2. 3 1/33%, 3.0303%
3. 10%
4. 20%
5. 37 1/27%, 37.037%
6. 1/10%, 0.1%
7. 25%
8. 52 1/12%, 52.0833%
9. 1/5%, 0.2%
10. 66 2/3%, 66.6666%
11. 55 5/9%, 55.5555%
12. 2133 1/3%, 2133.3333%

CHAPTER 4 Ratios—Posttest 1, p. 85

1. 7/8, 0.875, 87.5%
2. 1 : 250, 1/250, 0.4%
3. 13 : 20, 0.65, 65%
4. 9 : 400, 9/400, 0.0225
5. 7 : 20, 7/20, 35%
6. 6 : 25, 0.24, 24%
7. 27/40, 0.675, 67.5%
8. 3 : 1000, 3/1000, 0.003
9. 41 : 200, 41/200, 20.5%
10. 4 : 11, 0.3636, 36.36%

CHAPTER 4 Ratios—Posttest 2, p. 87

1. $\frac{7}{10}$, 0.7, 70%
2. 5 : 16, 0.3125, 31.25%
3. 3 : 40, $\frac{3}{40}$, 7.5%
4. 3 : 50, $\frac{3}{50}$, 0.06
5. 3 : 800, $\frac{3}{800}$, 0.00375
6. 1 : 150, 0.0066, 0.66%
7. 7 : 1000, $\frac{7}{1000}$, 0.7%
8. $\frac{2}{7}$, 0.2857, 28.57%
9. 161 : 500, $\frac{161}{500}$, 32.2%
10. 91 : 500, $\frac{91}{500}$, 0.182