

Important Concepts . . .

# Preview Review



**Mathematics    Grade 6    TEACHER KEY**

**W1 - Lesson 4: Ratios and Percents**

## Important Concepts of Grade 6 Mathematics

W1 - Lesson 1 .....	Basic Facts, Basic Operations, and Integers
W1 - Lesson 2 .....	Place Value, Whole Numbers, Decimals, and Common Fractions
W1 - Lesson 3 .....	Improper Fractions and Mixed Numbers
W1 - Lesson 4 .....	Ratios and Percents
W1 - Lesson 5 .....	Number Operations with Decimals
W1 - Quiz	
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W3 - Lesson 1 .....	Transformations
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W3 - Lesson 3 .....	Collecting and Analyzing Data
W3 - Lesson 4 .....	Number Patterns, Magic Squares, and Problem Solving
W3 - Lesson 5 .....	Probability and Outcomes
W3 - Quiz	

**Materials Required: A textbook is not needed. This is a stand-alone course.**

Mathematics Grade 6

Version 5

Preview/Review W1 - Lesson 4 TEACHER KEY

Publisher: Alberta Distance Learning Centre

Author: Elgin Pawlak

In-House Teacher: Sue Rees

Project Coordinator: Dennis McCarthy

Preview/Review Publishing Coordinating Team: Nina Johnson,

Laura Renkema, and Donna Silgard



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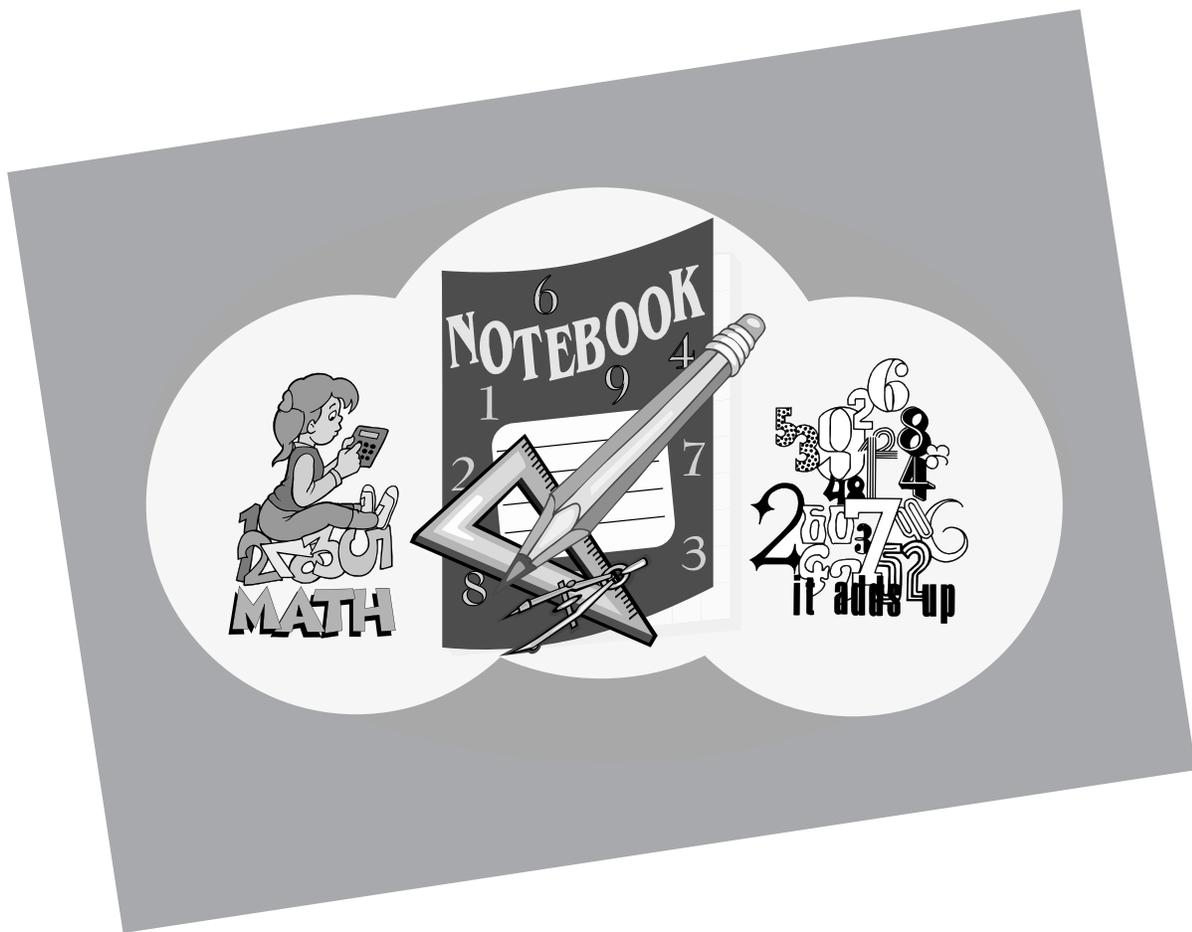
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# Preview/Review Concepts for Grade Six Mathematics

## *TEACHER KEY*



*W1 - Lesson 4:  
Ratios and Percents*

# OBJECTIVES

By the end of this lesson, you should

- change fractions and mixed numbers to percent
- calculate percent of specific numbers
- create proportional ratios

## GLOSSARY

**percent** - a comparison of a number to 100; means *out of one hundred*

**ratio** - a comparison of two or more numbers or quantities

**proportional ratios** - ratios that are equivalent' similar to equivalent fractions

## W1 - Lesson 4: Ratios and Percents

Welcome to W1 - Lesson 4! This lesson is about ratios and the different ways of writing them. You will be using the skills you reviewed earlier, including your understanding of lowest terms fractions. The lesson has three topics:

- Understanding Ratios and Changing Decimals and Mixed Numbers into Percents
- Finding the Percent of a Number and Creating Proportional Ratios
- Using the Cross-Products Method in Problem Solving

Ratios are very useful in problem solving.

### Understanding Ratios and Changing Decimals and Mixed Numbers into Percents

A **ratio** is a comparison of two or more numbers or quantities. Consider this group of triangles and circles.



The ratio of  $\triangle$  to  $\circ$  is 4 to 3.

A ratio can be written with a colon, such as **4:3**.

A ratio can be written as a fraction, such as  $\frac{4}{3}$ .

A ratio can be written in words, such as **four to three**.

**Percent** means *out of one hundred*. Because percent deals with parts of 100, it really is another way to write **hundredths**. We can show hundredths as a percent, as a decimal, or as a fraction.

**To change a decimal to a percent**, read the number carefully, then write it as a proper fraction. 0.41 equals forty-one hundredths.

We can write it as  $\frac{41}{100}$  or forty-one out of 100 or 41%.

0.8 equals eight tenths or eighty hundredths (eighty out of one hundred). We can write it as 0.8, 0.80 or 80%.

**To change a percent to a fraction**, read the number correctly.

25% is twenty-five hundredths. We can write it as 0.25 or  $\frac{25}{100}$ .

Then, you can change it to lowest-terms by dividing numerator and denominator by 25.

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

88% is eighty-eight hundredths. We can write it as 0.88 or  $\frac{88}{100}$ .

$$\frac{88 \div 4}{100 \div 4} = \frac{22}{25}$$

Whole numbers represent complete items. They represent all of something (a whole pie, a whole deck of cards, or a whole watermelon). The whole number 1 equals 100%. Similarly, 2 equals 200%, 3 equals 300%, and so on.

**To change a mixed number to a percent**, combine the fraction as tenths, hundredths, etc. with the whole number.

$$5.34 = 5 + \frac{34}{100} = 500\% + 34\% = 534\%.$$

The mixed number  $5.34 = 534\%$ .

$$12.57 = 12 + \frac{57}{100} = 1\ 200\% + 57\% = 1\ 257\%.$$

The mixed number  $12.57 = 1\ 257\%$ .

### Questions

1. Write the following ratios in two different ways.

**Examples:** 2 to 7 = 2:7 or  $\frac{2}{7}$ ;  $\frac{9}{5}$  = 9 to 5 or 9:5

a. 1 to 8     ***1 : 8 and  $\frac{1}{8}$***

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b. 2:5      ***$\frac{2}{5}$  and 2 : 5***

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c.  $\frac{4}{8}$      ***4 : 8 and 4 to 8***

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d. 16:5      ***$\frac{16}{5}$  and 16 to 5***

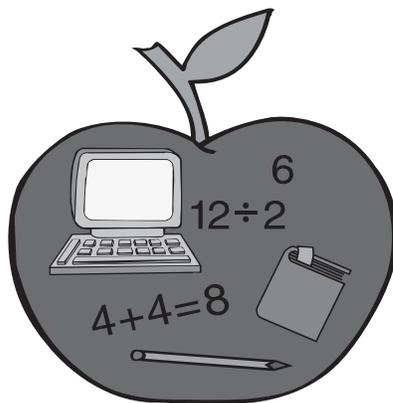
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e. 11 to 8     ***11 : 8 and  $\frac{11}{8}$***

---

f.  $\frac{10}{3}$      ***10 to 3 and 10 : 3***

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2. Change the following fractions, mixed numbers, and decimals to percents.

**Examples:**  $\frac{7}{10} = \frac{70}{100} = 70\%$ ,  $\frac{11}{100} = 11\%$ ,  $0.88 = 88\%$

$$3.55 = 3 + \frac{55}{100} = 300\% + 55\% = 355\%$$

$$6 \frac{33}{100} = 600\% + 33\% = 633\%$$

a.  $\frac{22}{100} = \underline{22\%}$

g.  $\frac{43}{100} = \underline{43\%}$

b.  $\frac{98}{100} = \underline{98\%}$

h.  $6 \frac{17}{50} = \underline{634\%}$

c.  $\frac{121}{100} = \underline{121\%}$

i.  $0.82 = \underline{82\%}$

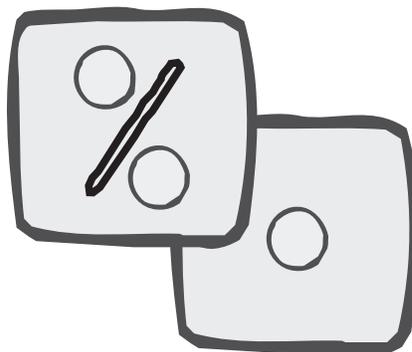
d.  $7 \frac{8}{10} = \underline{780\%}$

j.  $2.48 = \underline{248\%}$

e.  $3 \frac{4}{25} = \underline{316\%}$

k.  $5.75 = \underline{575\%}$

f.  $8 \frac{9}{20} = \underline{845\%}$



3. Convert the following percents to fractions or mixed numbers:

**Examples:**  $73\% = \frac{73}{100}$        $803\% = 8 \frac{3}{100}$

a.  $99\% = \frac{99}{100}$       b.  $161\% = 1 \frac{61}{100}$

c.  $73\% = \frac{73}{100}$       d.  $701\% = 7 \frac{1}{100}$

e.  $438\% = 4 \frac{38}{100}$

4. Convert the following percents to fractions or mixed numbers. Write the fractions in lowest terms.

**Examples:**  $35\% = \frac{35}{100} = \frac{7}{20}$  The fraction  $\frac{7}{20}$  is a lowest term fraction.

$884\% = 8 + \frac{84}{100} = 8 \frac{21}{25}$  The fraction  $\frac{21}{25}$  is a lowest term fraction.

a.  $65\% = \frac{65}{100} = \frac{13}{20}$       b.  $250\% = 2 \frac{50}{100} = 2 \frac{1}{2}$

c.  $555\% = 5 \frac{55}{100} = 5 \frac{11}{20}$       d.  $912\% = 9 \frac{12}{100} = 9 \frac{3}{25}$

e.  $640\% = 6 \frac{40}{100} = 6 \frac{2}{5}$

5. Convert the following percents to decimals.

**Examples:**  $29\% = 0.29$  and  $250\% = 2.50$

a.  $76\% = \underline{\mathbf{0.76}}$

b.  $22\% = \underline{\mathbf{0.22}}$

c.  $259\% = \underline{\mathbf{2.59}}$

d.  $408\% = \underline{\mathbf{4.08}}$

e.  $366\% = \underline{\mathbf{3.66}}$

6. On her Social Studies exam, Sally had 40 of 50 answers correct. What percent did she get on her exam?

$$\frac{40}{50} = \frac{80}{100} = 80\%$$

7. In an archery contest, Kim shot 13 of a possible 25 bull's-eyes. What percent of Kim's shots were bull's-eyes?

$$\frac{13}{25} = \frac{52}{100} = 52\%$$

8. A Grade 6 classroom has 12 girls and 8 boys. Six girls wore white socks, two wore black socks, and four wore red socks. Two boys wore white socks, five wore black socks, and one wore red socks. Use this information to answer the following questions.

a. What percent of the class wore white socks?

$$\frac{8}{20} = \frac{40}{100} = 40\%$$



b. What percent of the class wore black socks?

$$\frac{7}{20} = \frac{35}{100} = 35\%$$



c. What percent of the class wore red socks?

$$\frac{5}{20} = \frac{25}{100} = 25\%$$

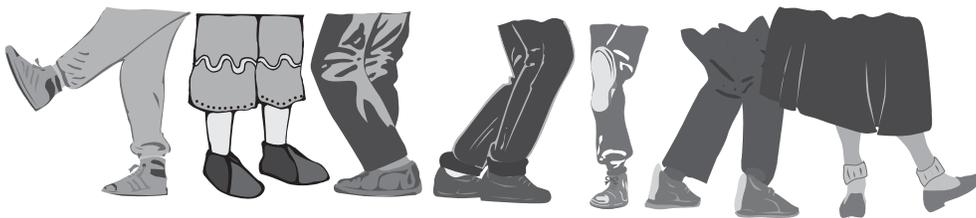
d. What percent of the girls wore white socks?

$$\frac{6}{12} = \frac{50}{100} = 50\%$$



e. What percent of the boys wore white socks?

$$\frac{2}{8} = \frac{25}{100} = 25\%$$



## Finding the Percent of a Number and Creating Proportional Ratios

To find the **percent** of a number, change the percent to a decimal and then multiply the decimal by the number.

Find 4% of 250.

4% = 0.04 (change the percent to a decimal)

$0.04 \times 250$  (multiply the decimal times the number)

Answer: 10.000 or 10

Find 24% of 600.

24% = 0.24 (change the percent to a decimal)

$0.24 \times 600$  (multiply the decimal times the number)

Answer: 144.00 or 144

**Proportional ratios** are ratios that are equal to each other. These are also called **equivalent** ratios because they are made the same way as equivalent fractions. We can multiply or divide both numbers of the ratio by the same whole number to make a proportional ratio.

**Remember:** *Proportional ratios are shown with an equals sign.*

$\frac{4}{5} = \frac{12}{15}$  We create  $\frac{12}{15}$  by multiplying both parts of  $\frac{4}{5}$  by 3.

This ratio can also be written 4:5 = 12:15 or 4 to 5 = 12 to 15.

15:20 =  $\frac{3}{4}$  We create  $\frac{3}{4}$  by dividing both parts of 15:20 by 5.

This ratio can also be written  $\frac{15}{20} = \frac{3}{4}$  or 15 to 20 = 3 to 4.

## Questions

1. Multiply by 5 to create a proportional ratio for each of the following:

**Example:**  $\frac{2 \times 5}{5 \times 5} = \frac{10}{25}$

a.  $\frac{1}{7} = \frac{5}{35}$

b.  $6:5 = 30:25$

c.  $\frac{6}{13} = \frac{30}{65}$

d.  $17:6 = 85:30$

e.  $5 \text{ to } 9 = 25 \text{ to } 45$

f.  $\frac{8}{3} = \frac{40}{15}$

g.  $20 \text{ to } 6 = 100 \text{ to } 30$

2. Divide by 3 to create a proportional ratio for each of the following:

**Example:**  $\frac{6 \div 3}{3 \div 3} = \frac{2}{1}$

a.  $\frac{12}{3} = \frac{4}{1}$

b.  $9 \text{ to } 6 = 3 \text{ to } 2$

c.  $12:15 = 4:5$

d.  $18 \text{ to } 21 = 6 \text{ to } 7$

e.  $\frac{24}{30} = \frac{8}{10}$

f.  $60:36 = 20:12 \text{ or } 10:6 \text{ or } 5:3$

3. Are the following pairs of numbers proportional ratios? Write **proportional** or **not proportional** in the answer space.

a.  $\frac{1}{4} = \frac{4}{16}$                    **proportional**                  

b.  $5:3 = 25:15$                    **proportional**                  

c.  $\frac{13}{2} = \frac{20}{4}$                    **not proportional**                  

d.  $24:18 = 8:6$                    **proportional**                  

e.  $\frac{4}{10} = \frac{400}{1\ 000}$                    **proportional**                  

f.  $\frac{44}{100} = \frac{5}{10}$                    **not proportional**                  

4. Write the following ratios in lowest terms.

a.  $\frac{2}{14} = \underline{\underline{\frac{1}{7}}}$

b.  $42:24 = \underline{\underline{7:4}}$

c.  $100 \text{ to } 25 = \underline{\underline{4 \text{ to } 1}}$

d.  $\frac{4}{30} = \underline{\underline{\frac{2}{15}}}$

e.  $8:40 = \underline{\underline{1:5}}$

5. A class has 14 boys and 18 girls. What is the ratio of girls to boys?

***18:14 or 9:7 (in lowest-terms)***

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6. A case of soft drinks contains 13 Cola, 6 Ginger Ale and 7 Orange. What is the ratio of the Orange soft drinks to the total number of bottles?

**7:26**

7. Calculate the answers for the following questions.

a. Find 66% of 450:  **$0.66 \times 450 = 297$**

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b. Find 40 percent of 3 000:  **$0.4 \times 3\ 000 = 1\ 200$**

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c. Find 120% of 665:  **$1.20 \times 665 = 798$**

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d. Find 225 percent of 244:  **$2.25 \times 244 = 549$**

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e. Find 75% of 6 500:  **$0.75 \times 6\ 500 = 4\ 875$**

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8. Sally has \$1 000 in the Savings and Loan Bank. The bank pays 4% interest per year. How much money will Sally have after one year?

**$0.04 \times \$1\ 000 = \$40 + \$1\ 000 = \$1040.00$**

9. During the 2002–2003 regular hockey season, the Mighty Mustangs scored on 16% of their power play chances. If they had 325 power play chances, how many power play goals did they score?

$$0.16 \times 325 = 52 \text{ power play goals.}$$

10. Joe's Hardware Store is having a spring sale. All hammers will be sold at a 25% discount. The regular price of a ballpeen hammer is \$24.80. What will the sale price be? (Note: This requires two operations.)

$$0.25 \times \$24.80 = \$6.20, \$24.80 - \$6.20 = \$18.60 \text{ is the sale price.}$$

## Using the Cross-Products Method in Problem Solving

In proportional ratios we find the cross product by multiplying the numerator of one ratio by the denominator of the other ratio.

**Example:**  $\frac{3}{5} = \frac{9}{15}$       $\frac{3}{5} \begin{matrix} \swarrow \searrow \\ \nearrow \nwarrow \end{matrix} \frac{9}{15}$       $3 \times 15 = 45$   
 $5 \times 9 = 45$  : Cross Products

In proportional ratios the cross products are always equal to each other. In this example  $45 = 45$ .

When we know three numbers of a proportional ratio, we can calculate the fourth number. First, calculate the cross product that is available. Then, divide the cross product by the other number that is given.

**Problem:**

Twenty-five kilograms of potatoes sell for \$10.25. How much will 5 kg cost?

**Solution:**

Let N = the cost of 5 kg of potatoes.

First, set up the ratio:

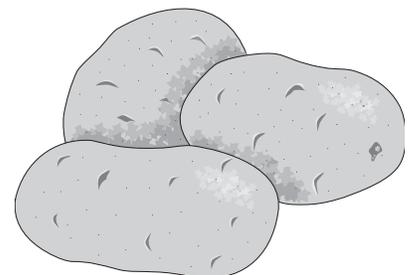
$$\frac{25 \text{ kg (number of kg)}}{\$10.25 \text{ (cost)}} = \frac{5 \text{ kg}}{N} \quad \text{or} \quad \frac{25}{\$10.25} = \frac{5}{N}$$

Second, calculate the cross product:  $\$10.25 \times 5 = \$51.25$

Then, calculate N by dividing the cross product by the unused number. In this example divide by 25.

$$\$51.25 \div 25 \text{ kg} = \$2.05$$

The answer: 5 kg of potatoes cost \$2.05.



## Questions

1. For the following questions, create a proportional ratio. Then, use the cross product method to calculate the answer. Let  $N$  = the number you are trying to find.

- a. A bus travels 512 km in 8 hours. What is the distance the bus will travel in 3 hours?

$$\frac{512 \text{ km}}{8 \text{ hrs}} = \frac{N}{3 \text{ hrs}}$$

1.  $512 \times 3 = 1\,536$

2.  $1\,536 \div 8 = 192 \text{ km in 3 hrs.}$

- b. Marty earned \$180.00 for 20 hours of work. What did he earn for one hour of work?

$$\frac{\$180}{20 \text{ hrs}} = \frac{N}{1 \text{ hr}}$$

1.  $180 \times 1 = 180$

2.  $180 \div 20 = \$9.00 \text{ per hour.}$

- c. A recipe using 660 grams of cheese serves 12 people. Using the same recipe, how much cheese is needed to serve 30 people?

$$\frac{660 \text{ g}}{12 \text{ people}} = \frac{N}{30 \text{ people}}$$

1.  $660 \times 30 = 19\,800$

2.  $19\,800 \div 12 = 1\,650 \text{ g. of cheese.}$

- d. If admission of 10 students into an IMAX film costs \$34.00, how much will admission of a class of 35 students cost?

$$\frac{\$34}{10 \text{ students}} = \frac{N}{35 \text{ students}}$$

1.  $34 \times 35 = \$1\,190$
2.  $1\,190 \div 10 = \$119.00$ .

- e. Three pairs of Supersocks cost \$6.98. How much will 12 pair of Supersocks cost?

$$\frac{\$6.98}{3} = \frac{N}{12}$$

1.  $\$6.98 \times 12 = \$83.76$
2.  $\$83.76 \div 3 = \$27.92$  for 12 pairs of socks.

- f. A coupon book provides 10 coupons for regular fries for \$4.45. How much will 50 coupons cost?

$$\frac{\$4.45}{10} = \frac{N}{50}$$

1.  $4.45 \times 50 = \$222.50$
2.  $\$222.50 \div 10 = \$22.25$  for 50 coupons.

## Homework Assignment

1. Calculate the amount of money each of the following individuals have.

- a. Matt has 27% of \$9 000.

$$0.27 \times \$9\,000 = \$2\,430.00$$

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- b. Radek has 63 percent of \$3 500.

$$0.63 \times \$3\,500 = \$2\,205.00$$

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- c. Lui has 83% of \$2 000.

$$0.83 \times \$2\,000 = \$1\,660.00$$

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2. Calculate a value for  $N$  in the following proportional ratios:

a.  $\frac{20}{100} = \frac{N}{\$1\,200}$

$$20 \times 1\,200 = 24\,000; 24\,000 \div 100 = 240; N = \$240.00$$

b.  $\frac{N}{\$7\,000} = \frac{32}{100}$

$$\$7\,000 \times 32 = 224\,000; 224\,000 \div 100 = 2\,240; N = \$2\,240.00$$

c.  $\frac{65}{100} = \frac{N}{\$1\,300}$

**$65 \times \$1\,300 = \$84\,500; \$84\,500 \div 100 = \$845; N = \$845.00$**

3. Divide the fractions below into *lowest terms*. If the fractions are in lowest terms, write lowest terms as your answer.

a.  $\frac{6}{10} = \frac{\mathbf{3}}{\mathbf{5}}$

b.  $\frac{7}{10} = \underline{\mathbf{lowest\ terms}}$

c.  $\frac{20}{25} = \frac{\mathbf{4}}{\mathbf{5}}$

d.  $\frac{19}{57} = \frac{\mathbf{1}}{\mathbf{3}}$

e.  $\frac{7}{20} = \underline{\mathbf{lowest\ terms}}$

f.  $\frac{12}{28} = \frac{\mathbf{3}}{\mathbf{7}}$

g.  $\frac{11}{25} = \underline{\mathbf{lowest\ terms}}$

h.  $\frac{66}{100} = \frac{\mathbf{33}}{\mathbf{50}}$

i.  $\frac{51}{120} = \frac{\mathbf{17}}{\mathbf{40}}$

j.  $\frac{75}{130} = \frac{\mathbf{15}}{\mathbf{26}}$

### Self-Evaluation

Ask yourself some important questions. Write your answers in sentences for your teacher.

1. In this lesson, what part of your work was **excellent**?

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2. In this lesson, what part of your work **needs improvement**?

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3. If you want help for some of the work in this lesson, ask your teacher in this space.

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