



What Is This Module About?

In this module, we will learn more applications of percentages, ratio and proportion in daily life. We will learn how to solve problems on commissions, discounts, loans and interest. We will also learn about converting from one currency to another. Proportion problems that deal with large distances and tall structures will also be discussed.

This module is divided into 2 lessons:

Lesson 1 – *Solving Percentage Problems*

Lesson 2 – *Solving Ratio and Proportion Problems*



What Will You Learn From This Module?

After studying this module, you should be able to:

- ◆ solve daily life problems involving percent;
- ◆ solve daily life problems involving ratio and proportion;
- ◆ solve problems on commission, discount and interest;
- ◆ solve problems on currency conversion; and
- ◆ use ratio and proportion in determining large distances or heights of tall structures.



Wait!

Before studying this module, you should have studied the EL2 modules ***Learning About Percentages*** and ***Ratio and Proportion***.



Let's See What You Already Know

Before starting with the lessons of this module, answer the following questions first. This will determine what you already know about the topic.

1. Alex is a salesman at a hardware store. He received a commission of ₱2,325 for his sales. If the commission rate is 15% of the total sales, how much was his total sales?
2. Aling Senya needs ₱12,400 for her daughter's tuition fee. She decided to borrow the money from Mang Lucio under a 5-6 scheme payable within a year. How much must Aling Senya pay Mang Lucio within the year?
3. Mrs. Ochoa borrowed ₱16,500 from a bank with a simple interest scheme and an interest rate of 16% per year. If Mrs. Ochoa was able to pay the loan after 3 years, how much did she pay the bank?
4. A statue standing 16 feet tall casts a shadow 4 feet long. If at the same time, a building casts a shadow 12.5 feet long, how tall is the building?

5. Mang Danny is an overseas Filipino worker in England. Before Christmas, he sent his family 280 pounds. If the exchange rate is 1 pound to P 70.73, how much did his family receive in pesos?

Well, how was it? Do you think you fared well? Compare your answers with those in the *Answer Key* on pages 34–37.

If all your answers are correct, very good! This shows that you already know much about the topics in this module. You may still study the module to review what you already know. Who knows, you might learn a few more new things as well.

If you got a low score, don't feel bad. This means that this module is for you. It will help you understand important concepts that you can apply in your daily life. If you study this module carefully, you would learn the answers to all the items in the test and a lot more! Are you ready?

You may now go to the next page to begin Lesson 1.

Solving Percentage Problems

In the module *Learning About Percentages*, you learned how to solve simple percentage problems on taxes, discounts, commissions and interests. In this module, we will build upon what you have learned so that you can solve more complex problems. We will still be tackling problems on discounts, commissions and interests. This time, however, the problems will be a little more complicated.

After studying this lesson, you should be able to:

- ♦ solve percentage problems on discounts, commissions and interest; and
- ♦ use the three general formulas on percentage, depending on what is asked in the problem.



Let's Solve This Problem

Do you remember what you learned about solving problems on commission from the module *Learning About Percentages*? Let us review the steps on how to solve problems like these by studying the example given below.

The formula used is:

$$P = B \times r$$

Where

P = percentage

B = base, this represents the whole or original amount.

r = rate, expressed in decimal form.

PROBLEM Dong is a sales agent of an appliance store. His total sales was ₱21,400.00 and was given a commission of 8% on all sales. How much was his commission?

STEP 1 Write the given information.

- a. ₱21,400.00 – total sales; this represents the base.
- b. 8% – rate

STEP 2 Determine what is asked.

Find how much is Dong's commission (P).

STEP 3 Solve for the answer.

- a. To solve for the answer, use the formula $P = B \times r$.

In this case, P represents the amount Dong will get as his commission; B represents the total sales (P 21,400.00); and r represents the commission rate (8%). Substituting the values in the formula $P = B \times r$ becomes:

$$\begin{array}{ccc} P = 21,400 \times 8\% & & \\ \downarrow & & \downarrow \\ \text{Base} & & \text{Rate} \end{array}$$

- b. Convert the rate to decimal form if it is not in decimal form already.

$$r = 8\%$$

To convert from percent to decimal, remove the % sign and then move the decimal point two places to the left.

$$r = 8\% = 0.\underbrace{08} = 0.08$$

- c. Compute for the percentage (P).

$$P = 21,400 \times 0.08$$

$$\begin{array}{r} 21,400 \\ \times 0.08 \\ \hline 171200 \end{array} \rightarrow \begin{array}{l} \text{2 decimal places} \\ \text{Move 2 decimal places to the left.} \end{array}$$

$$P = 21,400 \times 0.08 = 1,712$$

The percentage (P) is 1,712. Therefore, Dong's commission is ₱1,712.00.



Let's Study and Analyze

We have learned how to solve for the percentage (P) in different percentage problems from the formula $P = B \times r$. But how do we solve percentage problems where the base (B) or the rate (r) is missing? For these cases we need to introduce two new general formulas.

$$B = \frac{P}{r} \quad \text{and} \quad r = \frac{P}{B} \times 100\%$$

Let us study how these two formulas are used by looking at the sample problems below. We will be solving word problems on *commission*. *Commissions* are incentives given by employers to salespeople for being able to sell products or services. The more salespeople can sell, the more money they get from commissions.

PROBLEM 1

Lisa is a saleslady at a clothes shop. She got a commission of ₱762.00 for her sales. If the commission rate is 12% of the total sales, how much was her total sales?



STEP 1 Write the given information.

- a. ₱762.00 – commission for sales made; this represents the percentage (*P*).
- b. 12% – rate (*r*)

STEP 2 Determine what is asked.

Find Lisa's total sales. (**B**).

STEP 3 Solve for the answer.

- a. To solve for the answer, use the formula $B = P/r$.

In this case, *B* represents the total sales Lisa was able to make; *P* represents the amount she got as commission (₱762.00); and *r* represents the commission rate (12%). Substituting the values in the formula, $B = P/r$ becomes:

$$B = \frac{762}{12\%}$$

percentage
rate

- b. Convert the rate to decimal form if it is not in decimal form already.

$$r = 12\%$$

To convert from percent to decimal, remove the % sign and then move the decimal point two places to the left.

$$r = 12\% = 0.12$$

- c. Compute for the base (**B**).

$$B = \frac{762}{0.12}$$

$$0.12 \overline{)76200.}$$



$$\begin{array}{r}
 0.12 \overline{)76200.} \\
 \underline{728} \quad \rightarrow 12 \times 6 = 72 \\
 42 \quad \rightarrow 76 - 72 = 4; \text{ bring down } 2 = 42 \\
 \underline{36} \quad \rightarrow 12 \times 3 = 36 \\
 60 \quad \rightarrow 42 - 36 = 6; \text{ bring down } 0 = 60 \\
 \underline{60} \quad \rightarrow 12 \times 5 = 60 \\
 0 \quad \rightarrow 60 - 60 = 0 \\
 \underline{0} \quad \rightarrow 12 \times 5 = 0 \\
 0 \quad \rightarrow 0 - 0 = 0
 \end{array}$$

$$B = 762 \div 0.12 = 6,350$$

The quotient is 6,350. Therefore, Lisa's total sales amounts to ₱6,350.

PROBLEM 2

Mario is a salesman at a local bookstore. He received a commission worth ₱645 after he was able to sell ₱4,300.00 worth of books. How much was the commission rate?

SOLUTION

STEP 1 Write the given information.

- ₱645 – commission that Mario received; this represents the percentage (**P**).
- ₱4,300.00 – this is the total sales that Mario was able to make; this represents the base (**B**).

STEP 2 Determine what is asked.

Find how much is the commission rate (r).

STEP 3 Solve for the answer.

a. To solve for the answer, use the formula:

$$r = \frac{P}{B} \times 100\%$$

In this case, r represents the commission rate; P represents the commission that Mario received (₱ 645); and B represents the total sales that Mario was able to make (₱4,300). Substituting the values in the formula,

$$r = \frac{P}{B} \times 100\%$$

becomes:

$$r = \frac{645}{4,300} \times 100\%$$

b. Compute for the rate (r).

$$\begin{array}{r} 0.15 \\ 4,300 \overline{) 645.00} \\ \underline{430\ 00} \rightarrow 4,300 \times 1 = 4,300 \\ 215\ 00 \rightarrow 6,450 - 4,300 = 2,150; \text{bring down } 0 = 120 \\ \underline{215\ 00} \rightarrow 4,300 \times 5 = 21,500 \\ 0 \end{array}$$

$$64 \div 4,300 = 0.15$$

$$r = \frac{645}{4,300} \times 100\% = 0.15 \times 100\% = 15\%$$

Therefore, the commission rate r is equal to 15%.



Let's Try This

Solve the following problems below using the two new formulas to find either the rate (r) or the base (B).

1. Mr. Lando is a salesman at a jewelry store. In the month of June, he received a commission of ₱1,749.00. If the commission rate is 11% of his total sales, how much was his total sales?

STEP 1 Write the given information.

STEP 2 Determine what is asked.

STEP 3 Solve for the answer.

- a. To solve for the answer, use the formula $B = P/r$
- b. Convert the rate to decimal form if it is not in decimal form already.
- c. Compute for the base (B).

2. Minda is a saleslady at a shoe store. She received a commission worth ₱1,824.00 when she was able to sell ₱15,200 worth of shoes. How much was the commission rate?

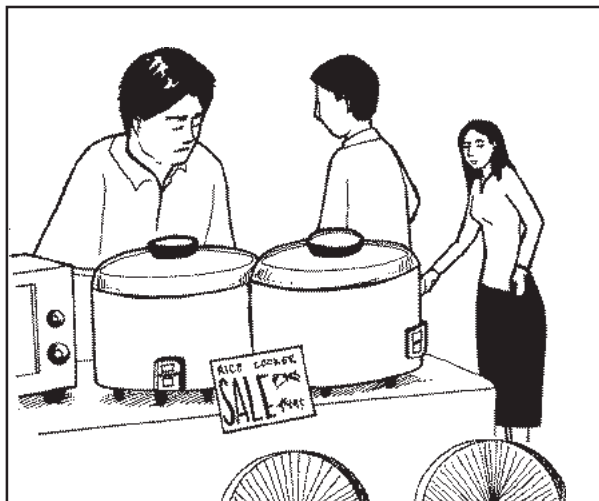
Compare your answers with those found in the *Answer Key* on pages 37–39.



Let's Study and Analyze

Let us now study how the two new formulas could be applied on word problems on *discounts*. A *discount* is an amount deducted from the original price of a commodity or service so that the customers can purchase them at a lower price. Below are some sample problems.

PROBLEM 1 A rice cooker with a tag price of P 900 was on sale, with a discounted price of P 495. What is the discount rate?



SOLUTION

STEP 1 Write the given information.

- P 900 – tag price of the rice cooker; this represents the base (**B**).
- P 495 – discounted price.

STEP 2 Determine what is asked.

Find the discount rate of the rice cooker.

STEP 3 Solve for the answer.

- To solve for the answer, use the formula

$$r = \frac{P}{B} \times 100\%$$

In this case, **r** represents the commission rate (which is unknown); **B** represents the tag price of the rice cooker; and **P** represents the amount of the discount:

$$P = \text{tag price} - \text{discounted price} = 900 - 495 = 405$$

Substituting the values in the formula:

$$r = \frac{P}{B} \times 100\% = \frac{405}{900} \times 100\%$$

- b. Compute for the rate (r).

$$\begin{array}{r} 0.45 \\ 900 \overline{)405.00} \\ \underline{360 } \rightarrow 900 \times 6 = 3600 \\ 45 \rightarrow 4050 - 3600 = 450; \text{bring down } 0 = 4500 \\ \underline{45 } \rightarrow 900 \times 5 = 4500 \\ 0 \rightarrow 4500 - 4500 = 0 \end{array}$$

$$405 \div 900 = 0.45$$

$$r = \frac{P}{B} \times 100\% = \frac{405}{900} \times 100\% = 45\%$$

Therefore, the discount rate r is equal to 45%.

PROBLEM 2 After deducting a 15% discount for a dining table, Mang Rey saved ₱ 675. What was the original price?

STEP 1 Write the given information.

- ₱ 675 – amount of the discount for the dining table (P).
- 15% – discount rate (r).

STEP 2 Determine what is asked.

Find how much is the original price (B).

STEP 3 Solve for the answer.

- To solve for the answer, use the formula $B = P/r$.

In this case, B represents the original price of the dining table; P represents the amount deducted from the original price; and r represents the discount rate (15%).

Substituting the values in the formula, $B = P/r$ becomes:

$$B = \frac{675}{15\%} \begin{array}{l} \longrightarrow \text{percentage} \\ \longrightarrow \text{rate} \end{array}$$

- b. Convert the rate to decimal form if it is not in decimal form already.

$$r = 15\%$$

To convert from percent to decimal, remove the % sign and then move the decimal point two places to the left.

$$r = 15\% = 0.15$$

- c. Compute for the base (**B**).

$$B = \frac{675}{0.15}$$

$$\begin{array}{r}
 0.15 \overline{)675.00} \\
 \Downarrow \\
 15 \overline{)67500} \\
 \underline{60} \quad \rightarrow 15 \times 4 = 60 \\
 75 \quad \rightarrow 67 - 60 = 7; \text{ bring down } 5 = 75 \\
 \underline{75} \quad \rightarrow 15 \times 5 = 75 \\
 0 \quad \rightarrow 75 - 75 = 0; \text{ bring down } 0 = 0 \\
 0 \quad \rightarrow 15 \times 0 = 0 \\
 0 \quad \rightarrow 0 - 0 = 0; \text{ bring down } 0 = 0 \\
 0 \quad \rightarrow 15 \times 0 = 0 \\
 0 \quad 0 - 0 = 0
 \end{array}$$

$$B = 675 \div 0.15 = 4,500$$

The quotient is 4,500. Therefore, the dining table has an original price of ₱4,500.



Let's Try This

Solve the following problems below to find either the discount rate or the base (original price).

1. A refrigerator has an original price of ₱9,700. After applying the discount the refrigerator cost ₱7,760. What is the discount rate of the refrigerator?

STEP 1 Write the given information.

STEP 2 Determine what is asked.

STEP 3 Solve for the answer.

a. To solve for the answer, use the formula

$$r = \frac{P}{B} \times 100\%$$

b. Compute for the rate (r).

2. Mely obtained a 30% discount on a dress. If Mely was able to save P 252, how much was the original price of the dress?

Compare your answers with those found in the *Answer Key* on pages 39–41.



Let's Study and Analyze

The 5-6 scheme

Many small-time creditors lend money using the 5-6 scheme. How does this scheme work? This means that for every P 5 that you borrow, you must return P 6 to the creditor at an agreed length of time.

What percent of P 5 is P 6? Use the formula

$$Y = \frac{\text{Part}}{\text{Whole}} \times 100\%$$

a. Substituting the values in the formula we have:

$$Y = \frac{6}{5} \times 100\%$$

- b. Divide the numerator (6) by the denominator (5).

$$\begin{array}{r}
 1.2 \\
 5 \overline{)6.0} \\
 \underline{5} \qquad \rightarrow 5 \times 1 = 5 \\
 10 \qquad \rightarrow 6 - 5 = 1; \text{bring down } 0 = 10 \\
 \underline{10} \qquad \rightarrow 5 \times 2 = 10 \\
 0 \qquad \rightarrow 10 - 10 = 0
 \end{array}$$

The quotient is 1.2.

- c. Replace the fraction (6/5) by the quotient (1.2) and simplify.

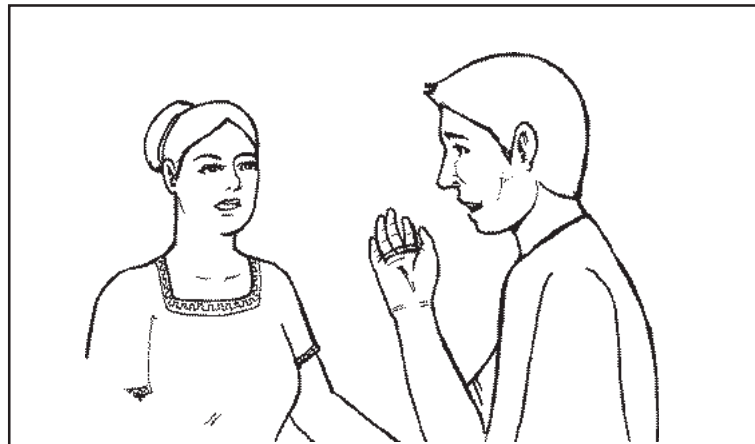
$$Y = 1.2 \times 100\% = 120\%$$

Therefore, ₱6 is 120% of ₱5.

This means that in a 5-6 scheme, there is a 20% interest for the money loaned. Therefore, in a 5-6 scheme, the borrower should give back 120% of the money he or she borrowed. Let us study an example given below.

EXAMPLE 1

Aling Nena needed to borrow P 4,000 to pay for the tuition fee of her son. She approached Mang Carlos, who was a creditor and agreed to a 5-6 scheme payable within 3 months. How much will Aling Nena have to pay within a period of 3 months?



SOLUTION

STEP 1 Write the given information.

- a. ₱4,000- amount of money borrowed.
- b. 20% interest (5-6 scheme).

STEP 2 Determine what is asked.

Find how much Aling Nena will have to pay within a period of three months.

STEP 3 Solve for the answer.

- a. To solve for the amount Aling Nena has to pay, multiply the money borrowed (₱ 4,000) by 120%.

$$₱ 4,000 \times 120\% = ?$$

- b. Convert 120% to a decimal.

$$120\% = 1.20$$

therefore:

$$₱ 4,000 \times 120\% = ₱ 4,000 \times 1.20 = ₱ 4,800$$

Therefore Aling Nena has to pay Mang Carlos ₱4,800 within a period of 3 months.



Let's Review

1. Mang Roberto needs to borrow ₱8,500 for hospital fees as his wife is to deliver a child. He decided to borrow money from Mang Lino and agreed to a 5-6 scheme payable within 4 months. How much does Mang Roberto have to pay Mang Lino?

STEP 1 Write the given information.

STEP 2 Determine what is asked.

STEP 3 Solve for the answer.

- a. To solve for the amount Mang Roberto needs to pay, multiply the money borrowed by 120%.

- b. Convert 120% to a decimal.

2. Aling Rita is putting up a sari-sari store. She needed an additional capital of ₱ 9,200 so she decided to borrow the amount from Aling Nora. Aling Rita agreed to a 5-6 scheme payable within a period of 6 months. How much does Aling Rita have to pay Aling Nora?

Compare your answers with those in the *Answer Key* on page 42.



Let's Study and Analyze

Simple Interest

We will now study how simple interest is applied on money deposited in a bank or money loaned from a bank. *Simple interest* is interest on loans computed on the basis of this equation:

$$\text{Interest} = \text{Principal} \times \text{rate} \times \text{time}$$

Or

$$I = Prt$$

Where:

Principal is the money deposited or loaned.

Rate is the interest rate expressed in decimal form.

Time is the duration of the deposit or loan, expressed in years.

Let us take as an example Aling Rosario, who deposited her savings worth ₱10,000 in a bank with a simple interest scheme. The interest rate per annum or per year is 7%. You can see from the table that the interest grows by ₱700 each year the money remains in the bank.

Principal	Rate	Time	Interest
₱10,000	7%	1 year	₱700
₱10,000	7%	2 years	₱1,400
₱10,000	7%	3 years	₱2,100
₱ 10,000	7%	4 years	₱ 2,800

Take a look at the sample problem given below. By studying the sample problem below, you will learn how to compute for the simple interest.

PROBLEM 1 If Mang Elias deposited ₱14,000 at 8% interest per year, how much will Mang Elias' interest be after 3 years?

SOLUTION

STEP 1 Write the given information.

- a. ₱14,000 – Money deposited; this represents the principal (**P**).
- b. 8% – interest rate per year; this represents the rate (**r**).
- c. 3 years – length of time money was deposited in the bank; this represents the time (**t**).

STEP 2 Determine what is asked.

Find how much is Mang Elias' interest (**I**) after three years.

STEP 3 Solve for the answer.

- a. Use the equation **$I = Prt$** . Substitute the values in the equation.

$$I = Prt$$

$$I = 14,000 \times 8\% \times 3$$

- b. Convert the rate (**r**) to decimal if it is not yet in decimal form.

$$r = 8\% = 0.\underbrace{08} = 0.08$$

- c. Compute for the interest (**I**).

$$I = 14,000 \times 0.08 \times 3 = 3,360$$

I is equal to 3,360. therefore the interest Mang Elias earned in three years is ₱3,360. This means that Mang Elias' money in the bank grew to ₱17,360 in three years.

Let us now study a sample problem on simple interest dealing with loans. The principle is basically the same as for computing for the interest of money invested in a bank.

PROBLEM 2 Mrs. Santos borrowed ₱15,000 at 9% per year with a simple interest scheme. If she was to pay back the money she borrowed after 1.5 years (1 year and 6 months), how much should she pay?

SOLUTION

STEP 1 Write the given information.

- a. ₱15,000 – Money borrowed; this represents the principal (**P**).
- b. 9% – interest rate per year; this represents the rate (**r**).
- c. 1.5 years – length of time money was loaned; this represents the time (**t**).

STEP 2 Determine what is asked.

Find how much Mrs. Santos has to pay for her loan.

STEP 3 Solve for the answer.

- a. Use the equation **$I = Prt$** . Substitute the values in the equation.

$$I = Prt$$

$$I = 15,000 \times 9\% \times 1.5$$

- b. Convert the rate (**r**) to decimal if it is not yet in decimal form.

$$r = 9\% = 0.\overset{\curvearrowright}{0}9 = 0.09$$

- c. Compute for the interest (**I**).

$$I = 15,000 \times 0.09 \times 1.5 = 2,025$$

I is equal to 2,025 therefore, the interest of Mrs. Santos' loan after 1.5 years is ₱2,025. That means Mrs. Santos needs to pay the bank ₱17,025 (₱15,000 + ₱2,025).



Let's Try This

Solve for the following problems on interest.

1. Mang David deposited his savings amounting to ₱19,500 in a local bank. If the bank's interest rate is 6% per annum, how much would his bank account be after 5 years?

STEP 1 Write the given information.

STEP 2 Determine what is asked.

STEP 3 Solve for the answer.

- a. Use the equation $I = Prt$. Substitute the values in the equation.
- b. Convert the rate (r) to a decimal if it is not yet in decimal form.
- c. Compute for the interest (I).

2. Mang Pedro borrowed ₱25,000 from a bank. The interest rate for the loan is 11% per annum. If Mang Pedro completes his loan payment after 3 years and 6 months, how much did he repay the bank?

Compare your answers with those in the *Answer Key* on pages 42–44.



Let's See What You Have Learned

Answer the following word problems.

1. Mang Ben is a salesman in a computer shop. He got a commission of ₱4,800 for his sales. If the commission rate is 15% of his total sales, how much was his total sales?
2. Aling Nora was able to save ₱3,150 for a television she bought at a special discount. If the original price of the television was ₱12,600, how much was the discount rate given to her?
3. Mang Vic needed ₱8,700 for his son's tuition fee. He decided to borrow the money from Mang Domeng under a 5-6 scheme payable within 6 months. How much will Mang Vic have to pay Mang Domeng within a period of 6 months?
4. Mrs. Fajardo applied for a loan in a bank. She borrowed ₱23,500 at an interest rate of 12% per annum. If she completed her payment after a period of 2.5 years, how much did she pay the bank?

5. Mang Lando was able to save ₱34,200. He decided to put it in a bank that had an interest rate of 7% per annum with a simple interest rate scheme. How much would Mang Lando's savings amount to after 6.5 years?

Compare your answers with those in the *Answer Key* on pages 44–48.

If your test score is:

- 5 Excellent! You have understood the lesson well.
3–4 Review the items in the lesson which you did not understand.
0–2 You must study the whole lesson again.



Let's Remember

- ♦ The three general formulas below are used to solve percentage problems.

$$P = B \times r$$

$$B = \frac{P}{r} \quad \text{and} \quad r = \frac{P}{B} \times 100\%$$

where:

P is the percentage
B is the base
r is the rate

- ♦ In a 5-6 scheme, there is a 20% interest for the money borrowed.
- ♦ Simple interest is computed on the basis of this equation:

$$I = Prt$$

Where:

Principal (**P**) is the money deposited or loaned.
Rate (**r**) is the interest rate expressed in decimal form.
Time (**t**) is the duration of the deposit or loan, expressed in years.

Ratio and Proportion Problems

In the EL2 module Ratio and Proportion, you have learned how to solve rate problems, problems on determining distances between two places using a map drawn to scale, adjusting the amount of the ingredients in a recipe, and other applications.

In this module, you will learn about converting from one currency to another using ratio and proportion. You will also learn about how large lengths or heights are measured using ratio and proportion.

After studying this lesson, you should be able to:

- ◆ solve word problems on determining the length or height of large objects using ratio and proportion; and
- ◆ convert from one currency to another using ratio and proportion.



Let's Solve This Problem

Do you still remember how to solve word problems using ratio and proportion? Let us study the examples given below. The examples will deal on converting from one currency to another.

PROBLEM

Mang Marlon is an overseas Filipino worker working in Saudi Arabia. He sent 1,100 rials to his family. If 1 rial is equivalent to ₱13.53, how much did Mang Marlon's family receive in pesos?

SOLUTION

STEP 1 Write the given information.

- a. 1 rial is to ₱13.53 (1 : 13.53)
- b. 1,100 rial is to ? pesos (1,100 : ?)

STEP 2 Determine what is asked.

Find out how much Mang Marlon's family received in pesos. Let **N** represent this unknown value.

1,100 rial is to **N** pesos (1,100 : **N**)

STEP 3 Solve for the answer.

- a. Equate the two ratios.

$$1 : 13.53 = 1,100 : N$$

- b. Equate the product of the means with the product of the extremes.

$$\begin{array}{c} \text{extremes} \\ \text{1:13.53 = 1,100:N} \\ \text{means} \end{array}$$

Equating we have:

$$13.53 \times 1,100 = 1 \times N$$

Simplifying we have:

$$14,883 = N$$

Therefore, 1,100 rials is equivalent to ₱14,883. This is the amount that Mang Marlon's family received.



Let's Try This

Solve the following problems using ratio and proportion.

1. Aling Remedios is a domestic helper in Hong Kong. She sent 2,700 Hong Kong dollars to her husband living in the Philippines. If the exchange rate is 1 Hong Kong dollar to ₱6.41, how much did her husband receive in pesos?

STEP 1 Write the given information.

STEP 2 Determine what is asked.

STEP 3 Solve for the answer.

- a. Equate the two ratios.

- b. Equate the product of the means with the product of the extremes.
2. Mr. Abalos is a representative of the Philippines in an international forum in Australia. During his stay there, he needed to convert his pocket money worth ₱16,043 to Australian dollars. If the exchange rate is 1 Australian dollar to ₱26.30, how much would he have in Australian dollars?

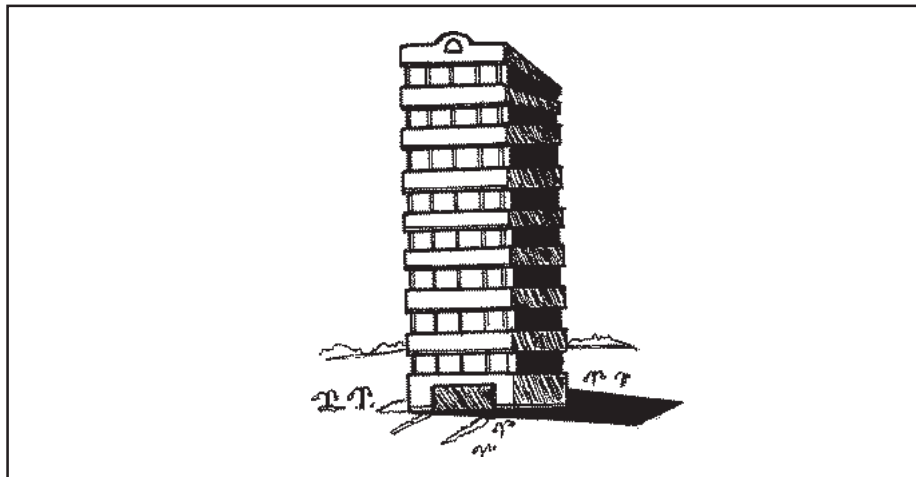
Compare your answers with those in the *Answer Key* on pages 48–49.



Let's Study and Analyze

Ratio and proportion can be used to measure the height of tall structures or wide rivers. Let us study the sample problems below to see how it is done.

PROBLEM 1 A 10-foot pole casts a shadow 3 feet in length. At the same time, a building casts a shadow 13.5 feet in length. How tall is the building?



SOLUTION The height of a structure in relation to the length of its shadow is proportional to the height of another structure in relation to the length of its shadow. And because of this, ratio and proportion can be applied to solve the problem.

STEP 1 Write the given information.

- a. 10 feet pole casts a shadow 3 feet long (10 : 3)
- b. ? feet tall building casts a shadow 13.5 feet long (? : 13.5)

STEP 2 Determine what is asked.

Find out how tall the building is. Let **N** represent this unknown value.

N feet tall building casts a shadow 13.5 feet long (**N** : 13.5)

STEP 3 Solve for the answer.

- a. Equate the two ratios.

$$10 : 3 = N : 13.5$$

- b. Equate the product of the means with the product of the extremes.

extremes

$$10 : 3 = N : 13.5$$

means

Equating, we have:

$$3 \times N = 10 \times 13.5$$

Simplifying, we have:

$$3N = 135$$

- c. Isolate **N** to one side of the equation.

To isolate **N**, 3 should be removed from the left side of the equation. To do this, divide both sides of the equation by 3.

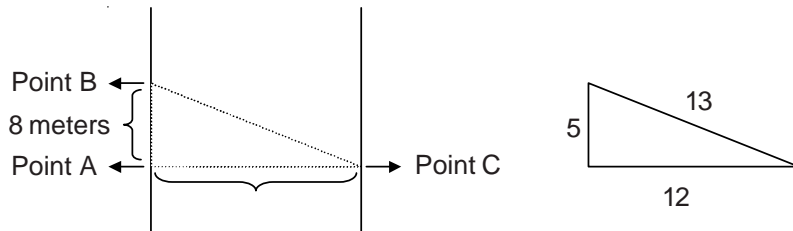
$$\frac{3N}{3} = \frac{135}{3}$$
$$N = 45$$

Therefore, the building, which casts a 13.5 feet long shadow, is 45 feet tall.

Let us now deal with problems involving triangles. Triangles with the same interior angles (the three angles inside the triangle) are proportional to each other, regardless of the sizes of these triangles. It is because of this fact that you can relate a triangle of known dimensions with a proportional triangle with one or two missing dimensions. Let us look at the sample problem on the next page to understand how this can be applied to real life problems.

PROBLEM 2

Points A and B lie on the same side of the river, while point C lies on the other side of the river. By connecting the three points, you create an imaginary right triangle. This imaginary triangle is proportional to the triangle on the right with dimensions 5, 12 and 13. If the distance between point A and point B is 8 meters, what is the distance between points A and C?



SOLUTION Note that the distance between points A and C is the width of the river. To determine this unknown value, we use ratio and proportion.

STEP 1 Write the given information.

We relate the short leg with the long leg of each triangle.

- 5 units is to 12 units (5 : 12)
- 8 meters is to ? meters (8 : ?)

STEP 2 Determine what is asked.

Determine the width of the river (distance between points A and C). Let **N** represent this unknown value.

8 meters is to **N** meters (8 : **N**)

STEP 3 Solve for the answer.

- Equate the two ratios.

$$5 : 12 = 8 : \mathbf{N}$$

- Equate the product of the means with the product of the extremes.

$$\begin{array}{c}
 \text{extremes} \\
 \text{5 : 12 = 8 : N} \\
 \text{means}
 \end{array}$$

Equating we have:

$$12 \times 8 = 5 \times \mathbf{N}$$

Simplifying we have:

$$96 = 5N$$

- c. Isolate **N** to one side of the equation.

To isolate **N**, 5 should be removed from the right side of the equation. To do this, divide both sides of the equation by 5.

$$\frac{96}{5} = \frac{5N}{5}$$

$$\begin{array}{r} 19.2 \\ 5 \overline{)96.0} \\ \underline{5} \rightarrow 5 \times 1 = 5 \\ 46 \rightarrow 9 - 5 = 4; \text{bring down } 6 = 46 \\ \underline{45} \rightarrow 5 \times 9 = 45 \\ 10 \rightarrow 46 - 45 = 1; \text{bring down } 0 = 10 \\ \underline{10} \rightarrow 10 - 10 = 0 \\ 0 \rightarrow 10 - 10 = 0 \end{array}$$

$$\boxed{19.2 = N}$$

Therefore, the width of the river is 19.2 meters.

As we can see from the above example, the proportionality of triangles can be used to determine the width of big rivers or dimensions of other structures with large dimensions.



Let's Try This

1. A statue standing 8 feet high casts a shadow 3 feet long. At the same time, a water tank casts a shadow 11 feet long. How high is the water tank?

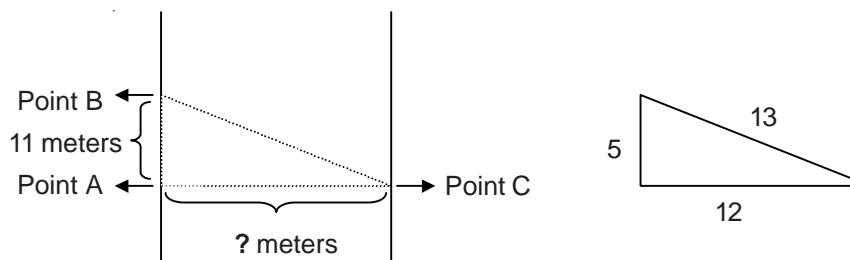
STEP 1 Write the given information.

STEP 2 Determine what is asked.

STEP 3 Solve for the answer.

- a. Equate the two ratios.
- b. Equate the product of the means with the product of the extremes.
- c. Isolate **N** to one side of the equation.

2. Look at the figure below.



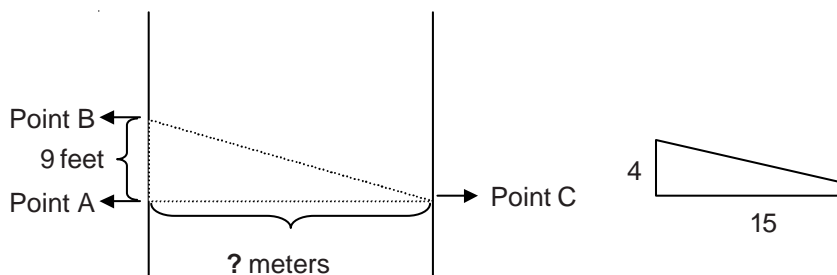
Points A and B lie on the same side of the river, while point C lies on the other side of the river. By connecting the three points, you create an imaginary right triangle. This imaginary triangle is proportional to the triangle on the right with dimensions 5, 12 and 13. If the distance between point A and point B is 11 meters, what is the distance between points A and C?

Compare your answers with those in the *Answer Key* on pages 50–52.



Let's See What You Have Learned

1. Sam is an Overseas Filipino Worker working in Canada. He sent 510 Canadian dollars to his family. If the currency exchange rate is 1 Canadian dollar to ₱33.36, how much did his family receive in pesos?
2. Karen is a nurse working in California. She sent \$415 dollars to her sister in the Philippines. If the currency exchange rate is \$1 to ₱50.76, how much did Karen's sister receive in pesos?
3. A pole 13 feet high casts a shadow 4 feet long. If at the same time, a building casts a shadow 15 feet long, how tall is the building?
4. Look at the figure below.



Points A and B lie on the same side of the river, while point C lies on the other side of the river. By connecting the three points, you create an imaginary right triangle. This imaginary triangle is proportional to the triangle on the right with the legs having dimensions of 4 and 15. If the distance between point A and point B is 9 feet, what is the distance between points A and C?

Compare your answers with those in the *Answer Key* on pages 52–55.

If your test score is:

- 4 Excellent! You have understood the lesson well.
- 3 Review the items in the lesson which you did not understand.
- 0–2 You must study the whole lesson again.



Let's Remember

- ◆ You can use ratio and proportion to convert from one currency to another.
- ◆ The ratio of the height of an object to the length of its shadow is proportional to the ratio of the height of another object to the length of its shadow, so long as the length of the shadows are measured at the same time of the day.
- ◆ Triangles with the same interior angles (the three angles inside the triangle) are proportional to each other even though their sizes may be different.



Let's Sum Up

- ◆ The three general formulas below are used to solve percentage problems.

$$P = B \times r$$

$$B = \frac{P}{r} \quad \text{and} \quad r = \frac{P}{B} \times 100\%$$

- ◆ where:

P is the percentage

B is the base

r is the rate

- ◆ In a 5-6 scheme, there is a 20% interest for the money borrowed.
- ◆ Simple interest is computed on the basis of this equation:

$$I = Prt$$

Where:

Principal (**P**) is the money deposited or loaned.

Rate (**r**) is the interest rate expressed in decimal form.

Time (**t**) is the duration of the deposit or loan, expressed in years.

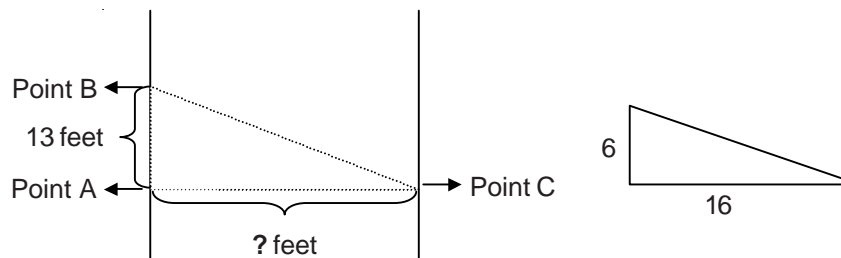
- ◆ The ratio of the height of an object to the length of its shadow is proportional to the ratio of the height of another object to the length of its shadow, so long as the length of the shadows are measured at the same time of the day.
- ◆ Triangles with the same interior angles (the three angles inside the triangle) are proportional to each other even though their sizes may be different.



What Have You Learned?

1. Paul is a salesman at a furniture shop. He received a commission worth ₱4,212 when he was able to sell ₱23,400 worth of furniture. How much was the commission rate?
2. Aling Norma needed ₱11,700 for the medical expenses of her husband. She decided to borrow the amount from Aling Rose under a 5-6 scheme payable within a period of 9 months. How much should Aling Norma pay Aling Rose within the 9-month period?
3. Mr. Cruz borrowed money from a bank amounting to ₱35,000. The interest rate for the loan is 13% per annum. If Mr. Cruz completed the payment for the loan in 2 years and 6 months, how much did he pay?
4. Mr. Garcia was sponsored by an NGO to attend a conference in France. He needs to convert the ₱14,820 he has to Francs. If the exchange rate is ₱6.50 to 1 Franc, how much money in Francs will he have?

5. A 13-foot tall pole casts a shadow 4 feet long. If at the same time a building casts a shadow 14 feet long, how tall is the building?
6. Points A and B lie on the same side of the river, while point C lies on the other side of the river. By connecting the three points, you create an imaginary right triangle. This imaginary triangle is proportional to the triangle on the right with the legs having dimensions of 6 and 16. If the distance between point A and point B is 13 feet, what is the distance between points A and C?



Compare your answers with those found in the *Answer Key* on pages 56–61.

If your test score is from:

- 6 Excellent! You have understood the lessons of the module well.
- 4–5 Review the lessons in the module which you did not understand.
- 0–3 You must study the whole module again.



Answer Key

A. Let's See What You Already Know (pages 2–3)

1. **STEP 1** Write the given information.

- ₱2,325 – commission for sales made; this represents the percentage (**P**).
- 15% – commission rate (**r**)

STEP 2 Determine what is asked.

Find out how much is his total sales. Let **B** represent this unknown value.

STEP 3 Solve for the answer.

- To solve for the answer, use the formula **$B = P/r$** .

In this case, **B** represents the total sales Alex made; **P** represents the amount he received as commission (₱2,325); and **r** represents the commission rate (15%). Substituting the values in the formula, **$B = P/r$** becomes:

$$B = \frac{2,325}{15\%} \begin{array}{l} \longrightarrow \text{percentage} \\ \longrightarrow \text{rate} \end{array}$$

- Convert the rate to decimal form if it is not in decimal form already.

$$r = 15\%$$

To convert from percent to decimal, remove the % sign and then move the decimal point two places to the left.

$$r = 15\% = 0.\underline{15} = 0.15$$

- Compute for the base (**B**).

$$0.\underline{15})\underline{232500} \longrightarrow \begin{array}{r} 15500 \\ 15 \overline{)232500} \\ \underline{15} \rightarrow 15 \times 1 = 15 \\ 82 \rightarrow 23 - 15 = 8; \text{bring down } 2 = 82 \\ \underline{75} \rightarrow 15 \times 5 = 75 \\ 75 \rightarrow 82 - 75 = 7; \text{bring down } 5 = 75 \\ \underline{75} \rightarrow 15 \times 5 = 75 \\ 0 \rightarrow 75 - 75 = 0; \text{bring down } 0 = 0 \\ \underline{0} \rightarrow 15 \times 0 = 0 \\ 0 \rightarrow 0 - 0 = 0 \end{array}$$

$$B = 2,325 \div 0.15 = 15,500$$

The quotient is 15,500. Therefore, Alex's total sales amounts to ₱15,500.

2. **STEP 1** Write the given information.

- a. ₱12,400– amount of money borrowed.
- b. 20% interest (5–6 scheme).

STEP 2 Determine what is asked.

Find how much Aling Senya will have to pay within a period of one year.

STEP 3 Solve for the answer.

- a. To solve for the amount Aling Senya has to pay, multiply the money borrowed (P12,400) by 120%.

$$\text{₱}12,400 \times 120\% = ?$$

- b. Convert 120% to a decimal.

$$120\% = 1.20$$

therefore:

$$\text{₱}12,400 \times 120\% = \text{₱}12,400 \times 1.20 = \text{₱}14,880$$

This means that at the end of one year, Aling Senya will have to pay Mang Lucio ₱14,880.

3. **STEP 1** Write the given information.

- a. ₱16,500 – Money borrowed; this represents the principal (**P**).
- b. 16% – interest rate per year at a simple interest scheme; this represents the rate (**r**).
- c. 3 years – length of time money was borrowed from the bank; this represents the time (**t**).

STEP 2 Determine what is asked.

Find how much Mrs. Ochoa's interest (**I**) is after three years.

STEP 3 Solve for the answer.

- a. Use the equation **I = Prt**. Substitute the values in the equation.

$$\mathbf{I = Prt}$$

$$\mathbf{I = 16,500 \times 16\% \times 3}$$

- b. Convert the rate (**r**) to decimal if it is not yet in decimal form.

$$r = 16\% = 16 = 0.16$$

- c. Compute for the interest (**I**).

$$I = 16,500 \times 0.16 \times 3 = 7,920$$

The interest is ₱7,920. Therefore, Mrs. Ochoa paid ₱24,420 (₱16,500 + ₱7,920 = ₱24,420) to the bank.

4. **STEP 1** Write the given information.

- a. 16 feet statue casts a shadow 4 feet long (16 : 4)
 b. At the same time, a building casts a shadow 12.5 feet long (? : 12.5)

- STEP 2** Determine what is asked.

Find out how tall the building is. Let **N** represent this unknown value.

N foot tall building casts a shadow 12.5 feet long (**N** : 12.5)

- STEP 3** Solve for the answer.

- a. Equate the two ratios.

$$16 : 4 = N : 12.5$$

- b. Equate the product of the means with the product of the extremes.

$$\begin{array}{c} \text{extremes} \\ \text{16 : 4 = N : 12.5} \\ \text{means} \end{array}$$

Equating, we have:

$$4 \times N = 16 \times 12.5$$

Simplifying, we have:

$$4N = 200$$

- c. Isolate **N** to one side of the equation.

To isolate **N**, 4 should be removed from the left side of the equation. To do this, divide both sides of the equation by 4.

$$\begin{array}{r} \frac{4N}{4} = \frac{200}{4} \\ \boxed{N = 50} \end{array}$$

Therefore, the building is 50 feet tall.

5. **STEP 1** Write the given information.

- a. 1 pound is to ₱70.73 (1 : 70.73)
- b. 280 pounds is to ? pesos (280 : ?)

STEP 2 Determine what is asked.

Find out how much Mang Danny's family received in pesos.
Let **N** represent this unknown value.

280 pounds is to **N** pesos (280 : **N**)

STEP 3 Solve for the answer.

- a. Equate the two ratios.

$$1 : 70.73 = 280 : \mathbf{N}$$

- b. Equate the product of the means with the product of the extremes.

$$1 : 70.73 = 280 : \mathbf{N}$$

Equating we have:

$$70.73 \times 280 = 1 \times \mathbf{N}$$

Simplifying we have:

$$19,804.4 = \mathbf{N}$$

Therefore, Mang Danny's family received P 19,804.40.

B. Lesson 1

Let's Try This (page 9)

1. **STEP 1** Write the given information.

- a. P 1,749.00 – commission for sales made; this represents the percentage (**P**).
- b. 11% – rate (**r**)

STEP 2 Determine what is asked.

Find the total sales that Mang Lando was able to make (**B**).

STEP 3 Solve for the answer.

- a. To solve for the answer, use the formula $B = P/r$.

In this case, B represents the total sales Mang Lando was able to make; P represents the amount she got as commission (₱1,749.00); and r represents the commission rate (11%). Substituting the values in the formula, $B = P/r$ becomes:

$$B = \frac{1,749}{11\%} \begin{array}{l} \longrightarrow \text{percentage} \\ \longrightarrow \text{rate} \end{array}$$

- b. Convert the rate to decimal form if it is not in decimal form already.

$$r = 11\%$$

To convert from percent to decimal, remove the % sign and then move the decimal point two places to the left.

$$r = 11\% = 0.11$$

- c. Compute for the base (B).

$$\begin{array}{r} 0.11 \overline{)174900} \longrightarrow 11 \overline{)174900} \\ \underline{11} \rightarrow 11 \times 1 = 11 \\ 64 \rightarrow 17 - 11 = 6; \text{bring down } 4 = 64 \\ \underline{55} \rightarrow 11 \times 5 = 55 \\ 99 \rightarrow 64 - 55 = 9; \text{bring down } 9 = 99 \\ \underline{99} \rightarrow 11 \times 9 = 99 \\ 0 \rightarrow 99 - 99 = 0; \text{bring down } 0 = 0 \\ \underline{0} \rightarrow 11 \times 0 = 0 \\ 0 \rightarrow 0 - 0 = 0; \text{bring down } 0 = 0 \\ \underline{0} \rightarrow 11 \times 0 = 0 \\ 0 \rightarrow 0 - 0 = 0 \end{array}$$

The quotient is 15,900. Therefore, Mr. Lando's total sales amounted to ₱15,900.

2. **STEP 1** Write the given information.

- a. ₱1,824.00 – commission that Minda received; this represents the percentage (P).
- b. ₱15,200.00 – Minda's total sales; this represents the base (B).

STEP 2 Determine what is asked.

Find how much is the commission rate (r).

STEP 3 Solve for the answer.

a. To solve for the answer, use the formula:

$$r = \frac{P}{B} \times 100\%$$

In this case, r represents the commission rate; P represents the commission that Minda received (₱645); and B represents the total sales that Mario was able to make (₱4,300). Substituting the values in the formula,

$$r = \frac{P}{B} \times 100\%$$

becomes:

$$r = \frac{1,824}{15,200} \times 100\%$$

b. Compute for the rate (r).

$$\begin{array}{r} 0.12 \\ 15,200 \overline{) 1824.00} \\ \underline{1520 } \rightarrow 48 \times 6 = 288 \\ 304 \\ \underline{304 } \\ 0 \end{array}$$

$$1,824 \div 15,200 = 0.12$$

$$r = \frac{1,824}{15,200} \times 100\% = 0.12 \times 100\% = 12\%$$

Therefore, the commission rate, r , is equal to 12%.

Let's Try This (pages 12–13)

1. **STEP 1** Write the given information.

- a. ₱9,700 – tag price of the refrigerator; this represents the base (B).
- b. ₱7,760 – discounted price.

STEP 2 Determine what is asked.

Find the discount rate of the refrigerator.

STEP 3 Solve for the answer.

- a. To solve for the answer, use the formula

$$r = \frac{P}{B} \times 100\%$$

In this case, r represents the commission rate (which is unknown); B represents the tag price of the refrigerator; and P represents the amount of the discount:

$$\begin{aligned} P &= \text{original price} - \text{discounted price} \\ &= 9,700 - 7,760 \\ &= 1,940 \end{aligned}$$

Substituting the values in the formula:

$$r = \frac{1,940}{7,760} \times 100\% = 0.25\% = 25\%$$

- b. Compute for the rate (r).

$$\begin{array}{r} 0.25 \\ 7760 \overline{)1940.00} \\ \underline{1552 \ 0} \rightarrow 48 \times 6 = 288 \\ 388 \ 00 \rightarrow 48 \times 6 = 288 \\ \underline{388 \ 00} \rightarrow 48 \times 6 = 288 \\ 0 \rightarrow 48 \times 6 = 288 \end{array}$$

$$1940 \div 7760 = 0.25$$

$$r = \frac{1,940}{7,760} \times 100\% = 0.25 \times 100\% = 25\%$$

Therefore, the discount rate r is equal to 25%.

2. **STEP 1** Write the given information.

- a. ₱252 – amount of the discount for the dress (P).
b. 30% – discount rate (r).

STEP 2 Determine what is asked.

Find how much is the original price (B).

STEP 3 Solve for the answer.

- a. To solve for the answer, use the formula $B = P/r$.

In this case, ***B*** represents the original price of the dress; ***P*** represents the amount deducted from the original price; and ***r*** represents the discount rate (30%).

Substituting the values in the formula, ***B = P/r*** becomes:

$$B = \frac{252}{30\%} \begin{array}{l} \longrightarrow \text{percentage} \\ \longrightarrow \text{rate} \end{array}$$

- b. Convert the rate to decimal form if it is not in decimal form already.

$$r = 30\%$$

To convert from percent to decimal, remove the % sign and then move the decimal point two places to the left.

$$r = 30\% \rightarrow .30 \rightarrow 0.30$$

- c. Compute for the base (***B***).

$$B = \frac{675}{15\%}$$

$$\begin{array}{r} 0.30 \overline{)25200} \longrightarrow 0.30 \overline{)25200} \\ \underline{240} \rightarrow 30 \times 8 = 240 \\ 120 \rightarrow 252 - 240 = 12; \text{bring down } 0 = 120 \\ \underline{120} \rightarrow 30 \times 4 = 120 \\ 0 \rightarrow 120 - 120 = 0; \text{bring down } 0 = 0 \\ \underline{0} \rightarrow 48 \times 6 = 288 \\ 0 \rightarrow 48 \times 6 = 288 \end{array}$$

$$B = 252 \div 0.30 = 840$$

The quotient is 840. Therefore, the dress has an original price of P 840.

Let's Review (pages 15–16)

1. **STEP 1** Write the given information.

- a. P 8,500—amount of money borrowed.
- b. 20% interest (5–6 scheme).

- STEP 2** Determine what is asked.

Find how much Mang Roberto will have to pay within a period of four months.

STEP 3 Solve for the answer.

- a. To solve for the amount Mang Roberto has to pay, multiply the money borrowed (₱8,500) by 120%.

$$₱ 8,500 \times 120\% = ?$$

- b. Convert 120% to a decimal.

$$120\% = 1 \underbrace{.20}$$

therefore:

$$₱8,500 \times 120\% = ₱8,500 \times 1.20 = ₱10,200$$

Therefore, Mang Roberto needs to pay Mang Lino ₱10,200 within a year.

2. **STEP 1** Write the given information.

- a. ₱9,200– amount of money borrowed.
b. 20% interest (5–6 scheme).

STEP 2 Determine what is asked.

Find how much Aling Rita will have to pay within a period of six months.

STEP 3 Solve for the answer.

- a. To solve for the amount Mang Roberto has to pay, multiply the money borrowed (₱9,200) by 120%.

$$₱9,200 \times 120\% = ?$$

- b. Convert 120% to a decimal.

$$120\% = 1 \underbrace{.20}$$

therefore:

$$₱9,200 \times 120\% = ₱9,200 \times 1.20 = ₱11,040$$

Therefore, Aling Rita needs to pay Aling Nora ₱11,040 within a period of six months.

Let's Try This (pages 18–19)

1. **STEP 1** Write the given information.

- a. ₱19,500 – Money deposited; this represents the principal (**P**).
b. 6% – interest rate per year; this represents the rate (**r**).
c. 5 years – length of time money was deposited in the bank; this represents the time (**t**).

STEP 2 Determine what is asked.

Find how much Mang David's interest (**I**) is after five years.

STEP 3 Solve for the answer.

- a. Use the equation **$I = Prt$** . Substitute the values in the equation.

$$I = Prt$$

$$I = 19,500 \times 6\% \times 5$$

- b. Convert the rate (**r**) to decimal if it is not yet in decimal form.

$$r = 6\% = 0.\underbrace{06} = 0.06$$

- c. Compute for the interest (**I**).

$$I = 19,500 \times 0.06 \times 5 = 5,850$$

I is equal to 5,850 therefore the interest Mang David earned in three years is ₱5,850. This means that Mang David's money in the bank grew to ₱25,350 (₱19,500 + ₱5,850 = ₱25,350) in five years.

2. **STEP 1** Write the given information.

- a. ₱25,000 – Money borrowed; this represents the principal (**P**).
- b. 11% – interest rate per year; this represents the rate (**r**).
- c. 3.5 years – length of time money was loaned; this represents the time (**t**).

STEP 2 Determine what is asked.

Find how much Mang Pedro has to pay for his loan.

STEP 3 Solve for the answer.

- a. Use the equation **$I = Prt$** . Substitute the values in the equation.

$$I = Prt$$

$$I = 25,000 \times 11\% \times 3.5$$

- b. Convert the rate (**r**) to decimal if it is not yet in decimal form.

$$r = 11\% \rightarrow 0.\underbrace{11} \rightarrow 0.11$$

- c. Compute for the interest (**I**).

$$I = 25,000 \times 0.11 \times 3.5 = 9,625$$

I is equal to 9,625 therefore, the interest of Mang Pedro's loan after 3.5 years is ₱9,625. That means Mang Pedro needs to pay the bank ₱34,625 (₱25,000 + ₱9,625).

Let's See What You Have Learned (pages 20–21)

1. **STEP 1** Write the given information.

- a. ₱ 4,800.00 – commission for sales made; this represents the percentage (**P**).
- b. 15% – rate (**r**)

- STEP 2** Determine what is asked.

Find the total sales that Mang Ben was able to make (**B**).

- STEP 3** Solve for the answer.

- a. To solve for the answer, use the formula **$B = P/r$** .

In this case, **B** represents the total sales Mang Ben was able to make; **P** represents the amount he got as commission (₱4,800); and **r** represents the commission rate (15%). Substituting the values in the formula, **$B = P/r$** becomes:

$$B = \frac{4800}{15\%} \begin{array}{l} \longrightarrow \text{percentage} \\ \longrightarrow \text{rate} \end{array}$$

- b. Convert the rate to decimal form if it is not in decimal form already.

$$r = 15\%$$

To convert from percent to decimal, remove the % sign and then move the decimal point two places to the left.

$$r = 15\% \rightarrow 0.\overset{1}{\underset{5}{5}} \rightarrow 0.15$$

- c. Compute for the base (**B**).

$$B = \frac{4800}{0.15}$$

$$0.15 \overline{)480000} \longrightarrow 0.15 \overline{)480000}$$

$$\begin{array}{r} 32000 \\ 0.15 \overline{)480000} \\ \underline{45} \\ 30 \\ \underline{30} \\ 0 \\ \underline{0} \\ 0 \\ \underline{0} \\ 0 \\ \underline{0} \\ 0 \\ \underline{0} \\ 0 \end{array}$$

$$B = 4,800 \div 0.15 = 32,000$$

The quotient is 32,000. Therefore, Mang Ben's total sales amounts to ₱32,000.

2. **STEP 1** Write the given information.

- a. ₱12,600 – original price of the television; this represents the base (**B**).
- b. ₱3,150 – amount of discount.

- STEP 2** Determine what is asked.

Find the discount rate (**r**).

- STEP 3** Solve for the answer.

- a. To solve for the answer, use the formula

$$r = \frac{P}{B} \times 100\%$$

In this case, **r** represents the commission rate (which is unknown); **B** represents the original price of the television (₱12,600); and **P** represents the amount of the discount (₱3,150). Substituting the values in the formula:

$$r = \frac{3150}{12600} \times 100\%$$

- b. Compute for the rate (r).

$$\begin{array}{r} 0.25 \\ 12,600 \overline{) 3150.00} \\ \underline{2520 \ 0} \\ 630 \ 00 \\ \underline{630 \ 00} \\ 0 \end{array}$$

$$3150 \div 12,600 = 0.25$$

$$r = \frac{3150}{12,600} \times 100\% = 0.25 \times 100\% = 25\%$$

Therefore, the discount rate r is equal to 25%.

3. **STEP 1** Write the given information.

- a. ₱ 8,700—amount of money borrowed.
- b. 20% interest (5-6 scheme).

- STEP 2** Determine what is asked.

Find how much Mang Vic will have to pay Mang Domeng within a period of six months.

- STEP 3** Solve for the answer.

- a. To solve for the amount Mang Vic has to pay, multiply the money borrowed (₱ 8,700) by 120%.

$$\text{₱ } 8,700 \times 120\% = ?$$

- b. Convert 120% to a decimal.

$$120\% = 1.20$$

therefore:

$$\text{₱ } 8,700 \times 120\% = \text{₱ } 8,700 \times 1.20 = \text{₱ } 10,440$$

Therefore Mang Vic has to pay Mang Domeng ₱10,440 within a period of 6 months.

4. **STEP 1** Write the given information.

- a. ₱23,500 – Money borrowed; this represents the principal (**P**).
- b. 12% – interest rate per year; this represents the rate (**r**).

- c. 2.5 years – length of time money was loaned; this represents the time (**t**).

STEP 2 Determine what is asked.

Find how much Mrs. Fajardo has to pay for her loan.

STEP 3 Solve for the answer.

- a. Use the equation **$I = Prt$** . Substitute the values in the equation.

$$I = Prt$$

$$I = 23,500 \times 12\% \times 2.5$$

- b. Convert the rate (**r**) to decimal if it is not yet in decimal form.

$$r = 12\% \rightarrow 0.\overset{\curvearrowright}{12} \rightarrow 0.12$$

- c. Compute for the interest (**I**).

$$I = 23,500 \times 0.12 \times 2.5 = 7,050$$

I is equal to 7,050 therefore, the interest of Mrs. Fajardo's loan after 2.5 years is ₱7,050. That means Mrs. Fajardo needs to pay the bank ₱30,550 (₱23,500 + ₱7,050).

5. **STEP 1** Write the given information.

- a. ₱34,200 – Money deposited; this represents the principal (**P**).
b. 7% – interest rate per year; this represents the rate (**r**).
c. 6.5 years – length of time money was deposited in the bank; this represents the time (**t**).

STEP 2 Determine what is asked.

Find how much Mang Lando's interest (**I**) is after 6.5 years.

STEP 3 Solve for the answer.

- a. Use the equation **$I = Prt$** . Substitute the values in the equation.

$$I = Prt$$

$$I = 34,200 \times 7\% \times 6.5$$

- b. Convert the rate (**r**) to decimal if it is not yet in decimal form.

$$r = 7\% \rightarrow 0.\overset{\curvearrowright}{07} \rightarrow 0.07$$

- c. Compute for the interest (**I**).

$$I = 34,200 \times 0.07 \times 6.5 = 15,561$$

I is equal to 15,561, therefore, the interest Mang Lando earned in 6.5 years is ₱15,561. This means that Mang Lando's money in the bank grew to ₱49,761 (₱34,200 + ₱15,561) in 6.5 years.

C. Lesson 2

Let's Try This (pages 23–24)

1. **STEP 1** Write the given information.

- 1 Hong Kong dollar is to ₱6.41 (1 : 6.41)
- 2,700 Hong Kong dollars is to ? pesos (2,700 : ?)

- STEP 2** Determine what is asked.

Find out how much Mang Marlon's family received in pesos.
Let **N** represent this unknown value.

2,700 Hong Kong dollars is to **N** pesos (2,700 : **N**)

- STEP 3** Solve for the answer.

- Equate the two ratios.

$$1 : 6.41 = 2,700 : \mathbf{N}$$

- Equate the product of the means with the product of the extremes.

$$\begin{array}{c}
 \text{extremes} \\
 \text{1 : 6.41 = 2,700 : N} \\
 \text{means}
 \end{array}$$

Equating we have:

$$6.41 \times 2,700 = 1 \times \mathbf{N}$$

Simplifying we have:

$$17,307 = \mathbf{N}$$

Therefore, 2,700 Hong Kong dollars is equivalent to ₱17,307. This is the amount that Aling Remedios's husband received.

2. **STEP 1** Write the given information.

- a. 1 Australian dollar is to ₱26.30 (1 : 26.30)
- b. ? Australian dollars is to 16,043 pesos (? : 16,043)

STEP 2 Determine what is asked.

Find out how much Mr. Abalos would have in Australian dollars. Let **N** represent this unknown value.

N Australian dollars is to ₱16,043 (**N** : 16,043)

STEP 3 Solve for the answer.

- a. Equate the two ratios.

$$1 : 26.30 = \mathbf{N} : 16,043$$

- b. Equate the product of the means with the product of the extremes.

extremes

$$1:26.30 = \mathbf{N}:16,043$$

means

Equating we have:

$$1 \times 16,043 = 26.30 \times \mathbf{N}$$

Simplifying we have:

$$16,043 = 26.3\mathbf{N}$$

- c. Isolate **N** to one side of the equation.

To isolate **N**, 26.3 should be removed from the right side of the equation. To do this, divide both sides of the equation by 26.3.

$$\frac{16,043}{26.3} = \frac{26.3\mathbf{N}}{26.3}$$

Simplifying we have:

$$610 = \mathbf{N}$$

Therefore, Mr. Abalos would have 610 Australian dollars.

Let's Try This (pages 27–28)

1. **STEP 1** Write the given information.

- a. 8 feet statue casts a shadow 3 feet long (8 : 3)
- b. ? feet tall water tank casts a shadow 12 feet long (? : 12)

STEP 2 Determine what is asked.

Find out how tall the building is. Let **N** represent this unknown value.

N feet tall water tank casts a shadow 11 feet long (**N** : 12)

STEP 3 Solve for the answer.

- a. Equate the two ratios.

$$8 : 3 = \mathbf{N} : 12$$

- b. Equate the product of the means with the product of the extremes.

$$\begin{array}{c} \text{extremes} \\ \text{8 : 3 = N : 12} \\ \text{means} \end{array}$$

Equating we have:

$$3 \times \mathbf{N} = 8 \times 12$$

Simplifying we have:

$$3\mathbf{N} = 96$$

- c. Isolate **N** to one side of the equation.

To isolate **N**, 3 should be removed from the left side of the equation. To do this, divide both sides of the equation by 3.

$$\begin{array}{l} \frac{3\mathbf{N}}{3} = \frac{96}{3} \\ \mathbf{N} = 32 \end{array}$$

Therefore, the building, which casts a 12-foot long shadow, is 32 feet tall.

2. Note that the distance between points A and C is the width of the river. To determine this unknown value, we use ratio and proportion.

STEP 1 Write the given information.

We relate the short leg with the long leg of each triangle.

- a. 5 units is to 12 units (5 : 12)
- b. 11 meters is to ? meters (11 : ?)

STEP 2 Determine what is asked.

Determine the width of the river (distance between points A and C). Let **N** represent this unknown value.

11 meters is to **N** meters (11 : **N**)

STEP 3 Solve for the answer.

- a. Equate the two ratios.

$$5 : 12 = 11 : \mathbf{N}$$

- b. Equate the product of the means with the product of the extremes.

extremes

$$5 : 12 = 11 : \mathbf{N}$$

means

Equating we have:

$$12 \times 11 = 5 \times \mathbf{N}$$

Simplifying we have:

$$132 = 5\mathbf{N}$$

- c. Isolate **N** to one side of the equation.

To isolate **N**, 5 should be removed from the right side of the equation. To do this, divide both sides of the equation by 5.

$$\frac{132}{5} = \frac{5\mathbf{N}}{5}$$

$$\begin{array}{r}
 26.4 \\
 5 \overline{)132.0} \\
 \underline{10} \rightarrow 5 \times 2 = 10 \\
 32 \rightarrow 13 - 10 = 3; \text{bring down } 2 = 32 \\
 \underline{30} \rightarrow 5 \times 6 = 30 \\
 20 \rightarrow 32 - 30 = 2; \text{bring down } 0 = 20 \\
 \underline{20} \rightarrow 5 \times 4 = 20 \\
 0 \rightarrow 20 - 20 = 0
 \end{array}$$

$$26.4 = \mathbf{N}$$

Therefore, the width of the river is 26.4 meters.

Let's See What You Have Learned (pages 29–30)

1. **STEP 1** Write the given information.

- 1 Canadian dollar is to P 33.36 (1 : 33.36)
- 510 Canadian dollars is to ? pesos (510 : ?)

STEP 2 Determine what is asked.

Find out how much Sam's family received in pesos. Let **N** represent this unknown value.

510 Canadian dollars is to **N** pesos (510 : **N**)

STEP 3 Solve for the answer.

- Equate the two ratios.

$$1 : 33.36 = 510 : \mathbf{N}$$

- Equate the product of the means with the product of the extremes.

$$\begin{array}{c}
 \text{extremes} \\
 \text{1 : 33.36 = 510 : N} \\
 \text{means}
 \end{array}$$

Equating we have:

$$33.36 \times 510 = 1 \times \mathbf{N}$$

Simplifying we have:

$$17,013.6 = \mathbf{N}$$

Therefore, 510 Canadian dollars is equivalent to ₱17,013.60. This is the amount that Sam's family received.

2. **STEP 1** Write the given information.

- a. \$ 1 is to ₱50.76 (1 : 50.76)
- b. \$ 415 is to ? pesos (415 : ?)

STEP 2 Determine what is asked.

Find out how much Karen's sister received in pesos. Let **N** represent this unknown value.

\$ 415 is to **N** pesos (510 : **N**)

STEP 3 Solve for the answer.

- a. Equate the two ratios.

$$1 : 50.76 = 415 : \mathbf{N}$$

- b. Equate the product of the means with the product of the extremes.

extremes

$$1 : 50.76 = 415 : \mathbf{N}$$

means

Equating we have:

$$50.76 \times 415 = 1 \times \mathbf{N}$$

Simplifying we have:

$$21,065.4 = \mathbf{N}$$

Therefore, \$ 415 is equivalent to ₱21,065.40. This is the amount that Karen's sister received.

3. **STEP 1** Write the given information.

- a. 13 feet pole casts a shadow 4 feet long (13 : 4)
- b. ? feet tall building casts a shadow 15 feet long (? : 15)

STEP 2 Determine what is asked.

Find out how tall the building is. Let **N** represent this unknown value.

N feet tall building casts a shadow 15 feet long (**N** : 15)

STEP 3 Solve for the answer.

- a. Equate the two ratios.

$$13 : 4 = \mathbf{N} : 15$$

- b. Equate the product of the means with the product of the extremes.

$$\begin{array}{c} \text{extremes} \\ \text{13 : 4 = N : 15} \\ \text{means} \end{array}$$

Equating we have:

$$4 \times N = 13 \times 15$$

Simplifying we have:

$$4N = 195$$

- c. Isolate **N** to one side of the equation.

To isolate **N**, 4 should be removed from the left side of the equation. To do this, divide both sides of the equation by 4.

$$\begin{array}{l} \frac{4N}{4} = \frac{195}{4} \\ N = 48.75 \end{array}$$

Therefore, the building, which casts a 15-foot long shadow, is 48.75 feet tall.

4. Note that the distance between points A and C is the width of the river. To determine this unknown value, we use ratio and proportion.

STEP 1 Write the given information.

We relate the short leg with the long leg of each triangle.

- 4 units is to 15 units (4 : 15)
- 9 meters is to ? meters (9 : ?)

STEP 2 Determine what is asked.

Determine the width of the river (distance between points A and C). Let **N** represent this unknown value.

9 meters is to **N** meters (9 : **N**)

STEP 3 Solve for the answer.

- Equate the two ratios.

$$4 : 15 = 9 : N$$

- b. Equate the product of the means with the product of the extremes.

$$\begin{array}{c} \text{extremes} \\ \text{4 : 15 = 9 : N} \\ \text{means} \end{array}$$

Equating we have:

$$15 \times 9 = 4 \times N$$

Simplifying we have:

$$135 = 4N$$

- c. Isolate N to one side of the equation.

To isolate N, 4 should be removed from the right side of the equation. To do this, divide both sides of the equation by 4.

$$\frac{135}{4} = \frac{4N}{4}$$

$$\begin{array}{r} 33.75 \\ 4 \overline{)135.00} \\ \underline{12} \rightarrow 4 \times 3 = 12 \\ 15 \rightarrow 13 - 12 = 1; \text{bring down } 5 = 15 \\ \underline{12} \rightarrow 4 \times 3 = 12 \\ 30 \rightarrow 15 - 12 = 3; \text{bring down } 0 = 30 \\ \underline{28} \rightarrow 4 \times 7 = 28 \\ 20 \rightarrow 30 - 28 = 2; \text{bring down } 0 = 20 \\ \underline{20} \rightarrow 4 \times 5 = 20 \\ 0 \rightarrow 20 - 20 = 0 \end{array}$$

$$33.75 = N$$

Therefore, the width of the river is 33.75 meters.

D. What Have You Learned? (pages 32–33)

1. **STEP 1** Write the given information.

- a. ₱4,212 – commission that Paul received; this represents the percentage (***P***).
- b. ₱23,400 – this is the total sales that Paul was able to make; this represents the base (***B***).

STEP 2 Determine what is asked.

Find how much is the commission rate (***r***).

STEP 3 Solve for the answer.

- a. To solve for the answer, use the formula:

$$r = \frac{P}{B} \times 100\%$$

In this case, ***r*** represents the commission rate; ***P*** represents the commission that Paul received (₱ 4,212); and ***B*** represents the total sales that he was able to make (₱ 23,400). Substituting the values in the formula,

$$r = \frac{P}{B} \times 100\%$$

becomes:

$$r = \frac{4,212}{23,400} \times 100\%$$

- b. Compute for the rate (***r***).

$$\begin{array}{r} 0.18 \\ 23,400 \overline{) 4212.00} \\ \underline{23400} \rightarrow 23,400 \times 1 = 23,400 \\ 187200 \rightarrow 42,120 - 23,400 \\ \underline{187200} \rightarrow 23,400 \times 8 = 187,200 \\ 0 \rightarrow 187,200 - 187,200 = 0 \end{array}$$

$$4,212 \div 23,400 = 0.18$$

$$r = \frac{4,212}{23,400} \times 100\% = 0.18 \times 100\% = 18\%$$

Therefore, the commission rate ***r*** is equal to 18%.

2. **STEP 1** Write the given information.

- a. ₱11,700– amount of money borrowed.
- b. 20% interest (5-6 scheme).

STEP 2 Determine what is asked.

Find how much Aling Norma will have to pay within a 9-month period.

STEP 3 Solve for the answer.

- a. To solve for the amount Aling Norma has to pay, multiply the money borrowed (₱11,700) by 120%.

$$₱11,700 \times 120\% = ?$$

- b. Convert 120% to a decimal.

$$120\% = 1.20$$

therefore:

$$₱11,700 \times 120\% = ₱11,700 \times 1.20 = ₱14,040$$

This means that at the end of 9 months, Aling Norma will have to pay Aling Rose ₱14,040.

3. **STEP 1** Write the given information.

- a. ₱35,000 – Money borrowed; this represents the principal (**P**).
- b. 13% – interest rate per year; this represents the rate (**r**).
- c. 2.5 years – length of time money was loaned; this represents the time (**t**).

STEP 2 Determine what is asked.

Find how much Mr. Cruz has to pay for his loan.

STEP 3 Solve for the answer.

- a. Use the equation **I = Prt**. Substitute the values in the equation.

$$I = Prt$$

$$I = 35,000 \times 13\% \times 2.5$$

- b. Convert the rate (**r**) to decimal if it is not yet in decimal form.

$$r = 13\% = 0.13 = 0.13$$

- c. Compute for the interest (**I**).

$$I = 35,000 \times 0.13 \times 2.5 = 11,375$$

I is equal to 11,375 therefore, the interest of Mr. Cruz's loan after 2.5 years is ₱11,375. That means Mr. Cruz needs to pay the bank ₱46,375 (₱35,000 + ₱11,375).

4. **STEP 1** Write the given information.

- 1 Franc is to ₱6.50 (1 : 6.50)
- ? Francs is to ₱14,820 pesos (? : 14,820)

- STEP 2** Determine what is asked.

Find out how much Mr. Garcia had in Francs. Let **N** represent this unknown value.

N Francs is to ₱14,820 (**N** : 14,820)

- STEP 3** Solve for the answer.

- Equate the two ratios.

$$1 : 6.50 = N : 14,820$$

- Equate the product of the means with the product of the extremes.

extremes

$$1:6.50 = N:14,820$$

means

Equating we have:

$$6.50 \times N = 1 \times 14,820$$

Simplifying we have:

$$14,820 = 6.5N$$

- Isolate **N** to one side of the equation.

To isolate **N**, 6.5 should be removed from the right side of the equation. To do this, divide both sides of the equation by 6.5.

$$\frac{14,820}{6.5} = \frac{6.5N}{6.5}$$

Simplifying we have:

$$2,280 = N$$

Therefore, Mr. Garcia would have 2,280 Francs.

5. **STEP 1** Write the given information.

- a. 13 feet pole casts a shadow 4 feet long (13 : 4)
- b. ? feet tall building casts a shadow 14 feet long (? : 14)

STEP 2 Determine what is asked.

Find out how tall the building is. Let **N** represent this unknown value.

N feet tall building casts a shadow 14 feet long (**N** : 14)

STEP 3 Solve for the answer.

- a. Equate the two ratios.

$$13 : 4 = N : 14$$

- b. Equate the product of the means with the product of the extremes.

extremes

$$13 : 4 = N : 14$$

means

Equating we have:

$$4 \times N = 13 \times 14$$

Simplifying we have:

$$4N = 182$$

- c. Isolate **N** to one side of the equation.

To isolate **N**, 4 should be removed from the left side of the equation. To do this, divide both sides of the equation by 4.

$$\frac{4N}{4} = \frac{182}{4}$$
$$N = 45.5$$

6. **STEP 1** Write the given information.

We relate the short leg with the long leg of each triangle.

- a. 6 units is to 16 units (6 : 16)
- b. 13 meters is to ? meters (13 : ?)

- STEP 2** Determine what is asked.

Determine the width of the river (distance between points A and C). Let **N** represent this unknown value.

13 meters is to **N** meters (13 : **N**)

- STEP 3** Solve for the answer.

- a. Equate the two ratios.

$$6 : 16.5 = 13 : \mathbf{N}$$

- b. Equate the product of the means with the product of the extremes.

extremes

$$6 : 16.5 = 13 : \mathbf{N}$$

means

Equating we have:

$$16.5 \times 13 = 6 \times \mathbf{N}$$

Simplifying we have:

$$214.5 = 6\mathbf{N}$$

- c. Isolate **N** to one side of the equation.

To isolate **N**, 6 should be removed from the right side of the equation. To do this, divide both sides of the equation by 6.

$$\frac{214.5}{6} = \frac{6\mathbf{N}}{6}$$

$$\begin{array}{r}
 35.75 \\
 6 \overline{) 214.50} \\
 \underline{18} \rightarrow 6 \times 3 = 18 \\
 34 \rightarrow 21 - 18 = 3; \text{bring down } 4 = 34 \\
 \underline{30} \rightarrow 6 \times 5 = 30 \\
 45 \rightarrow 34 - 30 = 4; \text{bring down } 5 = 45 \\
 \underline{42} \rightarrow 6 \times 7 = 42 \\
 30 \rightarrow 45 - 42 = 3; \text{bring down } 0 = 30 \\
 \underline{30} \rightarrow 6 \times 5 = 30 \\
 0 \rightarrow 30 - 30 = 0
 \end{array}$$

$$35.75 = N$$

Therefore, the width of the river is 35.75 meters.



Glossary

5-6 It is a set up for borrowing money on the condition that the borrower pays with an interest of 20% of the amount he or she borrows.

Extremes the two values of the proportion at both ends of the equation.

$$\begin{array}{c}
 \text{extremes} \\
 \text{a : b} = \text{c : d}
 \end{array}$$

where a, b, c and d are numerical values.

Means the two values of the proportion at the middle of the equation.

$$\begin{array}{c}
 \text{a : b} = \text{c : d} \\
 \text{means}
 \end{array}$$

Proportion A comparison between two fractions or ratios that have equal values.

Ratio A comparison between two quantities, this can be expressed as a fraction.

Simple interest Interest on money deposited in or loaned from a bank on the basis of the equation:

$$\text{Interest} = \text{Principal} \times \text{rate} \times \text{time}$$



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