

Who Really Did Better?

Objectives:

- A. Define actual and relative change.
- B. Distinguish between actual and relative change.

After researching several companies, you and your friend decided to purchase your first shares of stock. You bought \$200 worth of stock in one company and your friend invested \$400 in another. At the end of a year, your stock was worth \$280 and your friend's stock was valued at \$500.

- 1. How much money did you earn from your purchase?
- 2. How much did your friend earn?
- 3. Who earned more money?

Your answers to Problems 1 and 2 represent **actual change**, the actual numerical value by which a quantity has changed. When a quantity increases in value, such as your stock, the actual change is positive. When a quantity decreases in value, the actual change is negative.

- 4. Keeping in mind the amount each of you originally invested, whose investment do you believe did better? Explain your answer.

In answering Problem 4, you may have considered the actual change *relative* to the original amount invested. This comparison leads to the mathematical idea of relative change.

The ratio formed by comparing the actual change to the original value is called the **relative change**. Relative change is written in fraction form with the actual change in the numerator and the original value in the denominator.

$$\text{relative change} = \frac{\text{actual change}}{\text{original value}}$$

Since the relative change (increase or decrease) is frequently reported as a percent, it is often called **percent change**. The two terms are interchangeable.

- 5. Determine the relative change in your \$200 investment. Write your answer as a fraction and as a percent.

- 6. Determine the relative change in your friend's \$400 investment. Write your answer as a fraction and as a percent.

- 7. In relative terms, whose stock performed better?

8. Determine the actual change and the percent change of the following quantities:
- You paid \$20 for a rare baseball card that is now worth \$30.
 - Last year's graduating class had 180 students; this year's graduating class size is 225.
 - Ann invested \$300 in an energy stock, and now it is worth \$540.
 - Bob invested \$300 in a technology stock, but now it is worth only \$225
 - Pat invested \$300 in a risky dot-com venture, and his stock is now worth \$5

When speaking about percent change, a percent greater than 100% can make sense. For example, suppose a \$50 investment tripled to \$150. The actual increase in the investment is

$$\$150 - \$50 = \$100.$$

Then the relative change is $\frac{\text{actual change}}{\text{original value}} = \frac{\$100}{\$50} = 2.00$. Therefore, the investment increased by 200%.

9. Determine the actual change and the percent change of the following quantities.
- Your parents bought their home in 1970 for \$40,000. They sold it recently for \$450,000 after it lost value in the recent housing slump of \$550,000.
 - After building a new convention center, the number of hotel rooms in a city increased from 1500 to 6000.

Exercises:

1. The full-time enrollment in your college last year was 3200 students. This year there are 3560 full-time students on campus.
 - a. Determine the actual increase in full-time enrollment.
 - b. Determine the relative increase (as a percent) in full-time enrollment.

2. In the spring of 2004, the price of gasoline seemed to be rising every day. The average price for regular gas began the year at \$2.20 per gallon. By July, the price had risen to \$2.65 per gallon.
 - a. Determine the actual increase in gasoline price.
 - b. Determine the relative increase (as a percent) in gasoline price.

3. This year, the hourly wage from your part-time job is \$6.50, up from last year's \$6.25. What percent increase does this represent?

4. Last month, Acme and Arco corporations were forced to lay off 500 workers each. Acme's workforce is now 1000. Arco currently has 4500 employees. What percent of their workforce did each company lay off?

5. You are now totally committed to changing your eating habits for better health. You have decided to cut back your daily caloric intake from 2400 to 1800 calories. By what percent are you cutting back on calories?

6.
 - a. You paid \$10 per share for a promising technology stock. Within a year, the stock price skyrocketed to \$50 per share. By what percent did your stock value increase?
 - b. You held on to the stock for a bit too long. The price has just fallen from its \$50 high back to \$10. By what percent did your stock decrease from \$50?

7. Perform the following calculations.
 - a. Start with a value of 10, double it, and then calculate the percent increase.

 - b. Start with a value of 25, double it, and then calculate the percent increase.

 - c. Start with a value of 40, double it, and then calculate the percent increase.

 - d. When any quantity doubles in size, by what percent has it increased?

8. Perform a similar set of calculations to the ones you did in Exercise 7 to help determine the percent increase of any quantity that triples in size.