Applications

> *To make a million, start with $900,000.*
>
> —**Morton Shulman, politician, businessman, and television personality**

1. How might the words in the quote apply to what you have learned about compound interest this section? See margin.

2. Jimmy invests $4,000 in an account that pays 2% annual interest, compounded semi-annually. What is his balance, to the nearest cent, at the end of 10 years? $4,880.76

3. On Olga's 16th birthday, her uncle invested $2,000 in an account that was locked into a 1.75% interest rate, compounded monthly. How much will Olga have in the account when she turns 18? Round to the nearest cent. $2,071.19

4. Samantha deposits $1,500 into the Park Street Bank. The account pays 1.12% annual interest, compounded daily. To the nearest cent, how much is in the account at the end of three non–leap years? $1,551.26

5. Joanne deposits $4,300 into a 1-year CD at a rate of 2.3%, compounded daily.
   a. What is her ending balance after the year, to the nearest cent? $4,400.04
   b. How much interest does she earn, to the nearest cent? $100.04
   c. What is her annual percentage yield to the nearest hundredth of a percent? 2.33%

6. Mike deposits $5,000 in a 3-year CD account that yields 1.5% interest, compounded weekly. What is his ending balance, to the nearest cent, at the end of 3 years? $5,230.11

7. Rob deposits $1,000 in a savings account at New York State Bank that pays 1.4% interest, compounded monthly.
   a. How much is in his account at the end of 1 year, to the nearest cent? $1,014.09
   b. What is the APY for this account to the nearest hundredth of a percent? 1.41%

8. How much more does $1,000 earn in 8 years, compounded daily at 3%, than $1,000 over 8 years at 3%, compounded semi-annually, to the nearest cent? $2.25

9. If $3,000 is invested at an interest rate of 1.8%, compounded hourly for 2 years, what is the ending balance, to the nearest cent? $3,109.97

10. Mike and Julie receive $20,000 in gifts from friends and relatives for their wedding. They deposit the money into an account that pays 2.75% interest, compounded daily.
    a. Will their money double within 10 years? No
    b. Will their money double within 15 years? No

11. Lindsay invests $80 in an account that pays 1% annual interest, compounded monthly. Michele invests $60 in an account that pays 2% annual interest, compounded weekly.
    a. Whose balance is greater after 1 year? Lindsay's
    b. Whose balance is greater after 12 years? Lindsay's

12. Investigate the difference between compounding annually and simple interest for parts a–j. Round to the nearest cent.
   a. Find the simple interest for a 1-year CD for $5,000 at a 2.5% interest rate. $125
   b. Find the interest for a 1-year CD for $5,000 at an interest rate of 2.5%, compounded annually. $125
   c. Compare the results from parts a and b. The interest is the same
   d. Find the simple interest for a 3-year CD for $5,000 at an interest rate of 2.5%. $375
   e. Find the interest for a 3-year CD for $5,000 at an interest rate of 2.5%, compounded annually. $384.45
   f. Compare the results from parts d and e. See margin.
   g. Find the simple interest for a 6-year CD for $5,000 at an interest rate of 2%. $600
   h. Find the interest for a 6-year CD for $5,000 at an interest rate of 2%, compounded annually. $630.81
   i. Compare the results from parts g and h. See margin.
   j. Is interest compounded annually the same as simple interest? Explain. See margin.

13. Rodney invests a sum of money, P, into an account that earns interest at a rate of r, compounded yearly. Gerald invests half that amount into an account that pays twice Rodney's interest rate. Which of the accounts will have the higher ending balance after 1 year? Explain. See margin.

14. Island Bank is advertising a special 1.55% APR for long-term CDs. Manny takes out a 1-year CD for $40,000. The interest is compounded daily. Find the annual percentage yield for Manny's account to the nearest hundredth of a percent. 1.56%

15. Businesses deposit large sums of money into bank accounts. Imagine an account with $10 million in it.
   a. How much would the account earn in 1 year of simple interest at a rate of 2.12%? Round to the nearest cent. $212,000
   b. How much would the account earn in 1 year at 2.12% if the interest was compounded daily? Round to the nearest cent. $214,256.88
   c. How much more interest is earned by interest compounded daily compared to simple interest? $2,256.88

16. An elite private college receives large donations from successful alumni. The account that holds these donations now has $955 million.
   a. How much would the account earn in 1 year of simple interest at a rate of 2.33%? Round to the nearest cent. $22,251,500
   b. How much would the account earn in 1 year at 2.33% if the interest was compounded daily? Round to the nearest cent. $22,512,028
   c. How much more interest is earned by compounding daily as compared to simple interest? $260,528
   d. If the money is used to pay full scholarships, and the price of tuition is $61,000 per year, how many more students each year can receive full 4-year scholarships if the interest were compounded daily rather than using simple interest? One, since each 4-year (full) scholarship is worth $244,000

ANSWERS
12f. The annual compounded interest earned $9.45 more than the simple interest.
12i. The annual compounded interest earned $30.81 more than the simple interest.
12j. No; they are the same for the first year. For anything longer, compounded interest grows faster than simple interest.
13. Rodney's account balance will always be greater; $P(1 + r) > P(0.5 + 2r)$