

6.2 Exercises

✓ CONCEPT CHECK

1. The _____ is the amount you need to invest now in order to meet a future goal.
2. A sequence of _____ made into or taken out of an account is called an annuity.
3. If you buy stock in a company, you are buying a share in the ownership of that company, and you become a _____.
4. A dividend is the money that is divided amongst shareholders when a _____ earns a profit.
5. True or False: Contributions to a Roth IRA are taxed before they are deposited, but withdrawals are not taxed.

💡 PRACTICE

For each situation, use the formula for present value of money to calculate the amount you need to invest now in one lump sum. Round your answer to the nearest cent, if necessary.

6. \$25,000 after 10 years with an APR of 8% compounded monthly
7. \$25,000 after 10 years with an APR of 12% compounded monthly
8. \$100,000 after 18 years with an APR of 6% compounded quarterly
9. \$1,000,000 after 40 years with an APR of 10% compounded monthly
10. \$22,000 after 12 years with an APR of 7% compounded quarterly
11. \$54,000 after 8 years with an APR of 9% compounded semiannually
12. \$115,000 after 15 years with an APR of 11% compounded monthly
13. \$800,000 after 30 years with an APR of 13% compounded quarterly

A CD, or “certificate of deposit,” is a type of savings account with a fixed rate and term, meaning you can only redeem it when the term is over. Answer the following questions about CDs. Round your answers to the nearest cent, if necessary.

14. What is the profit earned on a 6-month CD with a face value of \$600 and a 0.45% APR compounded monthly?
15. What is the profit earned on a 1-year CD with a face value of \$2000 and a 0.51% APR compounded monthly?

16. What is the profit earned on a 3-year CD with a face value of \$1500 and a 0.71% APR compounded monthly?
17. What is the profit earned on a 5-year CD with a face value of \$800 and a 0.77% APR compounded monthly?

APPLICATIONS

18. Revere College predicts that in 18 years it will take \$200,000 to attend the college for four years. Debbie wishes to save money for her child's college fund. How much should Debbie put aside in an account with an APR of 9% compounded monthly in order to have \$200,000 in the account in 18 years?
19. Richard just entered a university, and his parents are planning to give him a car upon graduation. How much should they invest into an account with an APR of 10% compounded monthly if they estimate that in four years the car will cost \$15,000? Round your answer to the nearest cent.
20. Bella plans to buy a new laptop that should be released in a year. She predicts that the laptop will cost about \$2500. How much should she deposit now into an account with an APR of 5% compounded monthly so that the account accrues enough money to cover the cost of the laptop when it is released? Round your answer to the nearest cent.
21. Anita sets a goal to have \$100,000 in her account when she turns 40. What amount of money should she invest now at an APR of 4% compounded monthly to reach her goal if she is 22 this year? Round your answer to the nearest cent.
22. Raul's vision started to deteriorate while he was in middle school, and by the time he entered high school, he had to wear glasses. Together with his parents, he plans to undergo a laser vision correction in 6 years when he turns 21. They estimate the cost of the surgery at that time will be \$5500. How much should they deposit into an account with an APR of 8% compounded quarterly to obtain the desired sum in 6 years? Round your answer to the nearest cent.
23. Kevin learns that the game he has long awaited will be released in two years. He is not sure that his computer will be able to handle this game, so he decides to buy a new one. He estimates that the cost of the computer will be \$3200. If he wants to have enough money to buy it by the time the game is released, how much should he invest into an account with an APR of 4.5% compounded monthly? Round your answer to the nearest cent.
24. Carol wants to build a pool in her backyard in 5 years, so she decides to set aside a certain amount of money for this purpose. If the average cost of building a pool is \$50,000, how much should she invest into an account with an APR of 8.2% compounded quarterly to reach her goal? Round your answer to the nearest cent.

25. Alexis and Will are purchasing a home. They wish to save money for 10 years and purchase a house that has a value of \$180,000 with cash. If they deposit money into an account paying 12% interest, how much do they need to deposit each month in order to make the purchase?
26. Marilyn wishes to retire at age 65 with \$2,000,000 in the bank. At the age of 21, she decides to begin depositing money into an account with an APR of 11%. What is the monthly payment Marilyn must make in order to make this happen?
27. Suppose you wish to retire at the age of 65 with \$80,000 in savings. Determine your monthly payment into an IRA if the APR is 7.5% and you begin making payments at
- 20 years old.
 - 30 years old.
 - 40 years old.
28. Suppose you'd like to save enough money to pay cash for your next car. The goal is to save an extra \$26,000 over the next 6 years. What amount of quarterly payments must you make into an account that earns 5.5% interest in order to reach your goal?
29. Willie deposits a fixed monthly amount into an annuity account for his child's college fund. He wishes to accumulate a future value of \$75,000 in 15 years.
- Assuming an APR of 3.5%, how much money should Willie deposit monthly in order to reach his goal?
 - How much of the \$75,000 will Willie ultimately deposit in the account, and how much is interest earned?
30. Francis hopes that in 20 years, he will be able to purchase his own house. He estimates the amount of money needed for this will be \$450,000. How much should he deposit each month into an account with an APR of 4.4% compounded monthly to reach his goal? Round your answer to the nearest dollar.
31. Gabriel plans to retire when he has \$1,500,000 in his bank account, and he does not want to work more than 30 years. If his account has an APR of 5.4%, determine the minimum monthly annuity payment he would need to make. Round your answer to the nearest dollar.
32. Sophia has decided to undergo rhinoplasty when she turns 25. She estimates that the procedure will cost about \$8000. Determine the annuity payments she should deposit quarterly into an account with an APR of 3.2% to reach her goal if she is 21. Round your answer to the nearest dollar.
33. Samantha wants to open a clothing store using her own money. She estimates that she will need about \$80,000. How much should she deposit quarterly into an account with an APR of 2.4% in order to accrue enough money in ten years? Round your answer to the nearest dollar.

34. Hasan needs \$1200 to buy a new graphics card for his computer.
- How much should he deposit monthly into an account with an APR of 2.2% to accrue the desired amount in a year? Round your answer to the nearest dollar.
 - How much of the graphics card cost will be deposited by Hasan, and how much will be the interest?
35. Noah has always dreamed of having a yacht. When he was 18, he decided to start saving money to buy one. He learned that the cost of a yacht starts at \$500,000.
- If his goal is to own a yacht by age 30, how much should he deposit each quarter into an account with an APR of 8.7% in order to have enough money to purchase a \$500,000 yacht? Round your answer to the nearest dollar.
 - If he reaches his goal, how much of the \$500,000, will come from deposits, and how much will come from interest?
36. Blake starts an IRA (Individual Retirement Account) to save for retirement at the age of 22. He deposits \$450 each month. The IRA has an average annual interest rate of 7%.
- How much money will he have saved upon retirement at the age of 65?
 - Determine the amount of money Blake deposited over the length of the investment and how much he made in interest.
37. Jimmie has a job at an advertising agency earning \$54,000 per year. Jimmie is currently 26 years old and wishes to retire at age 67 with a retirement income of \$75,000. How much money would Jimmie need to invest each month into a growth stock mutual fund with an interest rate of 6.5% in order to withdraw \$75,000 per year without reducing the principal?
38. After getting married, Liam and Olivia decide to start a shared annuity savings plan. They plan to deposit \$1500 every quarter into an account that earns 2.1% APR compounded quarterly. How much will they have in the account on the day of their Pearl Anniversary, which is the 30th wedding anniversary? Round your answer to the nearest cent.
39. After graduating from college, Ela decides that she wants to start saving so that she can move out of her parents' home and start a new chapter in her life. She starts placing \$90 each month into an account with an APR of 3.4% compounded monthly. How much will she have in her account if she does this faithfully for five years? Round your answer to the nearest cent.
40. When Celine was ten, she asked her parents to start placing \$10 from the money they gave her each month into a savings account. If the account earns 4.1% APR compounded monthly, how much will Celine have when she turns 18? Round your answer to the nearest cent.

41. Alexander had difficulty finding a new job, so he decided to create an emergency fund in case this happened again. He plans to deposit \$2000 every quarter into an account with an APR of 5.8% compounded quarterly. How much will he have in his emergency fund after 10 years? Round your answer to the nearest cent.
42. Elias decided he would go on a trip to Australia when he saved enough money. He started to deposit \$150 each month in an account with an APR of 4.8% compounded monthly.
- How much will he save in three years? Round your answer to the nearest cent.
 - How much of the saved amount will be deposited by Elias, and how much will be the interest?
43. When Mia was 21, she started depositing \$500 each quarter into an account that earns 7.2% APR compounded quarterly.
- Find the future value of her account in 20 years. Round your answer to the nearest cent.
 - Determine how much of the future value Mia will personally put into the account and how much will she earn in interest.
44. When she was 35, Emma started an IRA account with an APR of 7.3% compounded quarterly. Until she turned 50, she contributed \$1400 every quarter. Then, she stopped making deposits and left the account to accrue interest for the next ten years.
- Find the value of the account when Emma was 50.
 - Find the value of the account when she turned 60.
 - How much interest did the account earn until the moment Emma turned 60?
 - According to the four percent rule of thumb, how much could Emma start to withdraw each quarter after she turned 60? Round your answer to the nearest cent.
45. In the first twelve years after opening an IRA account, Hugo deposited \$280 into it every month. After that, he was promoted to a higher position and from then on decided to deposit \$420 each month. The APR for the account is 5.4% compounded monthly.
- Calculate the future value of the account after the first twelve years.
 - Calculate the future value of the account after ten years of increased deposits.
 - How much interest is earned over the twenty-two years?
 - If after twenty-two years Hugo is old enough to not incur any penalties, how much can he start withdrawing each month according to the four percent rule of thumb? Round your answer to the nearest cent.

46. Use the Facebook stock listing in the following table to answer each question.

Facebook Inc. (FB) ↑ 333.65 +0.69 (+0.21%)	
Prev. Close	Open
332.96	329.19
Low	High
325.80	334.38
52wk Low	52wk High
244.69	384.33
Mkt Cap	Volume
938.76B	21,767,335
Avg Vol (3m)	P/E
14,696,273	24.69
EPS (TTM)	Beta
13.49	1.34
1y Target Est	Dividend
419.77	N/A

- What is the ticker symbol for Facebook?
- What is the percentage change in the stock price for the day?
- Does Facebook pay dividends to its shareholders?
- Has the stock price increased or decreased while the market was closed, and by how much?
- Is the number of shares bought and sold for the day greater or less than the average?
- How many shares has Facebook issued?

47. Use the Nike stock listing in the following table to answer each question.

Nike Inc. (NKE) ↓ 148.72 -0.74 (-0.50%)	
Prev. Close	Open
149.46	148.00
Low	High
147.52	149.46
52wk Low	52wk High
118.80	174.38
Mkt Cap	Volume
236.61B	5,512,446
Avg Vol (3m)	P/E
5,910,602	39.70
EPS (TTM)	Beta
3.76	0.89
1y Target Est	Dividend
173.78	1.10 (0.75%)

- a. What is the ticker symbol for Nike?
- b. What is the change in the stock price for the day?
- c. What do analysts predict the price of Nike stock will be in a year?
- d. Has the stock price increased or decreased while the market was closed, and by how much?
- e. How many shares has Nike issued?
- f. How much would you receive in dividends if you owned 70 shares?

 **WRITING & THINKING**

48. Why is it important for the payments in the formula for the future value of an annuity to be made at the end of each compounding interval and not in the middle or any other part of it?
49. If you follow the four percent rule of thumb in the future, will it guarantee that your retirement funds will last through 30 years of retirement?

6.2 PROJECT

PAYOUT ANNUITIES: WHAT HAPPENS AFTER YOU RETIRE?

According to Northwestern Mutual, 56% of adults in the US don't know how much money they will need to save to retire. This can be problematic when setting up your long-term financial goals. In this activity, you will explore a financial instrument, called a payout annuity, that can be used to invest after retirement and maintain a steady income.

Suppose you want to have an after-retirement annual income of \$50,000 for 20 years.

1. Suppose you plan to place your retirement fund into an account that does not earn interest. How much money would you need in the account by the time you retire?

Without further investing, your retirement fund will sit idle when it could be earning interest. A payout annuity provides regular withdrawals while allowing your balance to earn interest. The following formula is used to calculate the value of a payout annuity that compounds annually and has annual withdrawals.

$$P = \frac{d(1 - (1 + r)^{-N})}{r}$$

Here, P is the starting balance of the account (that is, the size of your retirement fund), d is the regular annual withdrawal, r is the annual interest rate as a decimal, and N is the number of years you plan to take withdrawals.

2. Suppose that you will invest your retirement fund (the value you found in part 1) for 20 years at an interest rate of 7% per year. Up to how much could you withdraw yearly in this case and still meet your goal? In other words, what is the value of d in the annuity formula in this case?