

QUICK REVIEW 3.6

1. Find 3.5% of 200.
2. Find 2.5% of 150.
3. What is one-fourth of 7.25%?
4. What is one-twelfth of 6.5%?
5. 78 is what percent of 120?
6. 28 is what percent of 80?

7. 48 is 32% of what number?
8. 176.4 is 84% of what number?
9. How much does Jane have at the end of 1 year if she invests \$300 at 5% simple interest?
10. How much does Reggie have at the end of 1 year if he invests \$500 at 4.5% simple interest?

SECTION 3.6 EXERCISES

In Exercises 1–4, find the amount A accumulated after investing a principal P for t years at an interest rate r compounded annually.

1. $P = \$1500$, $r = 7\%$, $t = 6$
2. $P = \$3200$, $r = 8\%$, $t = 4$
3. $P = \$12,000$, $r = 7.5\%$, $t = 7$
4. $P = \$15,500$, $r = 9.5\%$, $t = 12$

In Exercises 5–8, find the amount A accumulated after investing a principal P for t years at an interest rate r compounded k times per year.

5. $P = \$1500$, $r = 7\%$, $t = 5$, $k = 4$
6. $P = \$3500$, $r = 5\%$, $t = 10$, $k = 4$
7. $P = \$40,500$, $r = 3.8\%$, $t = 20$, $k = 12$
8. $P = \$25,300$, $r = 4.5\%$, $t = 25$, $k = 12$

In Exercises 9–12, find the amount A accumulated after investing a principal P for t years at interest rate r compounded continuously.

9. $P = \$1250$, $r = 5.4\%$, $t = 6$
10. $P = \$3350$, $r = 6.2\%$, $t = 8$
11. $P = \$21,000$, $r = 3.7\%$, $t = 10$
12. $P = \$8,875$, $r = 4.4\%$, $t = 25$

In Exercises 13–15, find the future value FV accumulated in an annuity after investing periodic payments R for t years at an annual interest rate r , with payments made and interest credited k times per year.

13. $R = \$500$, $r = 7\%$, $t = 6$, $k = 4$
14. $R = \$300$, $r = 6\%$, $t = 12$, $k = 4$
15. $R = \$450$, $r = 5.25\%$, $t = 10$, $k = 12$
16. $R = \$610$, $r = 6.5\%$, $t = 25$, $k = 12$

In Exercises 17 and 18, find the present value PV of a loan with an annual interest rate r and periodic payments R for a term of t years, with payments made and interest charged 12 times per year.

17. $r = 4.7\%$, $R = \$815.37$, $t = 5$
18. $r = 6.5\%$, $R = \$1856.82$, $t = 30$

In Exercises 19 and 20, find the periodic payment R of a loan with present value PV and an annual interest rate r for a term of t years, with payments made and interest charged 12 times per year.

19. $PV = \$18,000$, $r = 5.4\%$, $t = 6$
20. $PV = \$154,000$, $r = 7.2\%$, $t = 15$

21. **Finding Time** If John invests \$2300 in a savings account with a 9% interest rate compounded quarterly, how long will it take until John's account has a balance of \$4150?

22. **Finding Time** If Joelle invests \$8000 into a retirement account with a 9% interest rate compounded monthly, how long will it take until this single payment has grown in her account to \$16,000?

23. **Trust Officer** Megan is the trust officer for an estate. If she invests \$15,000 into an account that carries an interest rate of 8% compounded monthly, how long will it be until the account has a value of \$45,000 for Megan's client?

24. **Chief Financial Officer** Willis is the financial officer of a private university with the responsibility for managing an endowment. If he invests \$1.5 million at an interest rate of 8% compounded quarterly, how long will it be until the account exceeds \$3.75 million?

25. **Finding the Interest Rate** What interest rate compounded daily (365 days/year) is required for a \$22,000 investment to grow to \$36,500 in 5 years?

26. **Finding the Interest Rate** What interest rate compounded monthly is required for an \$8500 investment to triple in 5 years?

27. **Pension Officer** Jack is an actuary working for a corporate pension fund. He needs to have \$14.6 million grow to \$22 million in 6 years. What interest rate compounded annually does he need for this investment?
28. **Bank President** The president of a bank has \$18 million in his bank's investment portfolio that he wants to grow to \$25 million in 8 years. What interest rate compounded annually does he need for this investment?
29. **Doubling Your Money** Determine how much time is required for an investment to double in value if interest is earned at the rate of 5.75% compounded quarterly.
30. **Tripling Your Money** Determine how much time is required for an investment to triple in value if interest is earned at the rate of 6.25% compounded monthly.

In Exercises 31–34, complete the table about continuous compounding.

CONTINUOUS COMPOUNDING

Initial Investment	APR	Time to Double	Amount in 15 years
31. \$12,500	9%	?	?
32. \$32,500	8%	?	?
33. \$ 9,500	?	4 years	?
34. \$16,800	?	6 years	?

In Exercises 35–40, complete the table about doubling time of an investment.

DOUBLING TIME

APR	Compounding Periods	Time to Double
35. 4%	Quarterly	?
36. 8%	Quarterly	?
37. 7%	Annually	?
38. 7%	Quarterly	?
39. 7%	Monthly	?
40. 7%	Continuously	?

In Exercises 41–44, find the annual percentage yield (APY) for the investment.

41. \$3000 at 6% compounded quarterly
42. \$8000 at 5.75% compounded daily
43. P dollars at 6.3% compounded continuously
44. P dollars at 4.7% compounded monthly
45. **Comparing Investments** Which investment is more attractive, 5% compounded monthly or 5.1% compounded quarterly?
46. **Comparing Investments** Which investment is more attractive, $5\frac{1}{8}\%$ compounded annually or 5% compounded continuously?

In Exercises 47–50, payments are made and interest is credited at the end of each month.

47. **An IRA Account** Amy contributes \$50 per month into the Lincoln National Bond Fund that earns 7.26% annual interest. What is the value of Amy's investment after 25 years?
48. **An IRA Account** Andrew contributes \$50 per month into the Hoffbrau Fund that earns 15.5% annual interest. What is the value of his investment after 20 years?
49. **An Investment Annuity** Jolinda contributes to the Celebrity Retirement Fund that earns 12.4% annual interest. What should her monthly payments be if she wants to accumulate \$250,000 in 20 years?
50. **An Investment Annuity** Diego contributes to a Commercial National money market account that earns 4.5% annual interest. What should his monthly payments be if he wants to accumulate \$120,000 in 30 years?
51. **Car Loan Payment** What is Kim's monthly payment for a 4-year \$9000 car loan with an APR of 7.95% from Century Bank?
52. **Car Loan Payment** What is Ericka's monthly payment for a 3-year \$4500 car loan with an APR of 10.25% from County Savings Bank?
53. **House Mortgage Payment** Gendo obtains a 30-year \$86,000 house loan with an APR of 8.75% from National City Bank. What is her monthly payment?
54. **House Mortgage Payment** Roberta obtains a 25-year \$100,000 house loan with an APR of 9.25% from NBD Bank. What is her monthly payment?
55. **Mortgage Payment Planning** An \$86,000 mortgage for 30 years at 12% APR requires monthly payments of \$884.61. Suppose you decided to make monthly payments of \$1050.00.
- (a) When would the mortgage be completely paid?
- (b) How much do you save with the greater payments compared with the original plan?



56. **Mortgage Payment Planning** Suppose you make payments of \$884.61 for the \$86,000 mortgage in Exercise 53 for 10 years and then make payments of \$1050 until the loan is paid.
- (a) When will the mortgage be completely paid under these circumstances?
- (b) How much do you save with the greater payments compared with the original plan?