Chapter 6 Mathematics of Finance

1. Find I: $I = 5500(0.07)(4)$
   A) $1540
   B) $132
   C) $1320
   D) $1760
   E) $154
   Ans: A

2. What does the number 260 represent in the given equation: $260 = 2500(r)(4)$?
   A) principal
   B) interest
   C) future value
   D) time
   E) annual interest rate
   Ans: B

3. What does the number 0.08 represent in the given equation: $9871 = P + P(0.08)(4)$.
   A) annual interest rate
   B) interest
   C) future value
   D) time
   E) principal
   Ans: A

4. $2400 is invested for 18 months at an annual simple interest rate of 10%. How much interest will be earned?
   A) $2760.00
   B) $2788.40
   C) $360.00
   D) $386.67
   E) $720.00
   Ans: C

5. If you borrow $2200 for 5 years at 11% annual simple interest, how much must you repay at the end of the 5 years?
   A) $1,210.00
   B) $3,813.16
   C) $3,707.13
   D) $121,000.00
   E) $3,410.00
   Ans: E

6. If you lend $4300 to a friend for 15 months at 8% annual simple interest, find the future value of loan.
   A) $4300
   B) $430
   C) $4644
   D) $4730
   E) $4816
   Ans: D

7. Jenny Reed bought SSX stock for $19 per share. The annual dividend was $2.00 per share, and after 3 year(s), SSX was selling for $45 per share. Find the simple interest rate of growth of her money to the nearest hundredth of a percent.
   A) 933.33%
   B) 8.67%
   C) 45.61%
   D) 56.14%
   E) 0.56%
   Ans: D

8. Suppose that in order to buy a Treasury bill (T-bill) that matures to $11,000 in 6 months, you must pay $10,750. What rate does this earn? Round your answer to one decimal place.
   A) 3.9%
   B) 4.5%
   C) 3.7%
   D) 4.9%
   E) 4.7%
   Ans: E

9. A student has a savings account earning 9% simple interest. She must pay $1400 for first-semester tuition by September 1 and $1400 for second-semester tuition by January 1. How much must she earn in the summer (by September 1) in order to pay the first-semester bill on time and still have the remainder of her summer earnings grow to $1400 between September 1 and January 1?
   A) $1442.00
   B) $2800.00
   C) $2759.22
   D) $1359.22
   E) $2796.51
   Ans: C

10. What is the present value of an investment at 5% annual simple interest if it is worth $1008 in 12 months?
    A) $960
    B) $970
    C) $950
    D) $968
    E) $978
    Ans: A

11. How long does it take for $9000 invested at 9% annual simple interest to be worth $14,000?
    A) 17.28 years
    B) 11.73 years
    C) 6.17 years
    D) 3.09 years
    E) 25.93 years
    Ans: C

12. An investor owns several apartment buildings. The taxes on these buildings total $60,000 per year and are due before April 1. The late fee is $1/2\%$ per month up to 6 months, at which time the buildings are seized by the authorities and sold for back taxes. If the investor has $60,000 available on March 31, how much money will he save by investing the money at 8.5% and paying the taxes and the penalty on September 30 instead of paying the taxes at that time?
    A) $1800.00
    B) $2550.00
    C) $750.00
    D) $1275.00
    E) $3300.00
    Ans: C

13. Andre De Quadros bought a $4000, 9-month certificate of deposit (CD) that would earn 8% annual simple interest. What is the value of the CD when it matures?
    A) $6880.00
    B) $4080.00
    C) $4247.35
    D) $4246.50
    E) $4240.00
    Ans: E

14. Leah Hagel bought a $5000, 9-month certificate of deposit (CD) that would earn 7% annual simple interest. Three months before the CD was due to mature, Leah needed her CD money, so a friend agreed to lend her money and receive the value of the CD when it matured. If their agreement allowed the friend to earn a 9% annual simple interest return on her loan to Leah, how much did Leah receive from her friend?
    A) $5146.70
    B) $4929.74
    C) $4349.17
    D) $4914.00
    E) $5171.99
    Ans: A

15. What is the fifth term of the sequence whose n^{th} term is $\frac{(-1)^n}{(2n+5)}$?

A) $\frac{-1}{15}$

B) $\frac{1}{3}$

C) $\frac{1}{15}$

D) $\frac{-1}{3}$

E) $\frac{13}{15}$

Ans: A

16. Write the seventh term of the sequence whose nth term is $a_n = \frac{(n+1)(6n+1)}{2n}$?

A) $\frac{172}{7}$

B) $\frac{43}{7}$

C) $\frac{43}{2}$

D) $\frac{7}{172}$

E) $\frac{2}{43}$

Ans: A

17. What are d and a_1 in the following arithmetic sequence?

$3, 9, 15, \ldots$

A) $d = 3, \quad a_1 = 3$

B) $d = 12, \quad a_1 = 3$

C) $d = 3, \quad a_1 = 9$

D) $d = 6, \quad a_1 = 3$

E) $d = -6, \quad a_1 = 15$

Ans: D

18. What are the next three terms in the arithmetic sequence $-2, -1, 0, \ldots$?
    A) $1, 2, 3$
    B) $-3, -4, -5$
    C) $1, 1, 1$
    D) $-8, -10, -12$
    E) $0, 1, 2$
    Ans: A

19. Find the 29^{th} term of the arithmetic sequence with first term $\frac{1}{2}$ and common difference $-\frac{1}{3}$.
    A) $-\frac{31}{3}$
    B) $-\frac{59}{6}$
    C) $-\frac{28}{3}$
    D) $-\frac{53}{6}$
    E) $-\frac{25}{3}$
    Ans: D

20. Find the 76th term of the arithmetic sequence with first term 22 and tenth term 40.
    A) 1672
    B) 1368
    C) 174
    D) 170
    E) 172
    Ans: E

21. Find the sum of the first 62 terms of the arithmetic sequence with first term 4 and 62th term 288.
    A) 9,052
    B) 18,104
    C) 8,804
    D) 4,526
    E) 17,856
    Ans: A

22. Find the sum of the first 210 terms of the arithmetic sequence 11, 8, 5, ...
    A) –68,145
    B) –127,050
    C) –63,525
    D) –64,680
    E) –1155
    Ans: C

23. Suppose you are offered a job paying a starting salary of $21,000 with yearly raises of $1500. How much will you receive for your 13th year on the job?
    A) $22,500
    B) $39,000
    C) $19,500
    D) $40,500
    E) $42,000
    Ans: B

24. A new firm loses $2100 in its first month, but its profit increases by $300 in each succeeding month for the rest of its first year. What is its profit in the twelfth month?
    A) $21,600
    B) $1,200
    C) $1,500
    D) $3,600
    E) $5,400
    Ans: B

25. Suppose an employee has a base salary of $23,000 per year and at the end of each year a raise of $1000 will be given. Find the employee's total income after the first 5 years.
    A) $130,000
    B) $125,000
    C) $250,000
    D) $260,000
    E) $127,500
    Ans: B

26. Find S: $S = \$3000(1+0.03)^{24}$. Round your answer to the nearest cent.
    A) $6281.33
    B) $8102.19
    C) $6098.38
    D) $5787.19
    E) $5920.76
    Ans: C

27. What does the number $25,000 represent in the given equation:
    $\$25,000 = P(1+0.003)^{48}$?
    A) periodic rate
    B) number of periods
    C) principal value
    D) future value
    E) none of these choices
    Ans: D

28. What interest will be earned if $5700 is invested for 5 years at an annual rate of 9% compounded monthly?
    A) 5916.98
    B) 6096.50
    C) 8265.00
    D) 8924.38
    E) 15,514.01
    Ans: D

29. Find the future value if $3600 is invested for 5 years at an annual rate of 7% compounded quarterly.
    A) 5040.00
    B) 5078.16
    C) 3926.22
    D) 5049.19
    E) 5093.20
    Ans: E

30. What lump sum should be deposited in an account that will earn at an annual rate of 9%, compounded quarterly, to grow to $100,000 for retirement in 35 years?
    A) $98,978.01
    B) $4335.88
    C) $7352.94
    D) $24,096.39
    E) $4437.47
    Ans: E

31. Find the interest that will result if $7500 is invested at an annual rate of 8%, compounded continuously, for 12 years.
    A) $12,087.72
    B) $7200.00
    C) $19,587.72
    D) $14,700.00
    E) $4653.48
    Ans: A

32. If $9000 is invested at an annual rate of 7.5% compounded continuously, find the future value after $3\frac{1}{2}$ years.
    A) $11,673.18
    B) $11,692.03
    C) $11,362.50
    D) $11,701.59
    E) $13,844.27
    Ans: D

33. Suppose an individual wants to have $200,000 available for her child's education. Find the amount that would have to be invested at annual rate 7%, compounded continuously, if the number of years until college is 6 years.
    A) $14,084.51
    B) $71,000.00
    C) $131,409.36
    D) $65,704.68
    E) $30,439.23
    Ans: C

34. How much more interest will be earned if $8000 is invested for 4 years at an annual rate of 9% compounded continuously, instead of at 9% compounded quarterly?
    A) $15.39
    B) $30.27
    C) $45.66
    D) $540.97
    E) $571.24
    Ans: C

35. What is the annual percentage yield (or effective annual rate) for a nominal rate of 8.1% compounded quarterly?
    A) 8.10%
    B) 8.41%
    C) 8.44%
    D) 8.35%
    E) 8.26%
    Ans: D

36. What is the annual percentage yield (or effective annual rate) for a nominal rate of 7% compounded continuously?
    A) 10.72%
    B) 7.25%
    C) 14.00%
    D) 8.98%
    E) 10.50%
    Ans: B

37. Rank each interest rate and compounding scheme in order from highest yield to lowest yield.

    A) 8% compounded semi-annually, 8% compounded monthly, 8% compounded continuously
    B) 8% compounded monthly, 8% compounded continuously, 8% compounded semi-annually
    C) 8% compounded continuously, 8% compounded semi-annually, 8% compounded monthly
    D) 8% compounded continuously, 8% compounded monthly, 8% compounded semi-annually
    E) 8% compounded semi-annually, 8% compounded continuously, 8% compounded monthly
    Ans: D

38. If $12,000 had been invested in the Fictious Fund on June 30, 1990, then on June 30, 1999 the investment would have been worth $35,790.92. What interest rate compounded annually would this investment have earned?
    A) 33.14%
    B) 12.91%
    C) 22.03%
    D) 12.14%
    E) 22.03%
    Ans: B

39. How long (in years) would $500 have to be invested at an annual rate of 9%, compounded continuously, to amount to $700?
    A) 4.44 years
    B) 3.90 years
    C) 0.67 year
    D) 5.22 years
    E) 3.74 years
    Ans: E

40. To help their son buy a car on his 18th birthday, a boy's parents invest $1200 on his 12th birthday. If the investment pays an annual rate of 12% compounded continuously, how much is available on his 18th birthday?
    A) $2439.35
    B) $2465.32
    C) $2368.59
    D) $2064.00
    E) $21,377.13
    Ans: B

41. How long does it take for an account containing $6000 to be worth $18,200 if the money is invested at 10% compounded monthly?
    A) 20.3 years
    B) 9.9 years
    C) 11.1 years
    D) 22.3 years
    E) 14.3 years
    Ans: C

42. Suppose Emily Yu deposited $1100 in an account that earned simple interest at an annual rate of 9% and left it there for 5 years. At the end of the 5 years, Emily deposited the entire amount from that account into a new account that earned 9% compounded quarterly. She left the money in this account for 7 years. How much did she have after the 12 years?
    A) $2973.95
    B) $3155.72
    C) $4640.88
    D) $3216.61
    E) $6961.31
    Ans: A

43. Find the next three terms of the geometric sequence.
    $6, 30, 150, \ldots$
    A) $174, 198, 222, \ldots$
    B) $750, 3750, 18750, \ldots$
    C) $270, 390, 510, \ldots$
    D) $155, 160, 165, \ldots$
    E) $150, 750, 3750, \ldots$
    Ans: B

44. Find the next three terms of the geometric sequence.
    $48, 60, 75, \ldots$
    A) $93.75, 117.1875, 146.484375, \ldots$
    B) $750, 1875, 4687.5, \ldots$
    C) $87, 99, 111, \ldots$
    D) $90, 105, 120, \ldots$
    E) $75, 93.75, 117.1875, \ldots$
    Ans: A

45. What is the 10th term of the geometric sequence with first term 2 and common ratio 4?
    A) 42
    B) 2,097,152
    C) 38
    D) 262,163
    E) 524,288
    Ans: E

46. Write an expression that gives the requested term or sum.

The sum of the first 15 terms of the geometric sequence with first term 8 and common ratio 9

A) $n = 14, a_1 = 3, r = 4$

$$s_{15} = \frac{8\left(9^{15} - 1\right)}{1 - 8}$$

B) $s_{15} = \frac{15}{2}\left(8 + 8 \times 9^{15-1}\right)$

C) $s_{15} = 8 + 9(15 - 1)$

D) $s_{15} = 9^{15} - 1$

E) $s_{15} = 9^{16} - 1$

Ans: D

47. Which of the following expresses the sum of the first 33 terms of the geometric sequence 9, -6, 4....?

A) $15\left[1 + \left(\frac{2}{3}\right)^{33}\right]$

B) $\frac{27}{5}\left[1 + \left(\frac{2}{3}\right)^{33}\right]$

C) $\frac{27}{5}\left[1 - \left(\frac{2}{3}\right)^{33}\right]$

D) $15\left[1 - \left(\frac{2}{3}\right)^{33}\right]$

E) $\left[9 + \frac{2}{3}(33)\right]$

Ans: B

48. If inflation causes the cost of automobiles to increase by 3.5% each year, what should a car cost today if it cost $15,000 6 years ago?

A) $18,505.17
B) $18,150.00
C) $15,525.00
D) $18,438.83
E) $22,510.96

Ans: D

49. If a population of 8 million begins to increase at a rate of 0.5% each month, in how many months will it be 10 million?
A) 50.00 months
B) 22.37 months
C) 44.74 months
D) 47.37 months
E) 525.52 months,
Ans: C

50. A pump removes $\frac{1}{4}$ of the water in a container with every stroke. How much water remains in the container after 4 strokes if it originally contained 64 cm^3?
A) $20\frac{1}{4}\ cm^3$
B) $19\frac{1}{4}\ cm^3$
C) $18\frac{1}{4}\ cm^3$
D) $17\frac{1}{4}\ cm^3$
E) $16\frac{1}{4}\ cm^3$
Ans: A

51. Suppose a new business makes a $1000 profit in its first month and has its profit increase by 12% each month for the next 2 years. How much profit will the business earn in its 12^{th} month? Round your answer to the nearest cent.
A) $3895.98
B) $3478.55
C) $3130.69
D) $3826.40
E) $3506.38
Ans: B

52. Suppose a new business makes a $1000 profit in its first month and has its profit increase by 10% each month for the next 2 years. How much profit will it earn in its first year?
A) $2138.43
B) $2200.00
C) $88,497.33
D) $21,384.28
E) $7715.61
Ans: D

53. Find S: $S = \$2291\left[\dfrac{(1+0.03)^{40}-1}{0.03}\right]$. Round your answer to the nearest dollar.

A) $S = \$8,580$
B) $S = \$86,054$
C) $S = \$85,797$
D) $S = \$172,744$
E) $S = \$165,489$
Ans: D

54. What does \$480,157 represent in the following equation?

$$\$480,157 = R\left[\frac{(1+0.02)^{60}-1}{0.02}\right]$$

A) interest rate per period
B) future value of the annuity
C) total number of payments (periods)
D) total number of years
E) none of these choices
Ans: B

55. Find the future value of an ordinary annuity of \$61 paid quarterly for 3 years, if the interest rate is 8%, compounded quarterly. Round your answer to the nearest cent.
A) \$1157.60
B) \$818.14
C) \$2414.41
D) \$186.68
E) \$198.03
Ans: B

56. A sinking fund is established to discharge a debt of \$65,000 in 11 years. If deposits are made at the end of each 6-month period and interest is paid at the annual rate of 6%, compounded semiannually, what is the amount of each deposit?
A) \$1017.69
B) \$5075.03
C) \$2128.58
D) \$1497.96
E) \$729.94
Ans: C

57. If $6000 is deposited at the end of each half year in an account that earns an annual rate of 5.9% compounded semiannually, how long will it be before the account contains $210,000?
    A) 19.5 half years
    B) 5.8 half years
    C) 14.7 half years
    D) 48.8 half years
    E) 24.4 half years
    Ans: E

58. Emily Rideout deposits $2000 at the end of each of the 5 years she qualifies for an IRA. If she leaves the money that has accumulated in the IRA account for 25 additional years, how much is in her account at the end of the 30-year period? Assume an annual interest rate of 9%, compounded annually.
    A) $11,969.42
    B) $103,213.28
    C) $158,806.43
    D) $18,416.44
    E) $17,246.16
    Ans: B

59. Suppose that Bob delays starting an IRA for the first 10 years he works but then makes $2000 deposits at the end of each of the next 15 years. If the annual interest rate is 8%, compounded annually, and if he leaves the money in his account for 5 additional years, how much will be in his account at the end of the 30-year period?
    A) $79,790.73
    B) $117,238.75
    C) $172,262.19
    D) $253,109.68
    E) $88,159.68
    Ans: A

60. Find the future value of an annuity due of $1900 each month for 3 years if the annual interest rate is 10%, compounded monthly.
    A) $37,039.72
    B) $79,385.46
    C) $5795.53
    D) $309,947.01
    E) $80,047.01
    Ans: E

61. A house is rented for $3300 per quarter, with each quarter's rent payable in advance. If money is worth 4%, compounded quarterly, and the rent is deposited in an account, what is the future value of the rent for two years? Round your answer to the nearest cent.
    A) $30,406.95
    B) $6,732.00
    C) $37,738.43
    D) $6,633.00
    E) $27,342.71
    Ans: E

62. What is the size of the payments that must be deposited at the beginning of each 6-month period in an account that pays an annual rate of 7%, compounded semiannually, so that the account will have a future value of $180,000 at the end of 15 years?
    A) $9013.06
    B) $20,679.13
    C) $2168.65
    D) $3368.93
    E) $1769.96
    Ans: D

63. Parents agree to invest $600 (at an annual rate of 9%, compounded semiannually) for their son on the December 31 or June 30 following each semester that he makes the Dean's List during his 4 years in college. If he makes the Dean's List in each of the 8 semesters, how much money will his parents have to give him when he graduates?
    A) $6528.00
    B) $6826.08
    C) $5628.01
    D) $9861.28
    E) $18,961.34
    Ans: C

64. If $3000 is deposited at the beginning of each quarter into an account that earns 7% compounded quarterly, how long until the account contains $44,000?
    A) 10 quarters
    B) 13 quarters
    C) 11 quarters
    D) 14 quarters
    E) 12 quarters
    Ans: B

65. A family wants to have a $180,000 college fund for their children at the end of 18 years. What contribution must be made at the end of each quarter if their investment pays an annual rate of 6.3%, compounded quarterly?
    A) $141.12
    B) $5660.66
    C) $920.24
    D) $1362.51
    E) $3753.99
    Ans: D

66. State whether the problem relates to an ordinary annuity or an annuity due. A couple has determined that they need $150,000 to establish an annuity when they retire in 24 years. How much money should they deposit at the end of each month in an investment plan that pays an annual rate of 12%, compounded monthly, so they will have the $150,000 in 24 years?
    A) ordinary annuity
    B) annuity due
    Ans: A

67. A couple has determined that they need $250,000 to establish an annuity when they retire in 29 years. How much money should they deposit at the end of each month in an investment plan that pays an annual rate of 12%, compounded monthly, so they will have the $250,000 in 29 years?
    A) $1165.05
    B) $80.90
    C) $7473.75
    D) $75.98
    E) $537.83
    Ans: B

68. State whether the problem relates to an ordinary annuity or an annuity due. Mr. Gordon plans to invest $250 at the end of each month in an account that pays an annual rate of 10%, compounded monthly. After how many months will the account be worth $25,000?
    A) ordinary annuity
    B) annuity due
    Ans: A

69. Mr. Alphin plans to invest $450 at the end of each month in an account that pays an annual rate of 12%, compounded monthly. After how many months will the account be worth $60,000?
    A) 168.23 months
    B) 25.00 months
    C) 121.00 months
    D) 130.58 months
    E) 85.15 months
    Ans: E

70. State whether the problem relates to an ordinary annuity or an annuity due. Jane Adele deposits $300 in an account at the beginning of each 3-month period for 10 years. If the account pays interest at the annual rate of 12%, compounded quarterly, how much will she have in her account after 10 years?
    A) ordinary annuity
    B) annuity due
    Ans: B

71. Gail Kelley deposits $300 in an account at the beginning of each 3-month period for 10 years. If the account pays interest at the annual rate of 10%, compounded quarterly, how much will she have in her account after 10 years?
    A) $20,220.77
    B) $19,715.25
    C) $20,726.29
    D) $21,037.40
    E) $21,737.32
    Ans: C

72. State whether the problem relates to an ordinary annuity or an annuity due. A property owner has several rental units and wants to build more. How much of each month's rental income should be deposited at the beginning of each month in an account that earns an annual rate of 7.6%, compounded monthly, if the goal is to have $400,000 at the end of 5 years?
    A) ordinary annuity
    B) annuity due
    Ans: B

73. A property owner has several rental units and wants to build more. How much of each month's rental income should be deposited at the beginning of each month in an account that earns an annual rate of 8%, compounded monthly, if the goal is to have $250,000 at the end of 8 years?
    A) $2203.59
    B) $1855.14
    C) $1880.04
    D) $1867.50
    E) $1916.97
    Ans: B

74. Suppose a young couple deposits $900 at the end of each quarter in an account that earns an annual rate of 7.4%, compounded quarterly, for a period of 7 years. After the 7 years, they start a family and find they can contribute only $200 per quarter. If they leave the money from the first 7 years in the account and continue to contribute $200 at the end of each quarter for the next $18\frac{1}{2}$ years, how much will they have in the account (to help with their child's college expenses)?
    A) $39,881.85
    B) $157,852.43
    C) $140,231.91
    D) $168,663.25
    E) $297,578.50
    Ans: B

75. A small business owner contributes $3500 at the end of each quarter to a retirement account that earns an annual rate of 6% compounded quarterly. How long will it be until the account is worth $200,000?
    A) 41.58 quarters
    B) 99.95 quarters
    C) 14.64 quarters
    D) 70.51 quarters
    E) 67.1 quarters
    Ans: A

76. A small business owner contributes $6500 at the end of each quarter to a retirement account that earns an annual rate of 8% compounded quarterly. Suppose when the account reaches $500,000, the business owner increases the contributions to $10,500 at the end of each quarter. What will the total value of the account be after 12 more years?
    A) $1,293,535.19
    B) $833,211.95
    C) $2,126,747.15
    D) $1,797,535.19
    E) $2,169,282.09
    Ans: C

77. A young executive deposits $300 at the end of each month for 5 years and then increases the deposits. If the account earns an annual rate of 6.9%, compounded monthly, how much (to the nearest dollar) should each new deposit be in order to have a total of $410,000 after 20 years from the time the deposits were increased?
    A) $797
    B) $564
    C) $42
    D) $5442
    E) $755
    Ans: E

78. Find A_n: $A_n = \$2300\left[\dfrac{1-(1+0.02)^{-60}}{0.02}\right]$. Round your answer to the nearest dollar.

A) \$11,498
B) \$12,992
C) \$101,754
D) \$79,950
E) \$80,637
Ans: D

79. What does 60 represent in the following equation?

$$\$55,600 = R\left[\frac{1-(1+0.03)^{-60}}{0.03}\right]$$

A) present value of the annuity
B) total number of payments (periods)
C) interest rate per period
D) future value of the annuity
E) total number of years
Ans: B

80. How much is needed in an account that earns an annual rate of 7% compounded monthly in order to withdraw \$800 at the end of each month for 20 years?

A) \$51,025.39
B) \$171,099.71
C) \$11,428.57
D) \$103,186.01
E) \$137,107.25
Ans: D

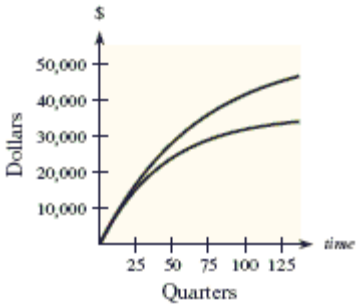
81. If \$67,000 is invested in an annuity that earns an annual rate of 5.4%, compounded quarterly, what payments will it provide at the end of each quarter for the next $4\frac{1}{2}$ years?

A) \$17,167.65
B) \$4217.72
C) \$5912.09
D) \$15,445.96
E) \$8435.43
Ans: B

82. A professional athlete invested \$3.9 million of a bonus in an account that earns an annual rate of 6.5%, compounded semiannually. If \$230,000 is to be withdrawn at the end of each six months, how long will it be until the account balance is \$0?

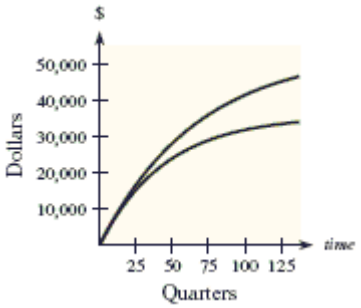
A) 25.0 half-years
B) 24.2 half-years
C) 11.6 half-years
D) 13.7 half-years
E) 70.2 half-years
Ans: A

83. The following figure shows a graph that compares the present values of two ordinary annuities of $800 quarterly as functions of the number of quarters. One annuity is at an annual rate of 6% compounded quarterly, and the other is at 9% compounded quarterly. What present value is required to purchase an annuity of $800 a quarter for 25 years with an interest rate of 9% compounded quarterly? Check your answer against the graph.



A) $31,713.39
B) $39,900
C) $22,200
D) $43,200
E) $52,000
Ans: A

84. The following figure shows a graph that compares the present values of two ordinary annuities of $800 quarterly as functions of the number of quarters. One annuity is at an annual rate of 6% compounded quarterly, and the other is at an annual rate of 9% compounded quarterly. Use the graph below to estimate the difference between the present values of these annuities for 25 years (100 quarters).



A) $90
B) $4900
C) $30,000
D) $35,000
E) $12, 000
Ans: E

85. An annuity consists of payments of $\$750$ at the end of each month with an annual rate of 5.6 per cent. Is this an ordinary annuity or an annuity due?
    A) annuity due
    B) ordinary annuity
    Ans: B

86. Suppose an annuity will pay $21,000 at the beginning of each year for the next 6 years. How much money is needed to start this annuity if it earns 6.2%, compounded annually?
    A) $6362.32
    B) $887,832.69
    C) $96,255.77
    D) $108,980.42
    E) $160,289.46
    Ans: D

87. A year-end bonus of $30,000 will generate how much money at the beginning of each month for the next year, if it can be invested at 6.48%, compounded monthly? Round your answer to the nearest cent.
    A) $2602.59
    B) $2574.71
    C) $3449.54
    D) $3284.20
    E) $29,838.87
    Ans: B

88. Decide whether the problem relates to an ordinary annuity or an annuity due. A trust will provide $8000 to a county library at the beginning of each 3-month period for the next $4\frac{1}{2}$ years. If the money is worth an annual rate of 7.3%, compounded quarterly, find the amount in the trust when it begins.
    A) ordinary annuity
    B) annuity due
    Ans: B

89. A trust will provide $10,000 to a county library at the beginning of each 3-month period for the next $3\frac{1}{2}$ years. If the money is worth an annual rate of 8%, compounded quarterly, find the amount in the trust when it begins.
    A) $121,062.49
    B) $123,483.74
    C) $127,512.67
    D) $95,744.41
    E) $2421.25
    Ans: B

90. Recent sales of some real estate and record profits make it possible for a manufacturer to set aside $680,000 in a fund to be used for modernization and remodeling. How much can be withdrawn from this fund at the beginning of each half year for the next 4 years if the fund earns an annual rate of 6.7%, compounded semiannually?
    A) $12,465.04
    B) $101,713.16
    C) $186,876.49
    D) $178,492.50
    E) $95,119.27
    Ans: E

91. As a result of a November 2004 court settlement, Goldman Gadgets agreed to pay $12.6 million to Fender Motor Company, with $7 million of it going to a Fender charitable trust. If the trust invested this money at an annual rate of 7.9%, compounded annually, how much could be awarded to worthwhile organizations at the end of each year for the next 18 years?
    A) $2,173,257.24
    B) $403,644.93
    C) $1,483,482.03
    D) $440,828.27
    E) $741,741.02
    Ans: E

92. Suppose Becky has her choice of $10,000 at the end of each month for life or a single prize of $1.5 million. She is 35 years old and her life expectancy is 40 more years. Find the present value of the annuity if money is worth an annual rate of 8%, compounded monthly.
    A) $1,561,796.08
    B) $1,407,933.38
    C) $61,796.08
    D) $1,438,203.92
    E) $1,195,542.92
    Ans: D

93. Suppose Becky has her choice of $10,000 at the end of each month for life or a single prize of $1.5 million. She is 35 years old and her life expectancy is 40 more years. If she takes the $1.5 million, spends $700,000 of it, and invests the remainder at an annual rate of 7.8% compounded monthly, what monthly annuity will she receive for the next 40 years?
    A) $5566.25
    B) $5442.78
    C) $4762.43
    D) $5694.28
    E) $6592.29
    Ans: B

94. Decide whether the problem relates to an ordinary annuity or an annuity due. A retiree inherits $100,000 and invests it at an annual rate of 7.3%, compounded monthly, in an annuity that provides an amount at the end of each month for the next 20 years. Find the monthly amount.
    A) Ordinary annuity
    B) Annuity due
    Ans: A

95. A retiree inherits $100,000 and invests it at an annual rate of 7.9%, compounded monthly, in an annuity that provides an amount at the end of each month for the next 10 years. Find the monthly amount.
    A) $372.12
    B) $285.93
    C) $863.80
    D) $1208.00
    E) $2022.86
    Ans: D

96. Suppose that Craig Nordstrom deposits his $13,000 bonus in an account that earns an annual rate of 7%, compounded quarterly, and makes additional deposits of $800 at the end of each quarter for the next $20\frac{1}{2}$ years, until he retires. How much is in the account after the last deposit is made?
    A) $98,911.66
    B) $53,921.95
    C) $143,901.38
    D) $220,411.88
    E) $197,823.33
    Ans: E

97. Suppose that Ian Greitzer deposits his $11,500 bonus in an account that earns an annual rate of 8.5%, compounded quarterly, and makes additional deposits of $600 at the end of each quarter for the next $19\frac{1}{2}$ years, until he retires. How much was deposited?
    A) $46,800
    B) $11,500
    C) $58,300
    D) $37,900
    E) $52,550
    Ans: C

98. Suppose that Tom Martin deposits his $11,000 bonus in an account that earns an annual rate of 8.5%, compounded quarterly, and makes additional deposits of $700 at the end of each quarter for the next $24\frac{1}{2}$ years, until he retires. To supplement his retirement, Tom wants to make withdrawals at the end of each quarter for the next 11 years (at which time the account balance will be $0). What is the amount of each withdrawal?
A) $4748.59
B) $7599.04
C) $10,986.96
D) $32,112.30
E) $9293.00
Ans: C

99. Suppose that Scott Andrews deposits his $10,500 bonus in an account that earns an annual rate of 7.5%, compounded quarterly, and makes additional deposits of $400 at the end of each quarter for the next $25\frac{1}{2}$ years, until he retires. To supplement his retirement, Scott wants to make withdrawals at the end of each quarter for the next 12 years (at which time the account balance will be $0). What is the total amount withdrawn? Assume the interest rate remains the same during Scott's retirement.
A) $190,395.27
B) $72,604.92
C) $121,531.31
D) $193,965.18
E) $290,419.66
Ans: E

100. A young couple wants to have a college fund that will pay $25,000 at the end of each half-year for 7 years. If they can invest at annual rate of 8.5%, compounded semiannually, how much do they need to invest at the end of each 6-month period for the next 18 years in order to begin making their college withdrawals 6 months after their last investment?
A) $3489.92
B) $3177.59
C) $4949.55
D) $259,772.50
E) $6436.20
Ans: B

101. A recent college graduate begins a savings plan at age 27 by investing $300 at the end of each month in an account that earns an annual rate of 7.4%, compounded monthly. If this plan is followed for 10 years, how much should the monthly contributions be for the next 28 years in order to be able to withdraw $10,000 at the end of each month from the account for the next 25 years?
A) $1581.33
B) $846.95
C) $1,365,189.82
D) $1330.13
E) $1449.51
Ans: B

102. A recent college graduate begins a savings plan at age 27 by investing $700 at the end of each month in an account that earns an annual rate of 7.3%, compounded monthly. Suppose this plan is followed for 10 years, and that sufficient equal monthly contributions are made for the next 28 years in order to be able to withdraw $10,000 at the end of each month from the account for the next 25 years. What is the total amount contributed?
A) $216,340.32
B) $406,780.46
C) $376,648.58
D) $150,659.43
E) $442,494.84
Ans: A

103. A recent college graduate begins a savings plan at age 27 by investing $500 at the end of each month in an account that earns an annual rate of 7.2%, compounded monthly. Suppose this plan is followed for 10 years, and that sufficient equal monthly contributions are made for the next 28 years in order to be able to withdraw $10,000 at the end of each month from the account for the next 25 years. What is the total amount withdrawn?
A) $3,360,000
B) $3,000,000
C) $3,240,000
D) $3,018,000
E) $3,300,000
Ans: B

104. Find the present value of an annuity of $2100, at the end of each quarter for 5 years after being deferred for 4 years, if the money is worth an annual rate of 8% compounded quarterly.
A) $9144.47
B) $127,960.24
C) $47,441.45
D) $25,013.38
E) $13,740.99
Ans: D

105. A grateful alumnus wishes to provide a scholarship of $2700 per year for 6 years to his alma mater, with the first scholarship awarded on his 59th birthday. If the money is worth an annual rate of 6.2%, compounded annually, how much money must he donate on his 49th birthday?
A) $9196.47
B) $10,594.69
C) $8437.23
D) $12,690.01
E) $7677.99
Ans: E

106. Christine Parks received a trust fund inheritance of $13,000 on her 40th birthday. She plans to use the money to supplement her income with 20 quarterly payments beginning on her 70th birthday. If the money is worth an annual rate of 6.4% compounded quarterly, how much will each quarterly payment be?
A) $5137.18
B) $5056.28
C) $336.63
D) $1231.09
E) $3190.90
Ans: B

107. Given 10 and 40 year loans with the same interest rate, the 40 year loan results in more of each payment being directed toward principal.
A) true
B) false
Ans: B

108. Given 15 and 30 year loans with the same interest rate, the 30 year loan results in a lower periodic payment.
A) true
B) false
Ans: A

109. For equipment upgrades, a business borrowed $250,000 at an annual rate of 8%, compounded semiannually, for 8 years. What are the semiannual payments?
A) $6519.30
B) $37,131.96
C) $21,455.00
D) $43,503.69
E) $5778.04
Ans: C

110. AdriAnne and Anna's Auto Repair wants to add a new service bay. How much can they borrow at an annual rate of 7%, compounded quarterly, if the desired quarterly payment is $6100? Assume a loan period of 4.5 years.
A) $65,511.25
B) $26,177.46
C) $93,493.86
D) $211,976.93
E) $130,367.53
Ans: C

111. Which table shows a correct amortization schedule for the loan described?

$34,000 for $2\frac{1}{2}$ years at an annual rate of 10% compounded semiannually

A)

Period	Payment	Interest	Balance Reduction	Unpaid Balance
				$34,000
1	$7853.14	$6153.14	$1700.00	7853.14
2	27,846.86	6460.80	1392.34	7853.14
3	21,386.06	6783.84	1069.30	7853.14
4	14,602.22	7123.03	730.11	7853.14
5	7479.18	7479.18	373.96	---

B)

Period	Payment	Interest	Balance Reduction	Unpaid Balance
				$34,000
1	$7853.14	$1700.00	$6153.14	27,846.86
2	7853.14	1392.34	6460.80	21,386.06
3	7853.14	1069.30	6783.84	14,602.22
4	7853.14	730.11	7123.03	7479.18
5	7853.14	373.96	7479.18	---

C)

Period	Payment	Interest	Balance Reduction	Unpaid Balance
				$34,000
1	$7853.14	$6153.14	$1700.00	27,846.86
2	7853.14	6460.80	1392.34	21,386.06
3	7853.14	6783.84	1069.30	14,602.22
4	7853.14	7123.03	730.11	7479.18
5	7853.14	7479.18	373.96	---

D)

Period	Payment	Interest	Balance Reduction	Unpaid Balance
				$34,000
1	$7853.14	$6153.14	$373.96	27,846.86
2	7853.14	6460.80	730.11	21,386.06
3	7853.14	6783.84	1069.30	14,602.22
4	7853.14	7123.03	1392.34	7479.18
5	7853.14	7479.18	1700.00	---

E)

Period	Payment	Interest	Balance Reduction	Unpaid Balance
				$34,000
1	$6153.14	$7853.14	$373.96	27,846.86
2	6460.80	7853.14	730.11	21,386.06

3	6783.84	7853.14	1069.30	14,602.22
4	7123.03	7853.14	1392.34	7479.18
5	7479.18	7853.14	1700.00	---

Ans: B

112. A debt of $8400 is to be amortized with 8 equal semiannual payments of $1299.66. If the annual interest rate is 10% compounded semiannually, find the unpaid balance immediately after the 5th payment.
A) $5626.85
B) $3539.30
C) $484.47
D) $6104.23
E) $463.60
Ans: B

113. A small business borrowed $40,000 for 7 years at an annual rate of 8%, compounded semiannually, in order to update some equipment. Find the payoff amount just after the company makes the 10th semiannual payment of $3786.76.
A) $28,868.29
B) $47,937.71
C) $43,898.10
D) $27,489.72
E) $13,745.54
Ans: E

114. A woman buys an apartment house for $1,250,000 by making a down payment of $125,000 and amortizing the rest of the debt with semiannual payments over the next 9 years. The annual interest rate on the debt is 8%, compounded semiannually. Find the size of each payment.
A) $98,741.66
B) $88,867.49
C) $9874.17
D) $56,976,065.50
E) $133,301.24
Ans: B

115. A woman buys an apartment house for $1,250,000 by making a down payment of $375,000 and amortizing the rest of the debt with semiannual payments over the next 9 years. The annual interest rate on the debt is 8.5%, compounded semiannually. Find the total amount paid over the life of the loan (excluding the down payment).
A) $544,095.96
B) $2,539,114.48
C) $634,778.62
D) $1,269,557.24
E) $1,088,191.92
Ans: D

116. A woman buys an apartment house for $1,250,000 by making a down payment of $325,000 and amortizing the rest of the debt with semiannual payments over the next 11 years. The annual interest rate on the debt is 8%, compounded semiannually. Find the total interest paid over the life of the loan.
A) $483,195.81
B) $808,195.81
C) $472,847.90
D) $541,597.90
E) $1,891,391.61
Ans: A

117. A woman buys a car for $40,000. If the interest rate on the loan is 14%, compounded monthly, and if she wants to make monthly payments of $600 for 4 years, how much must she have for a down payment? Round your answer to the nearest dollar.
A) $21,957
B) $6833
C) $18,043
D) $35,722
E) $37,668
Ans: C

118. A developer wants to buy a certain parcel of land. The developer feels she can afford payments of $25,000 each half-year for the next 6 years. How much can she borrow and hold to this budget at an annual rate of 7.8% compounded semianually?
A) $385,106.80
B) $235,994.11
C) $262,962.29
D) $131,481.14
E) $943,976.45
Ans: B

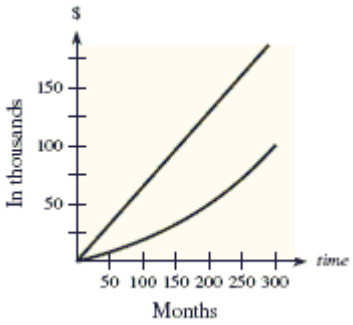
119. A company that purchases a piece of equipment by borrowing $250,000 for 10 years at an annual rate of 7%, compounded monthly, has monthly payments of $2902.71. Find the unpaid balance on this loan after 1 year.
A) $179,429.90
B) $232,100.41
C) $250,000.00
D) $103,290.14
E) $96,265.33
Ans: B

120. A company that purchases a piece of equipment by borrowing $500,000 for 8 years at annual rate of 6%, compounded monthly, has monthly payments of $6570.72. During the first year, how much interest does the company pay?
A) $28,634.02
B) $449,785.44
C) $78,848.58
D) $50,214.56
E) $460,575.71
Ans: A

121. A recent college graduate buys a new car by borrowing $20,000 at 8.4%, compounded monthly, for 5 years. She decides to pay an extra $15 per payment. How many payments (that include the extra $15) will she make, including the final partial payment?
A) 60
B) 55
C) 61
D) 58
E) 56
Ans: D

122. A young couple buying their first home borrows $70,000 for 26 years at 8.4%, compounded monthly, and makes payments of $552.7. After 2 years, they are able to make a one-time payment of $5000 along with their 24^{th} payment. How much will the couple save over the life of the loan by paying the extra $5000?
A) $154,178
B) $30,675
C) $25,675
D) $26,175
E) $25,175
Ans: C

123. A debt of $100,000 is amortized at 6%, compounded monthly, over 25 years with 300 monthly payments of $644.30 each. The figure below includes two graphs: one shows the total amount paid (in monthly payments) as a function of time (in months), and the other shows the amount paid toward the principal of the debt as a function of time.



Which of the answers represents how much interest will be paid on the debt after 250 months?

A) $1 - A$, where A is the area between the two curves.
B) The area between the two curves.
C) The length of the vertical line segment from the lower curve to the upper curve at $x = 250$.
D) The length of the upper graph from the origin to the point with x-coordinate 250.
E) The area below the lower curve.

Ans: C

124. Find the payment size and the total interest paid over the life of the loan of $250,000 at 12% under the following condition. Payments are monthly, and the rate is 12%, compounded monthly for 20 years. Round your answers to the nearest cent.

A) Payment size is $30,000.00 and the total interest paid is $7,200,000.00.
B) Payment size is $2,752.72 and the total interest paid is $660,652.80.
C) Payment size is $25,000.00 and the total interest paid is $5,750,000.00.
D) Payment size is $30,000.00 and the total interest paid is $6,950,000.00.
E) Payment size is $2,752.72 and the total interest paid is $410,652.80.

Ans: E

125. Time-share sales provide an opportunity for vacationers to own a resort condo for 1 week (or more) each year forever. The owners may use their week at their own condo or trade the week and vacation elsewhere. Timeshare vacation sales usually require payment in full or financing through the time-share company, and interest rates are usually in the 13% to 18% range. Suppose the cost to buy a 1-week time share in a 3-bedroom condo is $23,000. Also suppose a 9% down payment is required, with the balance financed for 17 years at an annual rate of 17.7%, compounded monthly. Find the monthly payment.

A) $294.03
B) $357.27
C) $398.13
D) $325.12
E) $787.23

Ans: D

126. Time-share sales provide an opportunity for vacationers to own a resort condo for 1 week (or more) each year forever. The owners may use their week at their own condo or trade the week and vacation elsewhere. Timeshare vacation sales usually require payment in full or financing through the time-share company, and interest rates are usually in the 13% to 18% range. Suppose the cost to buy a 1-week time share in a 3-bedroom condo is $24,200. Also suppose a 10% down payment is required, with the balance financed for 12 years at an annual rate of 17.2%, compounded monthly. Determine the total amount paid for the condo.
A) $28,220.56
B) $358.34
C) $51,601.12
D) $75,801.12
E) $54,021.12
Ans: E

127. During four years of college, Nolan MacGregor's student loans are $4400, $3800, $4000, and $4900 for freshman year through senior year, respectively. Each loan amount gathers interest of annual rate 1%, compounded quarterly while Nolan is in school; and an annual rate of 3%, compounded quarterly during a 6-month grace period after graduation. What is the loan balance after the grace period? Assume the freshman year loan earns an annual rate of 1% interest for $3/4$ year during the first year, then for 3 full years until graduation. Make similar assumptions for the loans for the other years.
A) $17,481.10
B) $17,761.93
C) $17,744.30
D) $17,498.47
E) $17,692.40
Ans: C

128. During four years of college, Nolan MacGregor's student loans are $3600, $4500, $4300, and $5000 for freshman year through senior year, respectively. Each loan amount gathers interest of annual rate 1%, compounded quarterly while Nolan is in school; and an annual rate of 3%, compounded quarterly during a 6-month grace period after graduation. Assume the freshman year loan earns an annual rate of 1% interest for $3/4$ year during the first year, then for 3 full years until graduation. Make similar assumptions for the loans for the other years. After the grace period, the loan is amortized over the next 10 years at an annual rate of 3%, compounded quarterly. Find the quarterly payment.
A) $516.04
B) $77.70
C) $974.92
D) $1423.76
E) $523.81
Ans: E

129. During four years of college, Nolan MacGregor's student loans are $5000, $3900, $3500, and $4000 for freshman year through senior year, respectively. Each loan amount gathers interest of annual rate 1% compounded quarterly while Nolan is in school; and annual rate of 3%, compounded quarterly during a 6-month grace period after graduation. Assume the freshman year loan earns an annual rate of 1% interest for $3/4$ year during the first year, then for 3 full years until graduation. Make similar assumptions for the loans for the other years. After the grace period, the loan is amortized over the next 10 years at an annual rate of 3%, compounded quarterly. If Nolan decides to pay an additional $90 above the calculated quarterly payment, how many payments of this size will amortize the debt?
    A) 33.0 quarters
    B) 30.3 quarters
    C) 40.0 quarters
    D) 36.1 quarters
    E) 16.57 quarters
    Ans: A

130. During four years of college, Nolan MacGregor's student loans are $4800, $4600, $4900, and $4700 for freshman year through senior year, respectively. Each loan amount gathers interest of annual rate of 1%, compounded quarterly while Nolan is in school; and an annual rate of 3%, compounded quarterly during a 6-month grace period after graduation. Assume the freshman year loan earns an annual rate of 1% interest for $3/4$ year during the first year, then for 3 full years until graduation. Make similar assumptions for the loans for the other years. After the grace period, the loan is amortized over the next 10 years at an annual rate of 3%, compounded quarterly. Suppse Nolan decides to pay an additional $90 above the calculated quarterly payment, how much will Nolan save by paying the extra $90 with each payment?
    A) $4656.42
    B) $749.41
    C) $7699.60
    D) $1056.42
    E) $499.60
    Ans: E

131. Use a spreadsheet or financial program on a calculator or computer to develop the first two rows of an amortization schedule for a 5-year car loan if $17,100.00 is borrowed at 8.4%, compounded monthly.

A)

Period	Payment	Interest	Balance Reduction	Unpaid Balance
	$0.00	$0.00	$0.00	$17,100.00
1	$350.01	$119.70	$230.31	$16,869.69
2	$350.01	$118.09	$230.31	$16,637.77

B)

Period	Payment	Interest	Balance Reduction	Unpaid Balance
	$0.00	$0.00	$0.00	$17,100.00
1	$350.01	$119.70	$230.31	$16,869.69
2	$350.01	$118.09	$231.92	$16,637.77

C)

Period	Payment	Interest	Balance Reduction	Unpaid Balance
	$0.00	$0.00	$0.00	$17,100.00
1	$350.01	$119.70	$230.31	$16,869.69
2	$350.01	$118.09	$230.31	$16,639.38

D)

Period	Payment	Interest	Balance Reduction	Unpaid Balance
	$0.00	$0.00	$0.00	$17,100.00
1	$1447.85	$1,436.40	$11.45	$17,088.55
2	$1447.85	$1,435.44	$12.41	$17,076.14

E)

Period	Payment	Interest	Balance Reduction	Unpaid Balance
	$0.00	$0.00	$0.00	$17,100.00
1	$1447.85	$1,436.40	$11.45	$17,088.55
2	$1447.85	$1,436.40	$12.41	$17,076.14

Ans: B

