Student name:\_\_\_\_\_\_\_\_\_\_

**MULTIPLE CHOICE - Choose the one alternative that best completes the statement or answers the question.  
1)** The net present value of a project is equal to the:

1) \_\_\_\_\_\_

A) present value of the future cash flows.   
 B) present value of the future cash flows minus the initial cost.  
 C) future value of the future cash flows minus the initial cost.  
 D) future value of the future cash flows minus the present value of the initial cost.  
 E) sum of the project's anticipated cash inflows.

**2)** Of the following choices regarding the time value of money, which one is accurate?

2) \_\_\_\_\_\_

A) Increasing the initial cost of a project increases the project's NPV.   
 B) Increasing the discount rate, increases the PV of a project.  
 C) Increasing the FV decreases the PV.  
 D) Decreasing the PV decreases the FV.  
 E) Decreasing the discount rate increases the FV.

**3)** Of the following choices, which one is the correct formula for computing the PV of $1 to be received two years from today? Assume the discount rate is 7 percent.

3) \_\_\_\_\_\_

A) $1/1.07   
 B) $1  
 C) $1 × 1.07  
 D) $1 × 1.072  
 E) $1/1.072

**4)** Assume a project has an initial cash outflow followed by seven years of cash inflows. If the discount rate increases, the present value will:

4) \_\_\_\_\_\_

A) remain unchanged.   
 B) change, but the direction of the change is unknown.  
 C) remain unchanged, but the timing of the cash flows must change.  
 D) increase.  
 E) decrease.

**5)** An analyst is evaluating two projects. Project A has projected cash flows of $7,500, $6,000, and $4,500 for the next three years, respectively. Project B has projected cash flows of $4,500, $6,000, and $7,500 for the next three years, respectively. Assuming both projects have the same initial cost, the analyst knows that:

5) \_\_\_\_\_\_

A) there are no conditions under which the projects can have equal values.   
 B) Project B has a higher net present value than Project A.  
 C) Project A is more valuable than Project B, given the same positive discount rate for each project.  
 D) both projects offer the same rate of return.  
 E) given any positive discount rate, both projects have equal net present values.

**6)** An interest rate that is compounded monthly, but is expressed as if the rate were compounded annually, is called the \_\_\_\_\_\_\_\_ rate.

6) \_\_\_\_\_\_

A) stated interest   
 B) compound interest  
 C) effective annual  
 D) periodic interest  
 E) daily interest

**7)** The \_\_\_\_\_\_\_\_ rate equals the interest rate per period multiplied by the number of periods per year.

7) \_\_\_\_\_\_

A) effective annual   
 B) annual percentage  
 C) periodic interest  
 D) compound interest  
 E) daily interest

**8)** The annual percentage rate:

8) \_\_\_\_\_\_

A) considers interest on interest.   
 B) reveals the actual cost of a loan that has monthly payments.  
 C) is higher than the effective annual rate when interest is compounded quarterly.  
 D) is the interest rate per period divided by (1 + *m*), where *m* is the number of periods per year.  
 E) equals the effective annual rate when the interest on an account is designated as simple interest.

**9)** You would be making a wise decision if you chose to:

9) \_\_\_\_\_\_

A) base decisions regarding investments on effective rates and base decisions regarding loans on annual percentage rates.   
 B) assume all loans and investments are based on simple interest.  
 C) accept the loan with the lower effective annual rate rather than the loan with the lower annual percentage rate.  
 D) invest in an account paying 6 percent, compounded quarterly, rather than an account paying 6 percent, compounded monthly.  
 E) ignore the effective rates and concentrate on the annual percentage rates for all transactions.

**10)** Assume the annual percentage rate is 8 percent. The highest effective annual rate that can be derived from it is computed as:

10) \_\_\_\_\_\_

A) (1 + .08/365)(365).   
 B) *e*08q.  
 C) 1.08*e*.  
 D) *e*08 − 1.  
 E) (1 + .09/365)365 − 1.

**11)** For any given interest rate, \_\_\_\_\_\_\_\_compounding will yield the highest effective annual rate.

11) \_\_\_\_\_\_

A) annual   
 B) monthly  
 C) daily  
 D) continuous  
 E) semiannual

**12)** In which way does a perpetuity differ from an annuity?

12) \_\_\_\_\_\_

A) Perpetuity cash flows vary with the rate of inflation.   
 B) Perpetuity cash flows vary with the market rate of interest.  
 C) Perpetuity cash flows are variable while annuity payments are constant.  
 D) Perpetuity cash flows never cease.  
 E) Annuity cash flows occur at irregular intervals of time.

**13)** Assume you are comparing two investments, each of which will result in $20,000 of total cash inflow. Investment A pays $8,000 in Year 1, followed by four annual payments of $3,000 each. Investment B pays five annual payments of $4,000 each. Which one of the following statements regarding the investments is correct?

13) \_\_\_\_\_\_

A) Both options are of equal value today.   
 B) Given a positive rate of return, Option A has a higher present value than Option B.  
 C) Given a positive rate of return, Option B has a higher present value than Option A.  
 D) Given a zero rate of return, Option B has a lower present value than Option A.  
 E) Option A is preferable because it is an annuity due.

**14)** An annuity is a stream of:

14) \_\_\_\_\_\_

A) equal cash flows occurring at equal time periods during a fixed length of time.   
 B) equal cash flows occurring at equal time periods forever.  
 C) either equal or varying cash flows occurring at set intervals of time for a fixed length of time.  
 D) increasing cash flows occurring at set intervals of time that go on forever.  
 E) arbitrary cash flows occurring each time period for no more than 10 years.

**15)** \_\_\_\_\_\_\_\_ annuities have payments that occur at the end of each period, whereas \_\_\_\_\_\_\_\_ annuities have payments that occur at the beginning of each period.

15) \_\_\_\_\_\_

A) Ordinary annuities; early annuities   
 B) Delayed annuities; straight annuities  
 C) Straight annuities; delayed annuities  
 D) Annuities due; ordinary annuities  
 E) Ordinary annuities; annuities due

**16)** A(n) \_\_\_\_\_\_\_\_ is a stream of unending payments that increase by a set percentage each year and occur at regular intervals of time.

16) \_\_\_\_\_\_

A) annuity due   
 B) growing annuity  
 C) growing perpetuity  
 D) variable annuity  
 E) variable perpetuity

**17)** Aubrey just purchased an annuity that will pay $2,500 per month for five years. The first payment was issued today. Bennett just purchased an annuity that will pay $2,500 per month for five years. The first payment will be issued one month from today. Which one of the following statements is correct concerning these two annuities?

17) \_\_\_\_\_\_

A) Both annuities are of equal value today.   
 B) Bennett’s annuity is an annuity due.  
 C) Aubrey’s annuity has a higher present value than Bennett’s.  
 D) Bennett’s annuity has a higher present value than Aubrey’s.  
 E) Aubrey’s annuity is an ordinary annuity.

**18)** An annuity will pay you $5,000 per year for six years. The first payment will occur at the end of Year 5. When you employ the PV formula to compute the present value of the annuity, the result will be the PV as of the end of:

18) \_\_\_\_\_\_

A) Today, Year 0.   
 B) Year 1.  
 C) Year 3.  
 D) Year 4.  
 E) Year 2.

**19)** Ramirez Wellness borrowed $150,000 for five years and is now making monthly payments that include both principal and interest. Paying off the debt by making installment payments, such as this firm is doing, is referred to as:

19) \_\_\_\_\_\_

A) foreclosing on the debt.   
 B) amortizing the debt.  
 C) funding the debt.  
 D) calling the debt.  
 E) refunding the debt.

**20)** Assume you borrow $12,000 for four years. How much will you still owe at the end of the four years if you pay all of the payments as set forth in the loan's amortization schedule?

20) \_\_\_\_\_\_

A) $3,000   
 B) $0  
 C) $6,000  
 D) $12,000  
 E) $9,000

**21)** Assume you borrow $20,000 for 6 years with equal annual repayments. If the interest rate on the actual loan turns out to be higher than you anticipated, then the:

21) \_\_\_\_\_\_

A) total principal repaid will be less than anticipated.   
 B) loan will still have a balance due at the end of the 6-year amortization period.  
 C) first annual payment will repay more of the principal than anticipated.  
 D) anticipated amortization schedule will still apply as the loan is still a 6-year loan.  
 E) annual payments will be higher than anticipated.

**22)** Your firm is considering the purchase of a company called Frost. What rate of return should be used to compute the NPV of the proposed purchase?

22) \_\_\_\_\_\_

A) A discount rate equal to Frost’s current return on equity   
 B) The discount rate applicable to other investments with similar risks  
 C) A discount rate equal to Frost’s net profit percentage  
 D) The rate of interest charged by a bank for a loan similar in size to the cost of the purchase  
 E) A discount rate that makes the NPV of the proposed purchase positive

**23)** For a proposed purchase to be acceptable, the PV of the future cash flows must:

23) \_\_\_\_\_\_

A) be positive at the relevant discount rate.   
 B) be less than the cost of the purchase.  
 C) equal or exceed the cost of the purchase.  
 D) equal the purchase price.  
 E) be positive at all discount rates.

**24)** What is the present value of $21,797 to be received in one year if the discount rate is 5.1 percent?

24) \_\_\_\_\_\_

A) $20,715.46   
 B) $20,739.30  
 C) $42,739.22  
 D) $207.39  
 E) $21,406.39

**25)** Jannat is purchasing a house today for $172,800, and expects to resell it in one year for $197,100. Using a discount rate of 6.75 percent, what is the expected net present value?

25) \_\_\_\_\_\_

A) $11,469.68   
 B) $11,837.00  
 C) $20,305.04  
 D) $19,310.50  
 E) $18,463.70

**26)** You have been awarded an insurance settlement of $211,400 that is payable one year from today. What is the minimum amount you should accept today in exchange for this settlement if you can earn 6.3 percent on your investments?

26) \_\_\_\_\_\_

A) $198,525.36   
 B) $224,718.20  
 C) $198,871.12  
 D) $207,239.13  
 E) $335,555.56

**27)** You plan to invest $6,500 for three years at 4 percent simple interest. What will your investment be worth at the end of the three years?

27) \_\_\_\_\_\_

A) $7,280.00   
 B) $7,311.62  
 C) $7,250.00  
 D) $6,924.32  
 E) $6,760.00

**28)** Marco invested $50,000 in account that he predicts will earn 5.25 percent per year, compounded annually. What does he expect his account to be worth in 45 years?

28) \_\_\_\_\_\_

A) $499,994   
 B) $504,359  
 C) $2,916,706  
 D) $2,969,456  
 E) $1,571,312

**29)** Beatrice invests $1,000 in an account that pays 5 percent simple interest. How much more could she have earned over a period of 10 years if the interest had compounded annually?

29) \_\_\_\_\_\_

A) $132.45   
 B) $135.97  
 C) $128.89  
 D) $117.09  
 E) $121.67

**30)** A project is expected to produce cash flows of $140,000, $225,000, and $200,000 over the next three years, respectively. After three years, the project will be worthless. What is the net present value of this project if the applicable discount rate is 10.1 percent and the initial cost is $522,765?

30) \_\_\_\_\_\_

A) −$99,428   
 B) $51,317  
 C) −$9,595  
 D) $46,262  
 E) −$60,141

**31)** Aaron plans to invest $20,000 at the end of Year 1, $44,000 at the end of Year 2, and $53,000 at the end of Year 3. You want to have the same amount of money as Aaron three years from now, but you want to make one lump sum investment today. What amount must you invest today if you both earn 9.7 percent per year, compounded annually?

31) \_\_\_\_\_\_

A) $88,627   
 B) $94,942  
 C) $106,655  
 D) $154,456  
 E) $151,047

**32)** You have been offered an insurance settlement that provides for annual payments of $29,000, $42,000, and $53,000 over the next three years, respectively. The first payment will be made one year from today. If you would rather receive a lump sum settlement today, what is the minimum amount you should accept? Assume your discount rate is 8.7 percent.

32) \_\_\_\_\_\_

A) $159,261   
 B) $156,364  
 C) $103,490  
 D) $96,546  
 E) $114,075

**33)** You have been offered a consulting opportunity that will pay $33,000, $35,000, and $48,000 over the next three years, respectively. The offer also includes a retainer of $5,000, payable immediately. What is this opportunity worth to you today if your discount rate is 7.9 percent?

33) \_\_\_\_\_\_

A) $97,341   
 B) $112,507  
 C) $150,721  
 D) $103,856  
 E) $148,492

**34)** You are considering a project with projected annual cash flows of $32,000, $33,000, and $70,000 for the next three years, respectively. What is the present value of these cash flows at a discount rate of 10.9 percent?

34) \_\_\_\_\_\_

A) $98,978   
 B) $121,731  
 C) $184,132  
 D) $179,145  
 E) $107,009

**35)** You expect an investment to return $11,300, $14,600, $21,900, and $38,400 annually over the next four years, respectively. What is this investment worth to you today if you desire a rate of return of 16.5 percent?

35) \_\_\_\_\_\_

A) $64,253.91   
 B) $58,700.89  
 C) $63,732.41  
 D) $55,153.57  
 E) $59,928.16

**36)** Assume a cash flow of $82,400 in the first year and $148,600 in the second year. Also assume a present value of $303,764.34 at a discount rate of 12.75 percent. What is the cash flow in the third year if that is the only other cash flow?

36) \_\_\_\_\_\_

A) $163,100   
 B) $163,800  
 C) $164,900  
 D) $164,400  
 E) $163,700

**37)** Assume you deposited $3,200 in an account two years ago and are depositing another $5,000 today. You will make a final deposit of $3,500 one year from now. What will your account balance be three years from now if the account pays 4.85 percent interest, compounded annually?

37) \_\_\_\_\_\_

A) $13,033.95   
 B) $13,430.84  
 C) $12,431.05  
 D) $14,328.90  
 E) $13,666.10

**38)** Anna has $38,654 in a savings account that pays 2.3 percent interest. Assume she withdraws $10,000 today and another $10,000 one year from today. If she waits and withdraws the remaining entire balance four years from today, what will be the amount of that withdrawal?

38) \_\_\_\_\_\_

A) $20,916.78   
 B) $20,109.08  
 C) $20,676.53  
 D) $19,341.02  
 E) $19,608.07

**39)** Theo will deposit $3,500 in an account one year from today, an additional $6,500 two years from today, and $9,000 three years from today. If the account earns 7.35 percent per year, compounded annually, what will his account balance be 14 years from today?

39) \_\_\_\_\_\_

A) $43,661   
 B) $15,358  
 C) $51,284  
 D) $22,382  
 E) $16,176

**40)** You want to save an equal amount each year for the next 38 years, at which time you will retire. What amount of annual savings are needed if you desire a retirement income of $55,000 per year for 25 years and earn 7.5 percent, compounded annually?

40) \_\_\_\_\_\_

A) $3,333.33   
 B) $2,640.85  
 C) $3,146.32  
 D) $2,889.04  
 E) $3,406.16

**41)** Leo received $7,500 today and will receive another $5,000 two years from today. If he invests these funds immediately at 11.5 percent, what will his investment be worth five years from now?

41) \_\_\_\_\_\_

A) $18,758.04   
 B) $18,806.39  
 C) $19,856.13  
 D) $20,314.00  
 E) $19,904.36

**42)** Suzette is receiving $10,000 today, $15,000 one year from today, and $25,000 four years from today. If she invests these funds immediately and earns 9.6 percent annually, how much will she have in savings 30 years from today?

42) \_\_\_\_\_\_

A) $586,124.93   
 B) $591,414.14  
 C) $646,072.91  
 D) $620,008.77  
 E) $641,547.39

**43)** You would like to have $50,000 saved at the end of Year 5. At the end of Year 2, you can deposit $7,500 for this purpose. If you earn 4.5 percent, how much must you deposit today to reach your goal assuming no other deposits are made?

43) \_\_\_\_\_\_

A) $33,254.58   
 B) $33,108.09  
 C) $34,276.34  
 D) $34,642.28  
 E) $34,912.63

**44)** The government imposed a fine on a firm that requires a payment of $100,000 today, $150,000 one year from today, and $200,000 two years from today. The government will hold the funds until the final payment is collected and then donate the entire amount to charity. How much will be donated if the government pays 3 percent interest on the held funds?

44) \_\_\_\_\_\_

A) $475,000   
 B) $460,590  
 C) $447,174  
 D) $451,050  
 E) $474,407

**45)** If you invest $15,000 today, an investment guarantees that 24 years from today you will have $54,750. What annual rate of interest will you earn?

45) \_\_\_\_\_\_

A) 5.25%   
 B) 5.54%  
 C) 5.68%  
 D) 5.93%  
 E) 5.71%

**46)** Twenty-two years ago, a particular violin cost $2,000. Today, that same violin costs $21,472. What has been the inflation rate on this instrument?

46) \_\_\_\_\_\_

A) 12.19%   
 B) 8.43%  
 C) 11.39%  
 D) 10.23%  
 E) 9.92%

**47)** Several years ago, Jacquelyn invested $6,000. Today, that investment is worth $97,920. It has earned an average annual rate of return of 9.5 percent, compounded annually. How long ago did Jacquelyn make her investment?

47) \_\_\_\_\_\_

A) 41.85 years   
 B) 16.32 years  
 C) 17.13 years  
 D) 30.77 years  
 E) 26.77 years

**48)** Some years ago, Zaid purchased a small parcel of land for $5,500. That land has appreciated at 11 percent annually and is now valued at $89,760. How long has Zaid owned this land?

48) \_\_\_\_\_\_

A) 26.76 years   
 B) 23.28 years  
 C) 36.39 years  
 D) 29.12 years  
 E) 32.43 years

**49)** Twenty-four years ago, your relative invested $3,000. Today that investment is worth $19,522. What annual rate of return has been earned on this investment?

49) \_\_\_\_\_\_

A) 7.51%   
 B) 8.12%  
 C) 0.05%  
 D) 9.25%  
 E) 8.68%

**50)** Your credit card company charges you 1.35 percent per month. What is the annual percentage rate on your account?

50) \_\_\_\_\_\_

A) 16.45%   
 B) 16.30%  
 C) 16.39%  
 D) 16.20%  
 E) 16.56%

**51)** What is the annual percentage rate on a loan that charges interest of 1.65 percent per quarter?

51) \_\_\_\_\_\_

A) 6.50%   
 B) 6.45%  
 C) 6.54%  
 D) 6.60%  
 E) 6.72%

**52)** A credit card compounds interest monthly and has an effective annual rate of 12.67 percent. What is the annual percentage rate?

52) \_\_\_\_\_\_

A) 12.35%   
 B) 12.00%  
 C) 11.99%  
 D) 11.87%  
 E) 11.93%

**53)** What is the effective annual rate if your credit card charges you 10.64 percent compounded daily? (Assume a 365-day year.)

53) \_\_\_\_\_\_

A) 10.79%   
 B) 11.22%  
 C) 11.95%  
 D) 11.48%  
 E) 12.01%

**54)** Rojas Watercraft offers credit at an APR of 13.8 percent and compounds interest monthly. What actual rate of interest are they charging?

54) \_\_\_\_\_\_

A) 14.7%   
 B) 14.5%  
 C) 16.1%  
 D) 15.0%  
 E) 15.7%

**55)** The pawn shop adds 2 percent to loan balances for every two weeks a loan is outstanding. What is the effective annual rate of interest?

55) \_\_\_\_\_\_

A) 79.97%   
 B) 73.08%  
 C) 51.21%  
 D) 67.34%  
 E) 83.43%

**56)** You have $2,500 to deposit into a savings account. The five banks in your area offer the following rates. In which bank should you deposit your savings?

56) \_\_\_\_\_\_

A) Bank A: 3.75%, compounded annually   
 B) Bank B: 3.69%, compounded monthly  
 C) Bank C: 3.70% compounded semiannually  
 D) Bank D: 3.67% compounded continuously  
 E) Bank E: 3.65% compounded quarterly

**57)** What is the effective annual rate of 10.25 percent compounded continuously?

57) \_\_\_\_\_\_

A) 10.98%   
 B) 11.11%  
 C) 10.79%  
 D) 11.04%  
 E) 10.86%

**58)** Marcy invested in an annuity that will pay her $2,500 every two years for the next ten years. The first payment is due two years from today. What is the present value of this annuity at a discount rate of 5 percent?

58) \_\_\_\_\_\_

A) $10,466.67   
 B) $11,221.08  
 C) $9,416.75  
 D) $10,052.48  
 E) $8,949.60

**59)** Credit Fast offers loans at an annual percentage rate of 7.9 percent. What is the maximum effective rate the bank can actually earn based on this quoted rate?

59) \_\_\_\_\_\_

A) 7.90%   
 B) 8.18%  
 C) 8.20%  
 D) 8.22%  
 E) 8.39%

**60)** What is the future value of investing $5,650 for 14 years at a continuously compounded rate of 8.6 percent?

60) \_\_\_\_\_\_

A) $17,933.54   
 B) $16,685.44  
 C) $19,369.83  
 D) $18,833.85  
 E) $13,183.85

**61)** Assume you could invest $25,000 at a continuously compounded rate of 10 percent. What would your investment be worth at the end of 50 years?

61) \_\_\_\_\_\_

A) $2,933,054   
 B) $3,500,824  
 C) $3,911,215  
 D) $3,710,329  
 E) $3,648,029

**62)** Jun Hin invested $4,500 at 6.2 percent, compounded continuously. What will his investment be worth after 15 years?

62) \_\_\_\_\_\_

A) $15,557.78   
 B) $9,240.03  
 C) $11,405.29  
 D) $12,308.84  
 E) $8,685.00

**63)** A trust has been established to fund scholarships in perpetuity. The first annual distribution, in the amount of $6,000, will take place one year from today. Future payments will increase by 4 percent per year. What is the value of this trust at a discount rate of 9 percent?

63) \_\_\_\_\_\_

A) $133,200   
 B) $130,800  
 C) $66,667  
 D) $120,000  
 E) $90,000

**64)** Zhu Equity established a trust fund that provides $125,000 in college scholarships each year. The trust fund earns 6.15 percent and distributes only its annual income. How much money did Zhu contribute to establish this fund?

64) \_\_\_\_\_\_

A) $2,291,613   
 B) $2,032,520  
 C) $2,150,000  
 D) $2,018,970  
 E) $1,987,408

**65)** A preferred stock pays an annual dividend of $6.50 per share and has an annual rate of return of 7.35 percent. What is the stock price?

65) \_\_\_\_\_\_

A) $74.50   
 B) $71.78  
 C) $92.09  
 D) $88.44  
 E) $77.78

**66)** You want to establish a charitable trust that will provide $50,000 per year forever to a particular charity. If the fund can earn a guaranteed rate of return of 4.5 percent, how much must you deposit in a solitary lump sum to establish this trust?

66) \_\_\_\_\_\_

A) $1,333,333   
 B) $2,250,000  
 C) $1,250,000  
 D) $1,666,667  
 E) $1,111,111

**67)** You just paid $525,000 for a security that will pay you and your heirs $25,000 per year forever. What rate of return will you earn?

67) \_\_\_\_\_\_

A) 4.95%   
 B) 4.39%  
 C) 4.76%  
 D) 5.00%  
 E) 4.50%

**68)** Anusha’s relative established a trust and deposited $250,000 into it. The trust pays a guaranteed 4.25 percent annual rate of return. Anusha will receive all the interest earnings on an annual basis. How much income will Anusha receive each year?

68) \_\_\_\_\_\_

A) $10,000   
 B) $8,500  
 C) $12,400  
 D) $10,625  
 E) $12,750

**69)** The preferred stock of Estrada Properties offers a rate of return of 7.87 percent. The stock is currently priced at $63.53 per share. What is the amount of the annual dividend?

69) \_\_\_\_\_\_

A) $5.20   
 B) $5.00  
 C) $4.60  
 D) $5.50  
 E) $6.00

**70)** Kwame is willing to pay $185 per month for four years for a car payment. If the interest rate is 4.9 percent per year, compounded monthly, and he makes a cash down payment of $2,500, what price car can he afford to purchase?

70) \_\_\_\_\_\_

A) $10,961.36   
 B) $10,549.07  
 C) $8,533.84  
 D) $8,686.82  
 E) $8,342.05

**71)** Sanghyuk will receive payments of $550 per month for ten years. What are these payments worth today at a discount rate of 6 percent, compounded monthly?

71) \_\_\_\_\_\_

A) $49,540.40   
 B) $51,523.74  
 C) $53,737.08  
 D) $49,757.69  
 E) $48,808.17

**72)** Assume your employer will contribute $50 per week for twenty years to your retirement plan. At a discount rate of 5 percent, compounded weekly, what is this employee benefit worth to you today?

72) \_\_\_\_\_\_

A) $29,144.43   
 B) $35,920.55  
 C) $32,861.08  
 D) $26,446.34  
 E) $36,519.02

**73)** Mercy has a consulting contract that calls for annual payments of $50,000 per year for five years, with the first payment due today. What is the current value of this contract if the discount rate is 8.4 percent?

73) \_\_\_\_\_\_

A) $214,142.50   
 B) $201,867.47  
 C) $195,618.19  
 D) $197,548.43  
 E) $224,267.10

**74)** Geller & Lao will deposit $3,000 per quarter for the next three years. The first deposit will be made today. The money is expected to earn 2.75 percent per year, compounded quarterly. If the company had wanted to deposit one lump sum today, rather than make quarterly deposits, how much would it have had to deposit to have the same amount saved at the end of the three years?

74) \_\_\_\_\_\_

A) $34,441.56   
 B) $34,678.35  
 C) $33,428.87  
 D) $33,687.23  
 E) $34,998.01

**75)** Michaela has been offered an employment contract for ten years at a starting salary of $65,000 with guaranteed raises of 5 percent per year. What is the current value of this offer at a discount rate of 7 percent?

75) \_\_\_\_\_\_

A) $638,724.17   
 B) $602,409.91  
 C) $558,845.85  
 D) $630,500.00  
 E) $525,000.00

**76)** Your friend agreed to lend you money today, in exchange for payments of $20 per month for the next six months. The first payment must be paid today. The interest rate is 1.5 percent per month. How much total interest does your friend expect to earn?

76) \_\_\_\_\_\_

A) $3.94   
 B) $4.35  
 C) $1.34  
 D) $3.63  
 E) $5.96

**77)** Benjamin purchased an annuity that will pay $5,000 annually for 20 years. He will receive the first payment today. What is the value of the annuity today, given a discount rate of 7 percent?

77) \_\_\_\_\_\_

A) $54,282.98   
 B) $52,970.07  
 C) $56,677.98  
 D) $56,191.91  
 E) $66,916.21

**78)** Victoria will receive annual payments of $10,000 for the next 25 years. The discount rate is 6.8 percent. What is the difference in the present value of this stream of payments if they are paid at the beginning of each year rather than at the end of each year?

78) \_\_\_\_\_\_

A) $8,069.29   
 B) $9,216.67  
 C) $9,706.67  
 D) $8,382.04  
 E) $8,850.00

**79)** You are comparing two annuities with equal present values. The applicable discount rate is 6.5 percent per year, compounded annually. One annuity will pay $2,000 per year, starting today, for 20 years. The second annuity will pay an annual amount, starting one year from today, for 20 years. What is the annual payment for the second annuity?

79) \_\_\_\_\_\_

A) $2,225   
 B) $2,075  
 C) $2,000  
 D) $2,130  
 E) $2,405

**80)** Bailey owns two annuities that will each pay $500 per month for the next 12 years. One payment is received at the beginning of each month while the other is received at the end of each month. At a discount rate of 7.25 percent, compounded monthly, what is the difference in the present values of these two annuities?

80) \_\_\_\_\_\_

A) $289.98   
 B) $265.42  
 C) $299.01  
 D) $308.00  
 E) $312.50

**81)** What is the future value of $845 per year for seven years at an interest rate of 11.3 percent?

81) \_\_\_\_\_\_

A) $6,683.95   
 B) $6,075.69  
 C) $8,343.51  
 D) $8,001.38  
 E) $8,801.91

**82)** What is the future value of $3,100 per year for six years at interest rate of 8.9 percent?

82) \_\_\_\_\_\_

A) $20,255.40   
 B) $26,847.26  
 C) $27,134.16  
 D) $23,263.57  
 E) $24,414.67

**83)** Ryan saves $3,000 per year at an interest rate of 4.2 percent. What will his savings be worth at the end of 35 years?

83) \_\_\_\_\_\_

A) $229,317.82   
 B) $230,702.57  
 C) $230,040.06  
 D) $234,868.92  
 E) $236,063.66

**84)** You plan to save $2,400 per year and earn an average rate of interest of 5.6 percent. How much more will your savings be worth at the end of 40 years if you save at the beginning of each year rather than at the end of each year?

84) \_\_\_\_\_\_

A) $17,822.73   
 B) $18,821.10  
 C) $18,911.21  
 D) $19,103.04  
 E) $18,115.31

**85)** Assume you borrowed $19,600 to buy a car. The terms of the loan call for monthly payments for five years at an interest rate of 6.25 percent, compounded monthly. What is the amount of each payment?

85) \_\_\_\_\_\_

A) $3,981.46   
 B) $1,258.11  
 C) $381.21  
 D) $4,684.66  
 E) $390.39

**86)** You borrow $199,000 to buy a house. The mortgage rate is 5.5 percent, compounded monthly. The loan period is 30 years, and payments are made monthly. If you pay for the house according to the loan agreement, how much total interest will you pay?

86) \_\_\_\_\_\_

A) $218,086   
 B) $198,161  
 C) $207,764  
 D) $211,086  
 E) $185,059

**87)** Assume you borrowed $460,000 to buy a house. The loan period is 30 years, with monthly payments of $1,700. If you pay for the house according to the loan agreement, how much total interest will you pay?

87) \_\_\_\_\_\_

A) $51,000   
 B) $61,200  
 C) $167,200  
 D) $144,400  
 E) $152,000

**88)** Starting today, Hector is going to contribute $100 per month to his retirement account. His employer will make matching contributions equal to 50 percent of Hector’s contributions. If the total contributions remain constant, and he earns a monthly rate of .55 percent, how much will his savings be worth 40 years from now?

88) \_\_\_\_\_\_

A) $399,459.44   
 B) $3,798.34  
 C) $3,801.03  
 D) $3,655.83  
 E) $4,038.01

**89)** On the day she retired, Kate had $101,900 in retirement savings. She expects to earn 4.5 percent, compounded monthly, and live 24 more years. How much can she withdraw from her savings each month during her retirement if she plans to die on the day she spends her last penny?

89) \_\_\_\_\_\_

A) $592.07   
 B) $609.21  
 C) $539.87  
 D) $604.86  
 E) $579.22

**90)** Malatak Manufacturing purchased a warehouse for $1,562,500, paid 20 percent down in cash, and financed the balance for 13 years at 9.5 percent, compounded monthly. What is the amount of each monthly mortgage payment?

90) \_\_\_\_\_\_

A) $101,566.39   
 B) $118,750.08  
 C) $171,440.07  
 D) $13,982.15  
 E) $14,286.67

**91)** Assume you graduate with $26,800 in student loan debt at an interest rate of 4.25 percent, compounded monthly. If you want to have this debt paid in full within seven years, how much must you pay each month?

91) \_\_\_\_\_\_

A) $4,506.48   
 B) $369.42  
 C) $1,174.60  
 D) $3,883.00  
 E) $375.54

**92)** You are buying a car for $7,500, paying $900 down in cash, and financing the balance for 24 months at 6.5 percent, compounded monthly. What is the amount of each monthly loan payment?

92) \_\_\_\_\_\_

A) $318.64   
 B) $294.01  
 C) $302.02  
 D) $264.78  
 E) $245.09

**93)** Your parents plan to give you $200 per month for four years while you are in college. At a discount rate of 6 percent, compounded monthly, what are these payments worth to you when you first start college?

93) \_\_\_\_\_\_

A) $8,797.40   
 B) $8,409.56  
 C) $8,198.79  
 D) $8,516.06  
 E) $8,279.32

**94)** You just won the lottery! As your prize you will receive $1,500 per month for 150 months. If you can earn 7 percent, compounded monthly, on your money, what is this prize worth to you today?

94) \_\_\_\_\_\_

A) $137,003.69   
 B) $149,676.91  
 C) $137,962.77  
 D) $148,104.26  
 E) $150,723.76

**95)** You want to purchase an annuity that will pay you $1,200 per quarter for 15 years and earn a return of 5.5 percent, compounded quarterly. What is the most you should pay to purchase this annuity?

95) \_\_\_\_\_\_

A) $52,988.16   
 B) $48,811.20  
 C) $47,455.33  
 D) $48,450.67  
 E) $52,806.30

**96)** A car dealer is willing to lease you a car for $319 per month for 60 months. Payments are due on the first day of each month starting with the day you sign the lease contract. If your cost of money is 4.9 percent, compounded monthly, what is the current value of the lease?

96) \_\_\_\_\_\_

A) $17,882.75   
 B) $17,906.14  
 C) $17,014.34  
 D) $16,235.42  
 E) $16,689.54

**97)** Sara is the recipient of a trust that will pay her $500 on the first day of each month, starting immediately and continuing for 40 years. What is the value of this inheritance today if the applicable discount rate is 7.3 percent, compounded monthly?

97) \_\_\_\_\_\_

A) $76,811.30   
 B) $67,557.52  
 C) $89,204.04  
 D) $78,192.28  
 E) $80,006.09

**98)** Starting today, Hector is going to contribute $100 per month to his retirement account. His employer will make matching contributions equal to 50 percent of Hector’s contributions. If the total contributions remain constant, and he earns a monthly rate of .55 percent, how much will his savings be worth 40 years from now?

98) \_\_\_\_\_\_

A) $399,459.44   
 B) $300,456.74  
 C) $349,981.21  
 D) $299,189.16  
 E) $354,087.88

**99)** An annuity costs $70,000 today, pays $3,500 per year, and earns a return of 4.5 percent. What is the length of the annuity time period?

99) \_\_\_\_\_\_

A) 54.96 years   
 B) 49.48 years  
 C) 52.31 years  
 D) 43.08 years  
 E) 48.00 years

**100)** You are borrowing $5,200 at 7.8 percent, compounded monthly. The monthly loan payment is $141.88. How many loan payments must you make before the loan is paid in full?

100) \_\_\_\_\_\_

A) 30   
 B) 36  
 C) 40  
 D) 42  
 E) 48

**101)** You are retired, have $264,500 in your savings, withdraw $2,000 each month, and earn 4.5 percent, compounded monthly. How long will it be until you run out of money?

101) \_\_\_\_\_\_

A) 13.67 years   
 B) 15.25 years  
 C) 22.08 years  
 D) 13.02 years  
 E) 18.78 years

**102)** A growing perpetuity is currently valued $6,225.81. The next annuity payment will be $386 and the discount rate is 9 percent. What is the annuity's rate of growth?

102) \_\_\_\_\_\_

A) 2.45%   
 B) 3.10%  
 C) 2.80%  
 D) 2.50%  
 E) 2.95%

**103)** Christina will receive annuity payments of $1,200 per year for five years, with the first payment occurring at Year 4. What is the value of this annuity to her today at a discount rate of 7.25 percent?

103) \_\_\_\_\_\_

A) $4,209.19   
 B) $4,774.04  
 C) $3,961.80  
 D) $4,887.48  
 E) $4,111.08

**104)** Jisoo expects to live 30 years after she retires. At the end of the first year of her retirement, she wants to withdraw $35,000 from her savings. Each year thereafter, she wants to increase her annual withdrawal by 3.5 percent. If she can earn 5.5 percent on her savings, how much does she need to have in retirement savings on the day she retires?

104) \_\_\_\_\_\_

A) $862,001.34   
 B) $648,909.18  
 C) $764,458.87  
 D) $919,028.56  
 E) $832,004.01

**105)** Ross plans to set aside an equal amount of money each year, starting today, so that he will have $25,000 saved at the end of three years. If he can earn 4.7 percent per year, how much does he have to save annually?

105) \_\_\_\_\_\_

A) $7,596.61   
 B) $7,689.16  
 C) $8,004.67  
 D) $8,414.14  
 E) $8,333.33

**106)** Seven years ago, Carlos took out a mortgage for $185,000 at 5.6 percent, compounded monthly, for 30 years. He has made all of the monthly payments as agreed. What is his current loan balance?

106) \_\_\_\_\_\_

A) $157,308.74   
 B) $141,833.33  
 C) $164,621.06  
 D) $148,211.09  
 E) $142,779.47

**107)** Assume mortgage rates increase to 7.5 percent and you borrow $329,000 for 30 years to purchase a house. What will your loan balance be at the end of the first 15 years of monthly payments?

107) \_\_\_\_\_\_

A) $238,854.07   
 B) $194,311.64  
 C) $248,153.73  
 D) $207,308.09  
 E) $192,938.72

**108)** Vaughn borrowed $5,000 for five years at an APR of 6.2 percent. The loan calls for equal, annual principal payments. Interest will also be paid annually. What will be her loan payment in Year 2?

108) \_\_\_\_\_\_

A) $1,248   
 B) $1,310  
 C) $1,016  
 D) $1,274  
 E) $1,157

**109)** A small craft store located in a kiosk expects to generate annual cash flows of $6,800 for the next three years. At the end of the three years, the business is expected to be sold for $15,000. What is the value of this business at a discount rate of 15 percent?

109) \_\_\_\_\_\_

A) $30,100.07   
 B) $29,408.27  
 C) $25,388.67  
 D) $17,409.09  
 E) $19,477.67

**110)** Horton Books expects to generate cash flows of $129,600 for the next two years. At the end of the two years, the business will be sold for an estimated $3.2 million. What is the value of this business at a discount rate of 14 percent?

110) \_\_\_\_\_\_

A) $2,704,655   
 B) $2,284,644  
 C) $2,675,703  
 D) $2,848,392  
 E) $2,900,411

**111)** Hernandez Tailors has expected net annual cash flows of $16,200, $18,600, $19,100, and $19,500 for the next four years, respectively. At the end of the fourth year, the firm is expected to be worth $57,900. What is the present value of the firm at a discount rate of 11.6 percent?

111) \_\_\_\_\_\_

A) $93,090.25   
 B) $87,492.16  
 C) $101,016.38  
 D) $104,998.02  
 E) $98,411.20

**112)** Thomas invests $116 in an account that pays 5 percent simple interest. How much money will Thomas have at the end of 5 years?

112) \_\_\_\_\_\_

A) $148.05   
 B) $150.80  
 C) $139.20  
 D) $141.00  
 E) $145.00

**113)** Beatrice invests $1,390 in an account that pays 4 percent simple interest. How much more could she have earned over a 5-year period if the interest had been compounded annually?

113) \_\_\_\_\_\_

A) $26.96   
 B) $19.48  
 C) $33.70  
 D) $23.15  
 E) $115.74

**114)** You can invest in an account that pays simple interest or an account that pays compound interest. In either case, you plan to invest $2,900 today and both accounts have an annual interest rate of 8 percent. How much more interest will you receive in the 11th year in the account that pays compound interest?

114) \_\_\_\_\_\_

A) $268.87   
 B) $282.54  
 C) $286.03  
 D) $281.72  
 E) $232.00

**115)** What is the future value of $3,108 invested for 8 years at 6.3 percent compounded annually?

115) \_\_\_\_\_\_

A) $3,983.23   
 B) $3,968.39  
 C) $8,031.34  
 D) $5,066.96  
 E) $8,260.63

**116)** Five years from today, you plan to invest $4,450 for 11 additional years at 7.5 percent compounded annually. How much will you have in your account 16 years from today?

116) \_\_\_\_\_\_

A) $14,154.53   
 B) $6,867.69  
 C) $9,859.46  
 D) $10,363.14  
 E) $10,245.91

**117)** Today, your dream car costs $63,300. You feel that the price of the car will increase at an annual rate 1.7 percent. If you plan to wait 7 years to buy the car, how much will it cost at that time?

117) \_\_\_\_\_\_

A) $71,227.94   
 B) $70,037.31  
 C) $72,438.81  
 D) $71,731.62  
 E) $73,715.70

**118)** You are going to deposit $2,900 in an account that pays .55 percent interest per quarter. How much will you have in 9 years?

118) \_\_\_\_\_\_

A) $3,537.00   
 B) $3,527.41  
 C) $3,552.51  
 D) $3,513.75  
 E) $3,533.07

**119)** You are going to deposit $2,500 in an account that pays .31 percent interest per month. How much will you have in 5 years?

119) \_\_\_\_\_\_

A) $3,000.89   
 B) $3,010.19  
 C) $3,019.52  
 D) $3,013.20  
 E) $3,000.91

**120)** Retirement Investment Advisors, Incorporated, has just offered you an annual interest rate of 5.8 percent until you retire in 40 years. You believe that interest rates will increase over the next year and you would be offered 6.4 percent per year one year from today. If you plan to deposit $17,000 into the account either this year or next year, how much more will you have when you retire if you wait one year to make your deposit?

120) \_\_\_\_\_\_

A) $43,472.14   
 B) $10,376.61  
 C) $42,301.84  
 D) $21,595.74  
 E) $28,926.59

**121)** You just purchased two coins at a price of $1,210 each. Because one of the coins is more collectible, you believe that its value will increase at a rate of 6 percent per year, while you believe the second coin will only increase at 5.4 percent per year. If you are correct, how much more will the first coin be worth in 16 years?

121) \_\_\_\_\_\_

A) $1,331.54   
 B) $266.87  
 C) $1,234.18  
 D) $184.43  
 E) $121.54

**122)** You are going to deposit $26,500 today. You will earn an annual rate of 6.3 percent for 9 years, and then earn an annual rate of 5.7 percent for 12 years. How much will you have in your account in 21 years?

122) \_\_\_\_\_\_

A) $84,882.98   
 B) $89,319.26  
 C) $95,597.04  
 D) $45,924.59  
 E) $75,634.53

**123)** You Save Bank has a unique account. If you deposit $9,500 today, the bank will pay you an annual interest rate of 5 percent for 4 years, 5.6 percent for 3 years, and 6.3 percent for 7 years. How much will you have in your account in 14 years?

123) \_\_\_\_\_\_

A) $18,809.35   
 B) $15,475.92  
 C) $16,333.24  
 D) $20,854.77  
 E) $19,912.23

**124)** The most recent census for a city indicated that there were 950,883 residents. The population of the city is expected to increase at an annual rate of 4 percent each year for the next 16 years. What will the population be at that time?

124) \_\_\_\_\_\_

A) 1,780,986   
 B) 1,926,314  
 C) 1,852,225  
 D) 1,801,300  
 E) 1,923,037

**125)** What is the present value of $12,850 to be received 4 years from today if the discount rate is 5 percent?

125) \_\_\_\_\_\_

A) $7,710.00   
 B) $11,016.80  
 C) $10,561.76  
 D) $11,100.31  
 E) $10,571.73

**126)** You need to have $35,000 for a down payment on a house in 5 years. If you can earn an annual interest rate of 4.1 percent, how much will you have to deposit today?

126) \_\_\_\_\_\_

A) $27,554.38   
 B) $27,501.96  
 C) $27,951.79  
 D) $28,629.54  
 E) $24,378.75

**127)** A company has a pension liability of $410,000,000 that it must pay in 26 in years. If it can earn an annual interest rate of 3.7 percent, how much must it deposit today to fund this liability?

127) \_\_\_\_\_\_

A) $130,545,018.79   
 B) $159,417,572.09  
 C) $64,278,729.02  
 D) $140,677,021.20  
 E) $153,729,577.72

**128)** You want to have $94,000 in 16 years to help your child attend college. If you can earn an annual interest rate of 5 percent, how much will you have to deposit today?

128) \_\_\_\_\_\_

A) $39,910.62   
 B) $43,062.48  
 C) $38,137.93  
 D) $41,011.89  
 E) $20,713.79

**129)** A small business has determined that the machinery they currently use will wear out in 17 years. To replace the new machine when it wears out, the company wants to establish a savings account today. If the interest rate on the account is 1.1 percent per quarter and the cost of the machinery will be $300,000, how much will the company have to deposit today?

129) \_\_\_\_\_\_

A) $142,574.77   
 B) $249,087.31  
 C) $144,475.77  
 D) $144,282.21  
 E) $145,743.10

**130)** You want to have $19,500 in 6 years for a dream vacation. If you can earn an interest rate of .2 percent per month, how much will you have to deposit today?

130) \_\_\_\_\_\_

A) $16,913.55   
 B) $17,112.40  
 C) $19,267.63  
 D) $16,887.24  
 E) $17,262.51

**131)** Your bank will pay you an interest rate of .082 percent per week. You want to have $20,500 in 7 years. How much will you have to deposit today? Assume 52 weeks per year.

131) \_\_\_\_\_\_

A) $15,414.56   
 B) $15,549.77  
 C) $15,304.29  
 D) $19,644.60  
 E) $15,211.74

**132)** Both you and your older brother would like to have $24,500 in 12 in years. Because of your success in this class, you feel that you are a more savvy investor than your brother and will be able to earn an annual return of 11.3 percent compared to your brother's 9.8 percent. How much less than your brother will you have to deposit today?

132) \_\_\_\_\_\_

A) $1,198.89   
 B) $1,332.11  
 C) $1,498.62  
 D) $2,049.49  
 E) $1,079.01

**133)** You need to have $34,000 in 11 years. You can earn an annual interest rate of 3 percent for the first 6 years, and 3.6 percent for the next 5 years. How much do you have to deposit today?

133) \_\_\_\_\_\_

A) $23,859.25   
 B) $25,518.96  
 C) $26,376.28  
 D) $24,562.32  
 E) $23,042.08

**134)** You need to have $33,000 in 17 years. You can earn an annual interest rate of 3 percent for the first 5 years, 3.6 percent for the next 4 years, and 4.3 percent for the final 8 years. How much do you have to deposit today?

134) \_\_\_\_\_\_

A) $17,644.70   
 B) $16,427.43  
 C) $19,965.54  
 D) $15,414.25  
 E) $17,284.75

**135)** Two years ago, you invested $3,450. Today, it is worth $4,200. What rate of interest did you earn?

135) \_\_\_\_\_\_

A) 5.60 percent   
 B) .86 percent  
 C) 4.60 percent  
 D) 5.17 percent  
 E) 10.34 percent

**136)** You need to have $31,250 in 14 in years. You can earn an annual interest rate of 4 percent for the first 4 years, 4.6 percent for the next 3 years, and 5.3 percent for the final 7 years. How much do you have to deposit today?

136) \_\_\_\_\_\_

A) $16,291.88   
 B) $15,434.56  
 C) $13,884.64  
 D) $16,260.09  
 E) $18,046.10

**137)** When your father was born 43 years ago, his grandparents deposited $500 in an account for him. Today, that account is worth $38,500. What was the annual rate of return on this account?

137) \_\_\_\_\_\_

A) 9.92 percent   
 B) 10.20 percent  
 C) 11.69 percent  
 D) 10.63 percent  
 E) 7.94 percent

**138)** Rick deposited $3,300 into an account 14 years ago for an emergency fund. Today, that account is worth $5,930. What annual rate of return did Rick earn on this account assuming no other deposits and no withdrawals?

138) \_\_\_\_\_\_

A) 4.10 percent   
 B) 4.28 percent  
 C) 3.99 percent  
 D) 3.19 percent  
 E) 4.70 percent

**139)** An investor who was not as astute as he believed invested $281,000 into an account 6 years ago. Today, that account is worth $217,200. What was the annual rate of return on this account?

139) \_\_\_\_\_\_

A) −3.68 percent   
 B) −4.20 percent  
 C) −3.92 percent  
 D) 4.39 percent  
 E) 5.12 percent

**140)** You made an investment of $15,500 into an account that paid you an annual interest rate of 2.7 percent for the first 3 years and 7.1 percent for the next 10 years. What was your annual rate of return over the entire 13 years?

140) \_\_\_\_\_\_

A) 5.46 percent   
 B) 4.85 percent  
 C) 4.90 percent  
 D) 6.07 percent  
 E) 6.74 percent

**141)** You purchased a bond at a price of $2,400. In 10 years when the bond matures, the bond will be worth $5,000. It is exactly 4 years after you purchased the bond and you can sell the bond today for $3,000. If you hold the bond until it matures, what annual rate of return will you earn from today?

141) \_\_\_\_\_\_

A) 9.9 percent   
 B) 8.9 percent  
 C) 5.7 percent  
 D) 8.0 percent  
 E) 7.6 percent

**142)** Bob bought some land costing $16,040. Today, that same land is valued at $46,117. How long has Bob owned this land if the price of land has been increasing at 4 percent per year?

142) \_\_\_\_\_\_

A) 29.11 years   
 B) 11.06 years  
 C) 27.99 years  
 D) 26.93 years  
 E) 11.50 years

**143)** Maxxie purchased a tract of land for $32,000. Today, the same land is worth $48,400. How many years have passed if the price of the land has increased at an annual rate of 5.2 percent?

143) \_\_\_\_\_\_

A) 7.00 years   
 B) 6.12 years  
 C) 7.26 years  
 D) 7.35 years  
 E) 8.16 years

**144)** You expect to receive a payout from a trust fund in 2 years. The payout will be for $10,000. You plan to invest the money at an annual rate of 6.1 percent until the account is worth $17,500. How many years do you have to wait from today?

144) \_\_\_\_\_\_

A) 10.18 years   
 B) 8.59 years  
 C) 10.31 years  
 D) 11.45 years  
 E) 9.45 years

**145)** You have $9,000 and will invest the money at an interest rate of .29 percent per month until the account is worth $14,800. How many years do you have to wait until you reach your target account value?

145) \_\_\_\_\_\_

A) 12.52 years   
 B) 15.41 years  
 C) 13.36 years  
 D) 14.31 years  
 E) 14.54 years

**146)** You expect to receive $2,900 upon your graduation and will invest your windfall at an interest rate of .39 percent per quarter until the account is worth $4,600. How many years do you have to wait until you reach your target account value?

146) \_\_\_\_\_\_

A) 29.63 years   
 B) 29.80 years  
 C) 27.66 years  
 D) 31.91 years  
 E) 25.93 years

**147)** If you earn an annual interest rate of 10.1 percent, how many years will it take to double your money?

147) \_\_\_\_\_\_

A) 6.65 years   
 B) 6.55 years  
 C) 7.20 years  
 D) 5.76 years  
 E) 6.30 years

**148)** You currently have $6,100. First United Bank will pay you an annual interest rate of 7.2, while Second National Bank will pay you an annual interest rate of 8.5. How many fewer years must you wait for your account value to grow to $20,200 at Second National Bank?

148) \_\_\_\_\_\_

A) 2.35 years   
 B) 2.86 years  
 C) 2.54 years  
 D) 3.05 years  
 E) 2.31 years

**149)** Your sister just deposited $7,000 into an investment account. She believes that she will earn an annual return of 9.1 percent for the next 9 years. You believe that you will only be able to earn an annual return of 8.2 percent over the same period. How much more must you deposit today in order to have the same amount as your sister in 9 years?

149) \_\_\_\_\_\_

A) $541.81   
 B) $1,160.24  
 C) $29.75  
 D) $505.69  
 E) $577.93

**150)** The winner of the first annual Tom Morris Golf Invitational won $175 in the competition which was held in 1913. In 2015, the winner received $1,600,000. If the winner's purse continues to increase at the same interest rate, how much will the winner receive in 2047?

150) \_\_\_\_\_\_

A) $27,977,722.23   
 B) $25,825,589.75  
 C) $25,434,292.94  
 D) $31,474,937.51  
 E) $22,382,177.79

**151)** You have just deposited $10,000 into an account that promises to pay you an annual interest rate of 6.3 percent each year for the next 4 years. You will leave the money invested in the account and 10 years from today, you need to have $32,800 in the account. What annual interest rate must you earn over the last 6 years to accomplish this goal?

151) \_\_\_\_\_\_

A) 17.03%   
 B) 15.72%  
 C) 15.48%  
 D) 19.16%  
 E) 13.62%

**ESSAY. Write your answer in the space provided or on a separate sheet of paper.  
152)** Explain the net present value formula and also explain what the net present value represents.  
   
 NPV = −Cost + PV

**153)** Marlene and Darlene are each the recipients of an annuity that pays $1,000 at the end of each year for twelve years. They both received their first payment on the same day. Explain how Marlene and Darlene could have different NPVs for their annuities.

**154)** There are four factors that affect the value of an annuity. Explain what these four factors are and discuss how a change in each factor will impact both the present value and the future value of the annuity.

**155)** Moro owns a perpetuity that will pay $1,500 per year, starting one year from now. He offers to sell you all the payments remaining after the first 25 payments have been paid. What price should you offer him today for payments 26 onward if the discount rate is 8 percent? What does your offer price illustrate about the value of perpetuities?

**156)** What is the difference between an ordinary annuity and an annuity due? What value can be used to quickly convert both the present value and the future value of an ordinary annuity into annuity due values?

**Answer Key**Test name: Chapter 4

1) B

2) D

3) E

4) E

5) C

6) C

7) B

8) E

9) C

10) D

11) D

12) D

13) B

14) A

15) E

16) C

17) C

18) D

19) B

20) B

21) E

22) B

23) C

24) B

PV = $21,797/1.051  
 PV = $20,739.30

25) B

NPV = −$172,800 + $197,100/1.0675  
 NPV = $11,837.00

26) C

PV = $211,400/1.063  
 PV = $198,871.12

27) A

Value3 = $6,500 + $6,500(.04)(3)  
 ValueYear 3 = $7,280.00

28) A

FV5 = $50,000(1.052545)  
 FV5 = $499,994

29) C

FVSimple = $1,000 + $1,000(.05)(10)  
 FVSimple = $1,500  
   
 FV = $1,000(1.0510)  
 FV = $1,628.89  
   
 Difference = $1,628.89 − 1,500  
 Difference = $128.89

30) E

NPV = −$522,765 + $140,000/1.101 + $225,000/1.1012 + $200,000/1.1013  
 NPV = −$60,141

31) B

PV = $20,000/1.097 + $44,000/1.0972 + $53,000/1.0973  
 PV = $94,942

32) C

PV = $29,000/1.087 + $42,000/1.0872 + $53,000/1.0873  
 PV = $103,490

33) D

PV = $5,000 + $33,000/1.079 + $35,000/1.0792 + $48,000/1.0793  
 PV = $103,856

34) E

PV = $32,000/1.109 + $33,000/1.1092 + $70,000/1.1093  
 PV = $107,009

35) D

PV = $11,300/1.165 + $14,600/1.1652 + $21,900/1.1653 + $38,400/1.1654  
 PV = $55,153.57

36) A

$303,764.34 = $82,400/1.1275 + $148,600/1.12752 + *C*3/1.12753  
 *C3* = $163,100

37) E

FV3 = $3,200(1.04855) + $5,000(1.04853) + $3,500(1.04852)  
 FV3 = $13,666.10

38) C

$38,654 = $10,000 + $10,000/1.023 + *C*4/1.0234  
 *C4* = $20,676.53

39) A

FV = $3,500(1.073513) + $6,500(1.073512) + $9,000(1.073511)  
 FV = $43,661

40) C

PV = $55,000[(1 − 1/1.07525)/.075]  
 PV = $613,082.02  
   
 $613,082.02 = *C*[(1.07538 − 1)/.075]  
 *C* = $3,146.32

41) C

FV = $7,500(1.1155) + $5,000(1.1153)  
 FV = $19,856.13

42) E

FV = $10,000(1.09630) + $15,000(1.09629) + $25,000(1.09626)  
 FV = $641,547.39

43) A

$50,000 = *C*01.0455 + $7,500(1.0453)  
 *C*0 = $33,254.58

44) B

FV = $100,000(1.032) + $150,000(1.03) + $200,000  
 FV = $460,590

45) B

$54,750 = $15,000(1 + *r*)24  
 *r* = .0554, or 5.54%

46) C

$21,472 = $2,000(1 + *r*)22  
 *R* = .1139, or 11.39%

47) D

$97,920 = $6,000(1.095)*T*  
 ln16.32 = ln1.095*T*  
 *T* = 30.77 years

48) A

$89,760 = $5,500(1.11)*T*  
 ln16.32 = ln1.11*T*  
 *T* = 26.76 years

49) B

$19,522 = $3,000(1 + r)24  
 *r* = .0812, or 8.12%

50) D

APR = .0135(12)  
 APR = .1620, or 16.20%

51) D

APR = .0165(4)  
 APR = .0660, or 6.60%

52) C

APR = (1.12671/12 − 1)(12)  
 APR = .1199, or 11.99%

53) B

EAR = (1 + .1064/365)365 − 1  
 EAR = .1122, or 11.22%

54) A

EAR = (1 + .138/12)12 − 1  
 EAR = .147, or 14.7%

55) D

EAR = 1.0252/2 − 1  
 EAR = .6734, or 67.34%

56) B

EARBank A = 3.75%  
   
 EARBank B = (1 + .0369/12)12 − 1  
 EARBank B = .03753, or 3.753%  
   
 EARBank C = (1 + .0370/2)2 − 1  
 EARBank C = .03734, or 3.734%  
   
 EARBank D = *e*.0367 − 1  
 EARBank D = .03738, or 3.738%  
   
 EARBank E = (1 + .0365/4)4 − 1  
 EARBank E = .03700, or 3.700%  
   
 Bank B offers the highest EAR.

57) C

EAR = *e*.1025 − 1  
 EAR = .1079, or 10.79%

58) C

2-year interest rate = 1.052 − 1  
 2-year interest rate = .1025, or 10.25%  
   
 PV = $2,500[(1 − 1/1.102510/2)/.1025]  
 PV = $9,416.75

59) D

EAR = *e*.079 − 1  
 EAR = .0822, or 8.22%

60) D

FV = $5,650*e*.086(14)  
 FV = $18,833.85

61) D

FV = $25,000*e*.10(50)  
 FV = $3,710,329

62) C

FV = $4,500*e*.062(15)  
 FV = $11,405.29

63) D

PV = $6,000/(.09 − .04)  
 PV = $120,000

64) B

PV = $125,000/.0615  
 PV = $2,032,520

65) D

PV = $6.50/.0735  
 PV = $88.44

66) E

PV = $50,000/.045  
 PV = $1,111,111

67) C

*r* = $25,000/$525,000  
 *r* = .0476, or 4.76%

68) D

*C* = $250,000(.0425)  
 *C* = $10,625

69) B

*C* = $63.53(.0787)  
 *C* = $5.00

70) B

PV = $2,500 + $185{[1 − 1/(1 + .049/12)4(12)]/(.049/12)}  
 PV = $10,549.07

71) A

PV = $550{[1 − 1/(1 + .06/12)10(12)]/(.06/12)}  
 PV = $49,540.40

72) C

PV = $50{[1 − 1/(1 + .05/52)20(52)]/(.05/52)}  
 PV = $32,861.08

73) A

PVADue = $50,000[(1 − 1/1.0845)/.084](1.084)  
 PVADue = $214,142.50

74) B

PVADue = $3,000{[1 − 1/(1 + .0275/4)3(4)]/(.0275/4)}(1 + .0275/4)  
 PVADue = $34,678.35

75) C

PV = $65,000({1 − [(1.05/1.07)10]}/(.07 − .05))  
 PV = $558,845.85

76) B

PVADue = $20[(1 − 1/1.0156)/.015](1.015)  
 PVADue = $115.65  
   
 Total interest = 6($20) − $115.65  
 Total interest = $4.35

77) C

PVADue = $5,000[(1 − 1/1.0720)/.07](1.07)  
 PVADue = $56,677.98

78) A

PVADue = $10,000[(1 - 1/1.06825)/.068](1.068)  
 PVADue = $126,735.21  
   
 PV = $10,000[(1 − 1/1.06825)/.068]  
 PV = $118,665.92  
   
 Difference = $126,735.21 − 118,665.92  
 Difference = $8,069.29

79) D

PVADue = $2,000[(1 − 1/1.06520)/.065](1.065)  
 PVADue = $23,469.42  
   
 $23,469.42 = *C*[(1 − 1/1.06520)/.065]  
 *C* = $2,130  
   
 This can also be computed as:  
   
 *C* = $2,000(1.065) = $2,130

80) A

PVADue = $500{[1 − 1/(1 + .0725/12)12(12)]/(.0725/12)}(1 + .0725/12)  
 PVADue = $48,285.87  
   
 PV = $500{[1 − 1/(1 + .0725/12)12(12)]/(.0725/12)}  
 PV = $47,995.89  
   
 Difference = $48,285.87 − 47,995.89  
 Difference = $289.98  
   
 This can also be computed as:  
   
 Difference = (.0725/12)$47,995.89  
 Difference = $289.98

81) C

FV = $845[(1.1137 − 1)/.113]  
 FV = $8,343.51

82) D

FV = $3,100[(1.0896 − 1)/.089]  
 FV = $23,263.57

83) C

FV = $3,000[(1.04235 − 1)/.042]  
 FV = $230,040.06

84) B

FV = $2,400[(1.05640 − 1)/.056]  
 FV = $336,091.14  
   
 FVADue = $2,400[(1.05640 − 1)/.056](1.056)  
 FVADue = $354,912.24  
   
 Difference = $354,912.24 − 336,091.14  
 Difference = $18,821.10  
   
 This can also be computed as:  
   
 Difference = $336,091.14(.056)  
 Difference = $18,821.10

85) C

$19,600 = *C*{[1 − 1/(1 + .0625/12)5(12)]/(.0625/12)}  
 *C* = $381.21

86) C

$199,000 = *C*{[1 − 1/(1 + .055/12)30(12)]/(.055/12)}  
 *C* = $1,129.90  
   
 Total interest = 30(12)($1,129.90) − $199,000  
 Total interest = $207,764

87) E

Total interest = ($1,700 per month)(360 months) − $460,000   
 Total interest = $152,000

88) D

$20,000 = *C*[(1.0455 − 1)/.045]  
 *C* = $3,655.83

89) E

$101,900 = *C*{[1 − 1/(1 + .045/12)24(12)]/(.045/12)}  
 *C* = $579.22

90) D

Amount financed = $1,562,500(1 − .20) = $1,250,000  
   
 $1,250,000 = *C*{[1 − 1/(1 + .095/12)13(12)]/(.095/12)}  
 *C* = 13,982.15

91) B

$26,800 = *C*{[1 − 1/(1 + .0425/12)7(12)]/(.0425/12)}  
 *C* = $369.42

92) B

Amount financed = $7,500 − 900 = $6,600  
   
 $6,600 = *C*{[1 − 1/(1 + .065/12)24]/(.065/12)}  
 *C* = $294.01

93) D

PV = $200{[1 − 1/(1 + .06/12)4(12)]/(.06/12)}  
 PV = $8,516.06

94) B

PV = $1,500{[1 − 1/(1 + .07/12)150]/(.07/12)}  
 PV = $149,676.91

95) B

PV = $1,200{[1 − 1/(1 + .055/4)15(4)]/(.055/4)}  
 PV = $48,811.20

96) C

PVADue = $319{[1 − 1/(1 + .049/12)60]/(.049/12)}(1 + .049/12)  
 PVADue = $17,014.34

97) D

PVADue = $500{[1 − 1/(1 + .073/12)40(12)]/(.073/12)}(1 + .073/12)  
 PVADue = $78,192.28

98) E

FVADue = ($100 + 50)[(1.005540(12) − 1)/.0055](1.0055)  
 FVADue = $354,087.88

99) C

$70,000 = $3,500[(1 − 1/1.045*T*)/.045]  
 10 = 1.045*T*  
 ln10 = *T*ln1.045  
 *T* = 52.31 years

100) D

$5,200 = $141.88{[1 − 1/(1 + .078/12)*T*]/(.078/12)}  
 ln1.3127 = *T*ln1.0065  
 *T* = 42

101) B

$264,500 = $2,000{[1 − 1/(1 + .045/12)*T*]/(.045/12)}  
 ln1.9839 = *T*ln1.00375  
 *T* = 183.02 months, or 15.25 years

102) C

$6,225.81 = $386/(.09 − *g*)  
 *g* = .028, or 2.80%

103) C

PV3 = $1,200[(1 − 1/1.07255)/.0725]  
 PV3 = $4,887.48  
   
 PV0 = $4,887.48/1.07253  
 PV0 = $3,961.80

104) C

PV = $35,000{[1 − (1.035/1.055)30]/(.055 − .035)}  
 PV = $764,458.87

105) A

$25,000 = *C*[(1.0473 − 1)/.047](1.047)  
 *C* = $7,596.61

106) C

$185,000 = *C*{[1 − 1/(1 + .056/12)30(12)]/(.056/12)}  
 *C* = $1,062.05  
   
 PV = $1,062.05{[1 − 1/(1 + .056/12)(30 − 7)(12)]/(.056/12)}  
 PV = $164,621.06

107) C

$329,000 = *C*{[1 − 1/(1 + .075/12)30(12)]/(.075/12)}  
 *C* = $2,300.42  
   
 PV = $2,300.42{[1 − 1/(1 + .075/12)(30 − 15)(12)]/(.075/12)}  
 PV = $248,153.73

108) A

Year 2 loan payment = $5,000/5 + ($5,000 − 1,000)(.062)  
 Year 2 loan payment = $1,248

109) C

PV = $6,800[(1 − 1/1.153)/.15] + $15,000/1.153  
 PV = $25,388.67

110) C

PV = $129,600[(1 − 1/1.142)/.14] + $3,200,000/1.142  
 PV = $2,675,703

111) A

PV = $16,200/1.116 + $18,600/1.1162 + $19,100/1.1163 + ($19,500 + 57,900)/1.1164  
 PV = $93,090.25

112) E

Balance Year 5 = $116 + ($116 × 0.05 × 5) = $145.00

113) D

Balance Year 5 with simple interest = $1,390 + ($1,390 × 0.04 × 5) = $1,668.00  
 Balance Year 5 with compound interest = $1,390 × 1.045 = $1,691.15  
 Additional interest = $1,691.15 − 1,668.00 = $23.15

114) A

Simple interest:  
   
 Interest per year = $2,900 × .08 = $232  
   
 Compound interest:  
   
 Value after 10 years = $2,900 × 1.0810 = $6,260.88  
   
 Interest in Year 11 = $6,260.88 × .08 = $500.87  
   
 Difference = $500.87 − 232 = $268.87

115) D

FV = $3,108 × 1.0638 = $5,066.96

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 8 | | | 6.3% | | | −$3,108 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $5,066.96 | | |

116) C

FV = $4,450 × 1.07511 = $9,859.46

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 11 | | | 7.5% | | | −$4,450 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $9,859.46 | | |

117) A

FV = $63,300 × 1.0177 = $71,227.94

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 7 | | | 1.7% | | | −$63,300 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $71,227.94 | | |

118) E

FV = $2,900 × 1.005536 = $3,533.07

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 9 × 4 | | | .55% | | | −$2,900 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $3,533.07 | | |

119) B

FV = $2,500 × 1.003160 = $3,010.19

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 5 × 12 | | | .31% | | | −$2,500 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $3,010.19 | | |

120) E

FV = $17,000 × 1.05840 = $162,134.57  
   
 FV = $17,000 × 1.06439 = $191,061.16  
   
 Difference = $191,061.16 − 162,134.57 = $28,926.59

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 40 | | | 5.8% | | | −$17,000 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $162,134.57 | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 39 | | | 6.4% | | | −$17,000 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $191,061.16 | | |

121) B

FV = $1,210 × 1.06016 = $3,073.83  
   
 FV = $1,210 × 1.05416 = $2,806.95  
   
 Difference = $3,073.83 − 2,806.95 = $266.87

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 16 | | | 6% | | | −$1,210 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $3,073.83 | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 16 | | | 5.4% | | | −$1,210 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $2,806.95 | | |

122) B

FV = $26,500 × 1.0639 = $45,924.59  
   
 FV = $45,924.59 × 1.05712 = $89,319.26

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 9 | | | 6.3% | | | −$26,500 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $45,924.59 | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 12 | | | 5.7% | | | −$45,924.59 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $89,319.26 | | |

123) D

FV = $9,500 × 1.0504 = $11,547.31  
   
 FV = $11,547.31 × 1.0563 = $13,597.92  
   
 FV = $13,597.92 × 1.0637 = $20,854.77

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 4 | | | 5% | | | −$9,500 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $11,547.31 | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 3 | | | 5.6% | | | −$11,547.31 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $13,597.92 | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 7 | | | 6.3% | | | −$13,597.92 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $20,854.77 | | |

124) A

FV = 950,883 × 1.04016 = 1,780,986

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 16 | | | 4% | | | −950,883 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | 1,780,986.00 | | |

125) E

PV = $12,850/1.054 = $10,571.73

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 4 | | | 5% | | |  | | |  | | | −$12,850 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $10,571.73 | | |  | | |  | | |

126) D

PV = $35,000/1.0415 = $28,629.54

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 5 | | | 4.1% | | |  | | |  | | | −$35,000 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $28,629.54 | | |  | | |  | | |

127) B

PV = $410,000,000/1.03726 = $159,417,572.09

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 26 | | | 3.7% | | |  | | |  | | | −$410,000,000 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $159,417,572.09 | | |  | | |  | | |

128) B

PV = $94,000/1.05016 = $43,062.48

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 16 | | | 5% | | |  | | |  | | | −$94,000 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $43,062.48 | | |  | | |  | | |

129) A

PV = $300,000/1.01117×4 = $142,574.77

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 17 × 4 | | | 1.1% | | |  | | |  | | | −$300,000 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $142,574.77 | | |  | | |  | | |

130) D

PV = $19,500/1.0026×12 = $16,887.24

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 6 × 12 | | | .2% | | |  | | |  | | | −$19,500 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $16,887.24 | | |  | | |  | | |

131) E

PV = $20,500/1.000827×52 = $15,211.74

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 7 × 52 | | | .082% | | |  | | |  | | | −$20,500 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $15,211.74 | | |  | | |  | | |

132) A

You: PV = $24,500/1.11312 = $6,779.91  
   
 Brother: PV = $24,500/1.09812 = $7,978.81  
   
 Difference = $7,978.81 − $6,779.91 = $1,198.89

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 12 | | | 11.3% | | |  | | |  | | | −$24,500 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $6,779.91 | | |  | | |  | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 12 | | | 9.8% | | |  | | |  | | | −$24,500 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $7,978.81 | | |  | | |  | | |

133) A

PV = $34,000/1.0365 = $28,489.19  
   
 PV = $28,489.19/1.0306 = $23,859.25

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 5 | | | 3.6% | | |  | | |  | | | −$34,000 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $28,489.19 | | |  | | |  | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 6 | | | 3% | | |  | | |  | | | −$28,489.19 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $23,859.25 | | |  | | |  | | |

134) A

PV = $33,000/1.0438 = $23,563.48  
   
 PV = $23,563.48/1.0364 = $20,455.05  
   
 PV = $20,455.05/1.0305 = $17,644.70

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 8 | | | 4.3% | | |  | | |  | | | −$33,000 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $23,563.48 | | |  | | |  | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 4 | | | 3.6% | | |  | | |  | | | −$23,563.48 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $20,455.05 | | |  | | |  | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 5 | | | 3% | | |  | | |  | | | −$20,455.05 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $17,644.70 | | |  | | |  | | |

135) E

FV = $4,200 = $3,450 × (1 + *r*)2  
   
 *r* = 0.1034 or 10.34%

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 2 | | |  | | | −$3,450 | | |  | | | $4,200 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | | 10.34% | | |  | | |  | | |  | | |

136) D

PV = $31,250/1.0537 = $21,769.65  
   
 PV = $21,769.65/1.0463 = $19,022.01  
   
 PV = $19,022.01/1.0404 = $16,260.09

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 7 | | | 5.3% | | |  | | |  | | | −$31,250 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $21,769.65 | | |  | | |  | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 3 | | | 4.6% | | |  | | |  | | | −$21,769.65 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $19,022.01 | | |  | | |  | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 4 | | | 4% | | |  | | |  | | | −$19,022.01 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $16,260.09 | | |  | | |  | | |

137) D

$38,500 = $500(1 + *r*)43  
   
 *r* = ($38,500/$500)1/43 − 1  
   
 *r* = .1063, or 10.63%

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 43 | | |  | | | $500 | | |  | | | −$38,500 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | | 10.63% | | |  | | |  | | |  | | |

138) B

$5,930 = $3,300(1 + *r*)14  
   
 *r* = ($5,930/$3,300)1/14 − 1  
   
 *r* = .0428, or 4.28%

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 14 | | |  | | | $3,300 | | |  | | | −$5,930 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | | 4.28% | | |  | | |  | | |  | | |

139) B

$217,200 = $281,000(1 + *r*)6  
   
 *r* = ($217,200/$281,000)1/6 − 1  
   
 *r* = −.0420, or −4.20%

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 6 | | |  | | | $281,000 | | |  | | | −$217,200 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | | −4.20% | | |  | | |  | | |  | | |

140) D

FV = $15,500 × 1.0273 = $16,789.70  
   
 FV = $16,789.70 × 1.07110 = $33,337.86  
   
 $33,337.86 = $15,500 × (1 + *r*)13  
   
 *r* = ($33,337.86/$15,500)1/13 − 1  
   
 *r* = .0607, or 6.07%

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 3 | | | 2.7% | | | −$15,500 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $16,789.70 | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 10 | | | 7.1% | | | −$16,789.70 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $33,337.86 | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 13 | | |  | | | −$15,500 | | |  | | | $33,337.86 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | | 6.07% | | |  | | |  | | |  | | |

141) B

$5,000 = $3,000 × (1 + *r*)6  
   
 *r* = ($5,000/$3,000)1/6−1  
   
 *r* = .089, or 8.9%

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 6 | | |  | | | −$3,000 | | |  | | | $5,000 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | | 8.9% | | |  | | |  | | |  | | |

142) D

$46,117 = $16,040 × 1.04*t*  
   
 2.87512 = 1.04*t*  
   
 *t* = ln2.87512/ln1.04  
   
 *t* = 1.05610/0.03922  
   
 *t* = 26.93 years

143) E

$48,400 = $32,000(1.052)*t*  
   
 *t* = 8.16 years

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter |  | | | 5.2% | | | $32,000 | | |  | | | −$48,400 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for | 8.16 | | |  | | |  | | |  | | |  | | |

144) D

$17,500 = $10,000(1.061)*t*  
   
 *t* = 9.45 years  
   
 Years to wait = 9.45 + 2 = 11.45 years

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter |  | | | 6.1% | | | $10,000 | | |  | | | −$17,500 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for | 9.45 | | |  | | |  | | |  | | |  | | |

145) D

$14,800 = $9,000(1.0029)*t*  
   
 *t* = 171.77 months  
   
 Years to wait = 171.77/12 = 14.31 years

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter |  | | | .29% | | | $9,000 | | |  | | | −$14,800 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for | 171.77 | | |  | | |  | | |  | | |  | | |

146) A

$4,600 = $2,900(1.0039)*t*  
   
 *t* = 118.52 quarters  
   
 Years to wait = 118.52/4 = 29.63 years

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter |  | | | .39% | | | $2,900 | | |  | | | −$4,600 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for | 118.52 | | |  | | |  | | |  | | |  | | |

147) C

$2 = $1(1.101)*t*  
   
 *t* = 7.20 years

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter |  | | | 10.1% | | | $1 | | |  | | | −$2 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for | 7.20 | | |  | | |  | | |  | | |  | | |

148) C

First United  
   
 $20,200 = $6,100(1.072)*t*  
   
 *t* = 17.22 years  
   
 Second National  
   
 $20,200 = $6,100(1.085)*t*  
   
 *t* = 14.68 years  
   
 Difference = 17.22 – 14.68 = 2.54 years

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter |  | | | 7.2% | | | $6,100 | | |  | | | −$20,200 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for | 17.22 | | |  | | |  | | |  | | |  | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter |  | | | 8.5% | | | $6,100 | | |  | | | −$20,200 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for | 14.68 | | |  | | |  | | |  | | |  | | |

149) A

FV = $7,000 × 1.0919 = $15,329.25  
   
 PV = $15,329.25/1.0829 = $7,541.81  
   
 Difference = $7,541.81 − 7,000 = $541.81

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 9 | | | 9.1% | | | −$7,000 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $15,329.25 | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 9 | | | 8.2% | | |  | | |  | | | −$15,329.25 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | | $7,541.81 | | |  | | |  | | |

150) A

$1,600,000 = $175 × (1 + *r*)102  
   
 *r* = .0935, or 9.35%  
   
 FV = $1,600,000(1.0935)32 = $27,977,722.23

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 102 | | |  | | | −$175 | | |  | | | $1,600,000 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | | 9.35% | | |  | | |  | | |  | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 32 | | | 9.35% | | | −$1,600,000 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $27,977,722.23 | | |

151) A

FV = $10,000 × 1.0634 = $12,768.30  
   
 $32,800 = $12,768.30(1 + *r*)6  
   
 *r* = .1703, or 17.03%

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 4 | | | 6.3% | | | −$10,000 | | |  | | |  | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | |  | | |  | | |  | | | $12,768.30 | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Enter | 6 | | |  | | | −$12,768.30 | | |  | | | $32,800.00 | | |
|  |  | **N** |  |  | **I/Y** |  |  | **PV** |  |  | **PMT** |  |  | **FV** |  |
| Solve for |  | | | 17.03% | | |  | | |  | | |  | | |

152) The net present value formula computes NPV as the present value of all cash flows that occur after the initial investment minus the initial investment, or cost. A positive NPV value indicates the amount the project or investment will earn over and above the discount rate. For example, if a project has an NPV of $200 and a discount rate of 14 percent, then the project is expected to earn a return of 14 percent plus an additional $200. If the NPV is negative, such as −$200 at a discount rate of 14 percent, then the project earns 14 percent less $200.

153) The value of an annuity depends on the payment amount, the timing of the payments (beginning or end of period), the number of annuity periods, and also the discount rate. If Marlene and Darlene assign different discount rates to their annuities, then the values of their annuities will differ. The higher the discount rate, the lower the present value.

154) The factors are the interest rate, payment amount, payment timing (beginning or end of period), and number of payments. An increase in either the payment amount or the number of payments will increase both the present value and the future value of the annuity. An annuity due (payment at beginning of period) will have a higher present value and a higher future value than a comparable ordinary annuity (payment at end of period). An increase in the interest rate will decrease the present value but increase the future value.

155) Perpetuity value:  
 PV = $1,500/.08  
 PV = $18,750  
   
 Value of payments for first 25 years:  
 PV = $1,500[(1 − 1/1.0825)/.08]  
 PV = $16,012.16  
   
 Value of payments after the first 25 years:  
 PV = $18,750 − 16,012.16  
 PV = $2,737.84  
   
 This can also be calculated as:  
 PV = $18,750/1.0825  
 PV = $2,737.84  
   
 This illustrates that the value of a perpetuity is derived primarily from the payments received early in the perpetuity's life.

156) An ordinary annuity has payments that occur at the end of each time period while annuity due payments occur at the beginning of each time period. If you multiply either the present value or the future value of an ordinary annuity by a factor of (1 + *r*), where *r* is the interest rate per period, you have the value of the annuity due.