1. $10,000 was deposited into an investment account earning interest at a nominal rate of 9% compounded monthly for eight years. How much interest was earned in the fifth year?

    A. $1468.72

    B. $1342.76

    C. $1303.11

    D. $1270.42

2. You invest $1500 today and another $2000 18-months from today in a fund earning $j_4 = 8\%$ for the first 18 months followed by $j_2 = 6\%$ thereafter. How much do you have at the end of 4 years?

    A. $4007.79

    B. $4274.59

    C. $4276.84

    D. $4377.73

3. A loan of $15,000 is taken out with interest at $j_4 = 8\%$. What is the total amount of interest due on the loan in the second year?

    A. $1338.41

    B. $1298.92

    C. $1296.00

    D. $1200.00

4. Jim deposits $5000 in an account earning $j_{12} = 9\%$. He leaves it there for 5 years. How much interest did he earn in the <u>last year</u> (that is, between years 4 and 5)?

    A. $671.38

    B. $644.13

    C. $635.21

    D. $565.82

5. You invest $5000 into a fund paying interest at $j_6 = 9\%$. How much is in the fund after 3 years?

    A. $6350.00

    B. $6475.15

    C. $6511.30

    D. $6536.70

6. What is the total amount of interest earned between the end of 18 months and the end of 36 months on an investment of $1000 if the interest rate is j_{12} = 9%?

    A. $308.65

    B. $164.69

    C. $154.94

    D. $143.96

7. A long-term promissory note for $40,000 is taken out on June 15, 2010. The interest rate on the note is j_4 = 7% and the note is due on Dec 15, 2015. What is the maturity value of the note?

    A. $58,597.50

    B. $58,589.15

    C. $58,398.79

    D. $57,581.47

8. A long-term promissory note for $40,000 is taken out on June 15, 2010. The interest rate on the note is j_4 = 7% and the note is due on December 15, 2015. What is the maturity value of the note?

    A. $58,589.15

    B. $58,398.79

    C. $58,597.50

    D. $57,581.47

9. You deposit $10 000 today in a fund that earns interest at j_1 = 4.5%. However, at the end of every year, an expense charge of 0.50% of the accumulated amount of the fund is withdrawn. How much do you have at the end of 3-years?

    A. $11,241.34

    B. $11,248.64

    C. $11,354.60

    D. $11,411.66

10. What simple interest rate, r, is equivalent to j_4 = 14% over 18 months?

    A. 14.48%

    B. 14.75%

    C. 15.28%

    D. 16.74%

11. You shop around for the best interest rate and have narrowed your choices to the following:

Bank I: j_1 = 12%

Bank II: j_4 = 11.55%

Bank III: j_{12} = 11.30%

You wish to have $\$S$ in 3 years. What is the <u>present value</u> of S? Put the banks in order, from lowest to highest present value of S.

A. I < II < III

B. III < II < I

C. II < I < III

D. III < I < II

12. What simple interest rate, r, is equivalent to j_{12} = 9% over a 2-year period?

A. 9.82%

B. 9.41%

C. 9.38%

D. 8.30%

13. You are investing a sum of money. Rank the following interest in order of which one will give you the most interest.

   a. j_2 = 8.00%

   b. j_{12} = 7.95%

   c. j_{52} = 7.90%

   A. c > b > a

   B. b > c > a

   C. a > b > c

   D. b > a > c

14. What nominal interest rate compounded semi-annually is equivalent to j_{52} = 13%?

   A. 12.60%

   B. 13.41%

   C. 13.86%

   D. 14.34%

15. Which of the following interest rates results in the most interest being charged on a loan?

   A. j_1 = 15.0%

   B. j_4 = 14.2%

   C. j_{12} = 14.1%

   D. j_{52} = 14.0%

16. What simple interest rate, r, is equivalent to $j_{12} = 8\%$ over 9 months?

    A. 8.30%

    B. 8.22%

    C. 7.92%

    D. 4.62%

17. What simple interest rate r is equivalent to $j_4 = 8\%$ if money is invested for 4 years?

    A. 8.24%

    B. 8.33%

    C. 9.01%

    D. 9.32%

18. What simple interest rate r is equivalent to $j_{12} = 9\%$ if money is invested for 3.5 years?

    A. 8.96%

    B. 9.83%

    C. 10.53%

    D. 11.27%

19. What simple interest rate, r, is equivalent to $j_6 = 8\%$ over 8 months?

    A. 16.77%

    B. 8.16%

    C. 15.08%

    D. 7.74%

20. Rank the following interest rates in the order in which they would give the highest to lowest

    amount of interest on an investment:

    a. $j_2 = 15.25\%$

    b. $j_4 = 15.1\%$

    c. $j_{12} = 14.85\%$

    A. $a > b > c$

    B. $c > a > b$

    C. $c > b > a$

    D. $b > c > a$

21. Your portfolio of investments consists of a $10,000 loan due at the end of 5 years with interest at

    $j_1 = 10\%$, and a $25,000 loan due at the end of 10 years with interest at $j_{12} = 6\%$. What is the

    present value of this portfolio at $j_2 = 8\%$? (Answer to nearest dollar)

    A. $18,165

    B. $28,109

    C. $31,639

    D. $32,029

22. You buy a motor boat worth $13,400. You can pay cash, or chose one of two payment options:

Option 1: Pay $10,000 in one year and $5000 in two years

Option 2: Pay $17,400 in 3 years

If the interest rate on both options is j_{12} = 9%, which one should you take and how much cheaper is it compared to paying cash?

A. Best option is to pay cash

B. 1; $17.19

C. 1; $78.46

D. 2; $103.81

23. A woman plans to withdraw $1800 18-months from now and $2400 36-months from now. How much does she need to deposit today if the interest rate is j_{12} = 12% for the first 2 years and j_{12} = 6% thereafter?

A. $3182.25

B. $3285.18

C. $3510.38

D. $3765.40

24. A promissory note for $10,000, dated July 1, 2007, is due in four years with interest at $j_2 = 8\%$. On October 1, 2008, it was sold to an investor who discounted the note at $j_4 = 9\%$. What was the purchase price of the note on October 1, 2008?

    A. $10,714.46

    B. $10,955.53

    C. $11,176.77

    D. $11,975.31

25. A company has a loan that is due on December 30, 2009. At that time they are required to pay $20,000. What was the original amount of the loan if it was taken out on September 30, 2007 at j_4 = 12%?

    A. $15,290.08

    B. $15,328.33

    C. $15,498.49

    D. $15,516.81

26. You take out a loan of $25,000 from the ABC company. It is due in 5 years with interest at j_2 = 6%. After 18 months, ABC sells your loan to the XYZ company at a price that will earn XYZ a rate of return of $j_4 = 5\%$. What price does XYZ pay?

    A. $28,264.75

    B. $28,234.61

    C. $27,318.18

    D. $26,934.58

27. A long term promissory notes for $20 000 is signed on April 15, 2010. It is due on October 15, 2013 at j_2 = 6%. The maturity value of the note is $24 597.48. The note is sold on April 15, 2011 to a bank that discounts the note at j_4 = 8%. What are the proceeds?

A. $21,218.00

B. $20,582.07

C. $20,292.30

D. $20,178.50

28. An individual borrowed $10,000 nine months ago and another $6,000 three months ago and he wishes to pay off this loan with a payment of $X today. You are given that j_2 = 10% and that the practical method of crediting/charging interest is used. Determine $X.

A. $16,918.90

B. $16,912.50

C. $16,907.46

D. $16,900.26

29. What is the accumulated value of $15,000 over 6 years and 5 months if j_4 = 10% and the exact method of accumulating is used? (Answer to the nearest dollar)

A. $27,411

B. $27,981

C. $28,039

D. $28,271

30. You invest $50,000 today in a fund earning $j_4 = 12\%$. How much have you accumulated 65 months later using the practical method?

    A. $81,038

    B. $93,945

    C. $94,866

    D. $94,875

31. What is the present value of $100,000 due exactly 4 years and 8 months from today if $j_2 = 9\%$ and the practical method of discounting is used?

    A. $66,324.55

    B. $66,310.35

    C. $66,296.00

    D. $65,358.66

32. You invest $20,000 today in a fund earning interest at $j_1 = 4\%$. How much will you have in 5 years, 270 days if the exact method of accumulating is used?

    A. $25,063.05

    B. $25,059.46

    C. $25,053.05

    D. $25,049.36

33. You invest $50,000 today in a fund earning $j_4 = 12\%$. How much have you accumulated 5 years and 5 months later using the exact method?

    A. $93,935.73

    B. $93,944.88

    C. $94,865.84

    D. $94,875.02

34. The maturity value of a promissory note due on Sept. 14, 2010 is $6200. What are the proceeds of the note using the practical (approximate) method on Jun. 2, 2007 if $j_2 = 10\%$?

    A. $4454.51

    B. $4498.36

    C. $4502.80

    D. $4760.25

35. What is the accumulated value of $5000 at the end of 4 years, 11 months if $j_4 = 9\%$ using the exact method?

    A. $7588.52

    B. $7638.07

    C. $7708.09

    D. $7744.89

36. Using the exact method, what is the present value of $100,000 due in 19 months if j_4 = 12%? (Answer to nearest dollar.)

    A. $82,935

    B. $82,927

    C. $82,919

    D. $82,901

37. What is the accumulated value of $5000 for 20 months at j_2 = 11% using the practical method?

    A. $5978.85

    B. $5976.93

    C. $5957.00

    D. $5949.88

38. Three payments of $10,000 are made at the end of 3, 9 and 15 months respectively. Calculate the total accumulated value of these payments at the end of two years using the exact method with j_6 = 6%.

    A. $30,756.65

    B. $32,334.08

    C. $32,340.10

    D. $34,869.82

39. A loan of A is taken out today. You are given that this loan is to be paid off with a payment of $20,000 in 3 years and 8 months. Determine A, if j_2 = 10% and the practical method of crediting/charging interest is used.

   A. $13,988.01

   B. $13,984.33

   C. $13,980.62

   D. $13,762.40

40. Mrs. Singh owes Mr. Valdy $55,513.78 in 14-months. Mr. Valdy agrees to let her repay the loan with a payment of $35,000 in 6-months, $10,000 in 8-months and $$X$ in 14-months. If money is worth j_4 = 6%, what is the value of X, using 14-months as the focal date along with the exact method of crediting/charging interest?

   A. $8793.97

   B. $9204.40

   C. $9230.06

   D. $9794.03

41. A long term promissory note is due on April 5, 2013. The maturity value of the note on that date is $4720.56. On June 7, 2010, the holder of the notes sells it to a bank who discounts the note at j_2 = 14%. Using the practical method of crediting/charging interest, calculate the proceeds of the sale.

   A. $3217.60

   B. $3218.30

   C. $3219.24

   D. $3221.52

42. A promissory note with a maturity value of $20,000 is sold to a bank 32-months before maturity. The bank discounts the note using j_2 =16%. What are the proceeds, if the practical method is used?

   A. $13,275.57

   B. $13,258.11

   C. $13,266.92

   D. $12,939.48

43. A non-interest bearing long term promissory note is due on February 1, 2011. The loan amount was $30,000. On October 15th, 2010 the note was sold to a bank that charges interest at j_{12} = 12%. How much did the bank pay for this note? Assume the practical (or approximate) method is used for fractional time periods.

A. $28,962.10

B. $28,952.61

C. $28,829.41

D. $28,675.35

44. A non-interest bearing long term promissory note is due on February 1, 2011. The loan amount was $30,000. On October 15th, 2010 the note was sold to a bank that charges interest at j_{12} = 12%. How much did the bank pay for this note? Assume the exact method is used for fractional time periods.

A. $28,959.25

B. $28,973.20

C. $28,977.85

D. $29,104.21

45. Using the practical method, what is the accumulated value of $20,000 over 7 years and 10 months if the investment earns interest at j_2 = 10%?

A. $42,898.52

B. $42,953.22

C. $42,964.52

D. $44,350.47

46. A loan of $A is taken out today. The loan is to be paid off with a payment of $20,000 in 44 months. If the interest rate on the loan is j_2 = 10% and the practical method of crediting/charging interest is used, what is the value of A?

    A. $13,988.01

    B. $13,762.40

    C. $13,984.33

    D. $13,980.62

47. An individual borrowed $10 000 nine months ago and another $6000 three months ago and he wishes to pay off this loan with a payment of $X today. You are given that j_2 = 10% and that the practical method of crediting/charging interest is used. Determine $X.

    A. $16 918.90

    B. $16 912.50

    C. $16 907.46

    D. $16 900.26

48. Mrs. Singh owes Mr. Valdy $55 513.78 in 14-months. Mr. Valdy agrees to let her repay the loan with a payment of $35 000 in 6-months, $10 000 in 10-months and $X in 14-months. If money is worth j_4 = 6%, what is the value of X, using 14-months as the focal date along with the exact method of crediting/charging interest?

    A. $8894.58

    B. $8895.72

    C. $8896.37

    D. $8897.69

49. A lump sum of $25,000 is due in 4-years and 5 months. What is the present value of this amount using the practical method if the interest rate is $j_2 = 8\%$?

   A. $17,681.77

   B. $17,679.86

   C. $17,677.99

   D. $17, 685.52

50. What is the present value of $100,000 due in 5-years and 10-months using the practical method if the interest rate is $j_4 = 12\%$?

   A. $49,685.31

   B. $50,167.50

   C. $50,172.39

   D. $50,177.24

51. You deposit $1000 today in an account that pays interest at $j_2 = 8\%$ for the next 5 years and $j_2 = 6\%$ thereafter. How many complete interest periods will it take for you to accumulate at least double your original investment?

   A. 11 periods

   B. 18 periods

   C. 21 periods

   D. 24 periods

52. You invest $2130.22 today. Four and a half years later, you see that this investment has grown to $3316.08. What nominal rate of interest, j_{12}, have you been earning?

A. 9.25%

B. 9.88%

C. 10.08%

D. 10.33%

53. A $2000 loan is to be repaid with payments of $1200 in 1 year, $800 in 4 years, and $400 in n years, assuming a nominal interest rate of 6% compounded annually. Determine n.

A. 4.59

B. 6.37

C. 9.18

D. 14.74

54. $15,000 is invested into an account that earns interest at $j_4 = x\%$. There are no other deposits made into the account. At the end of 15 years, the accumulated value of the account is $45,000. Determine x.

A. 1.85%

B. 2.00%

C. 7.39%

D. 8.00%

55. A deposit of $100 is made into an account earning j_{12} = 18%. Another $100 is deposited into a 2nd account earning j_2 = 10%. At what time, n (where n is in years), would the accumulated value of the first account be twice as much as the accumulated value in the 2nd account? (Answer in years)

A. 8.5

B. 9.3

C. 9.9

D. 10.2

56. How long does it take for a loan of $5000 to accumulate $1000 of interest if j_2 = 10%?

A. 1 year, 10 months, 13 days

B. 1 year, 10 months, 29 days

C. 3 years, 8 months, 26 days

D. 3 years, 9 months, 28 days

57. An investment doubles in 9 ½ years. What nominal rate of interest j_4 is being earned?

A. 7.32%

B. 7.36%

C. 7.43%

D. 7.57%

58. You invest $1000 today at $j_{12} = 6\%$. After 2 years, the interest rate changes to $j_{12} = 12\%$. How many years from today will it take the $1000 to grow to $10,000?

    A. 21.28 years

    B. 20.28 years

    C. 19.28 years

    D. 18.28 years

59. How long will it take for $750 to accumulate to $1000 if $j_2 = 9\%$?

    A. 6 years, 175 days

    B. 6 years, 196 days

    C. 3 years, 88 days

    D. 3 years, 98 days

60. You wish to have $4000 in 3-years time. If you invest $3000 today, what nominal rate j_4 must you earn on your investment to reach your goal?

    A. 9.62%

    B. 9.71%

    C. 10.06%

    D. 11.11%

61. If money triples in 6 years, what rate of interest, j_2, is being earned?

    A. 9.6%

    B. 10.0%

    C. 19.2%

    D. 20.1%

62. $4000 is deposited into an account earning j_2 = 8% for the first 2 years and j_2 = 10% thereafter. How long will it take for it to grow to $9041.67?

    A. 6 yrs, 9 months

    B. 8 yrs, 9 months

    C. 13 yrs, 6 months

    D. 17 yrs, 6 months

63. If money triples in value in 8 years, what nominal rate of interest compounded semi-annually is being earned?

    A. 7.11%

    B. 7.36%

    C. 14.22%

    D. 14.72%

64. $25,000 was deposited into an investment account earning interest at a nominal rate of $j_2 = x\%$ for 10 years. You are given that the corresponding total amount of interest earned in the first four years is $9,012.22. Determine x.

A. 6.25%

B. 6.55%

C. 7.85%

D. 8.00%

65. A car insurance company charges you a premium of $1452 a year for your car insurance policy. You have two options. Option 1 is to pay the $1452 in cash today. Option 2 is to make three payments of $499 at the following times: today, 3-months from now and 6-months from now. What nominal rate of interest, j_4, are you being charged?

A. 11.73%

B. 12.12%

C. 12.53%

D. 13.06%

66. Which of the following rates would lead to the shortest length of time (n, in years) needed to double an initial investment of $1000?

A. $j_1 = 9.15\%$

B. $j_2 = 8.90\%$

C. $j_4 = 8.84\%$

D. $j_{12} = 8.77\%$

67. If money doubles at a certain rate of interest compounded monthly in 6 years, how long will it take for the same amount of money to triple in value?

    A. 10.40 years

    B. 9.51 years

    C. 8.35 years

    D. Cannot be determined

68. What is the nominal rate of interest convertible quarterly at which the discounted value (present value) of $15,000 due at the end of 186 months is $5000?

    A. 9.56%

    B. 7.39%

    C. 7.27%

    D. 7.15%

69. You are given that at a certain rate j_1, money will double itself in 12-years. At this same rate j_1, how many years will it take for $1500 to accumulate $700 of interest?

    A. 8.2 years

    B. 6.6 years

    C. 5.6 years

    D. 4.2 years

70. You deposit $1000 today in an account that pays interest at $j_2 = 8\%$ for the next 5-years and $j_2 = 6\%$ thereafter. How long in total (in years and days) will it take for you to at least double your original investment?

    A. 10 years, 34 days

    B. 10 years, 67 days

    C. 10 years, 79 days

    D. 10 years, 158 days

71. A car insurance company charges you a premium of $1452 a year for your car insurance policy. You have two options. Option 1 is to pay the $1452 in cash today. Option 2 is to make two payments of $749 at the following times: today and 6-months from today. What nominal rate of interest, j_4, are you being charged?

    A. 11.73%

    B. 13.06%

    C. 12.88%

    D. 12.12%

72. Paul deposited $1000 in a savings account paying interest at $j_1 = 4.5\%$. The account has now grown to $1246.18. If he had been able to invest the same amount over twice as long in a fund paying interest at $j_1 = 5.5\%$, to what amount would his investment now have accumulated?

    A. $1498.43

    B. $1882.35

    C. $1653.64

    D. $1708.14

73. You borrows $10,000 today at $j_2 = 8\%$. You pay back $7000 at the end of 2-years and another $7000 at the end of n-years (from today). What is the value of n? (years, days)

    A. 7 yrs, 30 days

    B. 7 yrs, 60 days

    C. 14 yrs, 30 days

    D. 14 yrs, 60 days

74. Mr. Harry Leggs borrows $5000 today, due with interest at $j_4 = 8\%$ in one lump sum at the end of 2 years. Instead, Mr. Leggs wishes to pay $2000 six months from today and X in 18 months. If money is worth $j_{12} = 6\%$, what is X?

    A. $3252.09

    B. $3346.29

    C. $3465.95

    D. $3562.23

75. A loan of $5000 is taken out today. It is due with interest at $j_4 = 8\%$ in 2 years. Instead, the borrower negotiates with the lender to pay $2500 in 1 year and X in 3 years. If the lender can reinvest any payment at $j_2 = 5\%$, what is the value of X?

    A. $2493.59

    B. $3038.93

    C. $3395.34

    D. $3581.68

76. A woman borrowed money and owes $3000 one-year from now and $3000 three-years from now. The loan is renegotiated so that the woman can instead pay $X two-years from now and $4000 four-years from now which will fully pay back the loan. If the interest rate on the loan is $j_2 = 8\%$, what is the value of X?

    A. $2599.25

    B. $2588.42

    C. $2580.78

    D. $2306.39

77. A debt of $5700 is due, with interest at $j_2 = 8\%$, in three years. It is agreed instead that the loan will be repaid with a payment of $X in one year and $3000 in two years. If money is worth $j_4 = 4\%$, what is the value of X?

    A. $3282.18

    B. $3348.50

    C. $3391.45

    D. $3777.51

78. Payments of $1000 due in 6 months, $1500 due in 9 months, and $1200 due in 15 months are to be exchanged for a single payment $X due in 12 months. What is X if $j_4 = 6\%$?

    A. $3770.73

    B. $3734.99

    C. $3809.54

    D. $3927.05

79. You borrow $2000 today. The loan is due in 3 years, with interest at $j_1 = 9\%$. It is agreed that you will instead pay $1000 one year from now and $$X$ two years from now. If money is worth $j_2 = 6\%$, what is the value of X?

    A. $1190.12

    B. $1286.20

    C. $1380.48

    D. $1529.16

80. A debt of $7000 is due with interest at $j_2 = 8\%$ at the end of 3 years. To repay this debt, a payment of $1500 is made at the end of 1 year, followed by a payment of $$X$ at the end of 2 years. If money is worth $j_4 = 10\%$, what is the value of X so that the loan is fully paid off?

    A. $4685.94

    B. $4713.64

    C. $5172.40

    D. $6873.10

81. A student borrows $2,000 today and they agree to pay off the loan with one payment of $2,590.06 to be made at the end of 3 years time. It is then agreed that, instead of paying off the loan with one payment, the student can pay off the loan with a payment of $1000 one year from now and $$X$ two years from now. Given that $j_2 = 6\%$, determine $$X$.

    A. $1190.12

    B. $1286.20

    C. $1380.48

    D. $1529.16

82. You borrow $2000 today. This loan is due in 3-years with interest at $j_1 = 9\%$. It is agreed that you will instead pay $1000 one-year from now and X two-years from now. If money is worth $j_2 = 6\%$, what is the value of X?

   A. $1190.12

   B. $1286.20

   C. $1380.48

   D. $1529.16

83. You owe your parents $2500 today. You agree to pay this back by making a payment of $500 now, $600 six months from now and X 18-months from now. What is X if $j_4 = 6\%$?

   A. $1417.60

   B. $1473.22

   C. $1482.36

   D. $1550.07

84. You borrow $5000 today. The loan is due in 5 years, with interest at $j_1 = 7\%$. It is agreed that you can instead pay $1000 one year from now, X two years from now and $2000 three years from now. If money is worth $j_4 = 8\%$, what is the value of X?

   A. $2599.39

   B. $2648.80

   C. $2788.70

   D. $2794.38

85. A $1000 loan is taken out today. The loan is repaid with a payment of $400 at the end of the 1st year, $800 at the end of the 5th year, and a payment of X at the end of the 10th year. If $j_4 = 12\%$, what is X?

    A. $220.97

    B. $657.84

    C. $737.26

    D. $1406.54

86. You borrow $2500 today. The loan is due in 5-years, with interest at $j_2 = 8\%$. It is agreed that you can instead pay X two years from now and $1500 three years from now. If money is worth $j_{12} = 6\%$, what is the value of X?

    A. $1679.54

    B. $1537.81

    C. $1405.04

    D. $675.25

87. A woman plans to withdraw $1800 18-months from now, and $2400 36-months from now. How much does she need to deposit today if the interest rate is $j_{12} = 12\%$ for the first 2 years and $j_{12} = 6\%$ thereafter?

    A. $3182.25

    B. $3765.40

    C. $3510.38

    D. $3285.18

88. A loan of $5000 is taken out today. It is due with interest at $j_4 = 8\%$ in 2 years. Instead, the

borrower negotiates with the lender to replace this loan with a payment of $2500 in 1-year and

another payment of $X in 3-years. If the lender can reinvest any payment at $j_2 = 5\%$, what is the

value of X?

A. $3038.93

B. $2493.59

C. $3581.68

D. $3395.34

89. A woman who died left an estate worth $200 000 to be split among her two children, currently age

8 and 12. Each child is to receive an _equal_ amount, X, from the estate when they reach age 18. If

the money can be invested at $j_2 = 6\%$, how much does each child receive when they turn 18?

(Answer to nearest dollar)

A. $142,576

B. $159,355

C. $179,356

D. $180,611

90. An investment has the following interest rates: $j_2 = 6\%$ for the first 30 months, followed by $j_4 = 8\%$ for the next 36 months, followed by $j_6 = 9\%$ for the last 18 months. What is the equivalent j_2 earned over the 7 year period?

A. 6.24%

B. 6.68%

C. 7.56%

D. 7.70%

91. A fund pays interest at $j_1 = 5\%$ for the first 3 years, $j_4 = 10\%$ for one year, and $j_{12} = 12\%$ for one year. What is the equivalent nominal interest rate, j_2, earned over the 5 years?

A. 7.56%

B. 7.43%

C. 7.40%

D. 7.23%

92. You are investing a sum of money for 4 years. You earn a simple interest rate of $r = 10\%$ for the first 2 years and $j_{12} = 6\%$ for the last 2 years. What is the equivalent effective annual rate of return, j, you earn over each of the 4 years?

A. 8.81%

B. 8.07%%

C. 7.98%

D. 7.84%

93. You invest a sum of money at j_{12} = 15% for 3 years, followed by j_4 = 12% for 4 years. What equivalent rate of return, j_1, do you earn over each of the 7 years?

    A. 13.29%

    B. 13.50%

    C. 13.79%

    D. 14.05%

94. You invest $1000 in a fund earning j_1 = 6% in the first year, j_2 = x% in the 2nd year, and j_4 = 8% in the 3rd year. If the accumulated value is $1264.98 after three years, what is the value of x?

    A. 10.00%

    B. 10.25%

    C. 10.50%

    D. 10.75%

95. $$P$ is deposited today in a fund which earns j_{12} = 6% for the 1st year, j_4 = 6% for the 2nd year and j_2 = 6% thereafter. At the end of 4 years, there is $12,000 in the fund. What is P?

    A. $9461.84

    B. $9505.12

    C. $9747.82

    D. $10,038.06

96. Jim Dandy invests a sum of money today. He earns the following interest rates over the next 5-years:

j_2 = 10% for the first 2-years

j_4 = 8% for the next 2-years

j_{12} = 6% for the last year

What annual effective rate of return, j_1, did Jim earn over the 5-year period?

A. Less than 8%

B. 8% or more, but less than 8.5%

C. 8.5% or more, but less than 9%

D. more than 9%

97. The 1996 Canada Savings Bond issue offered the following annual rates, guaranteed over 10 years: 3% in the first year, followed by 4%, 5%, 6%, 6.50%, 6.75%, 7%, 7,25%, 8% and 8.75% in the 10th year. If you buy one of these bonds today and cash it in after 5 years, what annual rate of return do you earn?

A. 4.89%

B. 5.39%

C. 6.21%

D. 6.50%

98. A single deposit of $25,000 is made into an account that earns interest at $j_4 = 7\%$ for one year, j_2 = 6% for the next year and j_6 = 3% thereafter. How much interest is earned in the <u>fourth year</u>?

A. $143.93

B. $863.58

C. $889.82

D. $916.85

99. An investment has the following interest rates: j_4 = 8% for the first 2 years, followed by j_2 = 8% for the next 4 years,, followed by j_{12} = 6% for the last 28 months. What is the equivalent nominal rate of interest, compounded 3 times a year, j_3, earned over this time period?

A. 5.56%

B. 7.43%

C. 9.99%

D. 11.31%

100. You invest $1000 for 3 years in a fund earning j_1 = 6% in the first year, j_2 = x% in the second year, and j_4 = 8% in the third year. If the accumulated value is $1264.98 after three years, what is the value of x?

A. 10.00%

B. 10.25%

C. 10.50%

D. 10.75%

101. What is the effective annual rate, j, over 7 years that is equivalent to $j_6 = 6\%$ for the first two years, $j_{12} = 9\%$ for the next three years, and $j_2 = 4\%$ for the last two years?

    A. 6.00%

    B. 6.31%

    C. 6.69%

    D. 6.91%

102. What is the equivalent effective annual rate, j, over 8-years that is equivalent to $j_6 = 8\%$ for the first three years, $j_{12} = 6\%$ for the next three years, and $j_2 = 5\%$ for the last two years?

    A. 6.02%

    B. 6.13%

    C. 6.50%

    D. 6.67%

103. You invest some money and earn the following rates of interest: simple interest of 15% for 9 months, followed by $j_6 = 12\%$ for 18 months, followed by $j_4 = 5\%$ for 9 months. What is the equivalent rate of interest, j_2 earned over the 36 months?

    A. 10.97%

    B. 11.03%

    C. 11.06%

    D. 11.23%

104. An investment has the following interest rates: $j_4 = 8\%$ for the first 2-years, followed by $j_2 = 8\%$ for the next 4-years, followed by $j_{12} = 6\%$ for the last 28-months. What is the equivalent nominal rate of interest, compounded 3 times a year, j_3, earned over this time period of 100 months?

A. 9.99%

B. 7.43%

C. 5.56%

D. 11.31%

105. Jackie invested $500 in an investment fund that pays interest at $j_2 = 5.3\%$ for the first two years, $j_{12} = 7\%$ for the next three years, and $j_{365} = 4.5\%$ for the last year. What effective interest rate, j, did she earn over the 6 years?

A. 6.17%

B. 7.23%

C. 6.78%

D. 6.01%

106. An investment earns the following interest rates: 10% simple interest for 24 months, followed by 8% compounded quarterly for 36 months. What is the equivalent nominal rate compounded semi-annually that is earned over the 5-years?

A. 7.34%

B. 7.49%

C. 8.58%

D. 8.76%

107. Suppose the inflation rate in a country is 1% per month. How many years will it take for the purchasing power of $1 today to be cut in half?

    A. 11.62

    B. 9.20

    C. 6.12

    D. 5.81

108. If inflation is 3.4% per year, what does the purchasing power of $1 today become in 10 years?

    A. $0.716

    B. $0.746

    C. $1.340

    D. $1.397

109. If there will be 3 times as many fruit flies in a vegetable garden in 10 days as there are today, what rate of growth, compounded twice a day, does this represent?

    A. 11.29%

    B. 11.61%

    C. 12.29%

    D. 23.22%

110.A person invests $2000 today in a fund earning interest at f_1 = 6%. If the rate of inflation is 2.1% in the first year and 3.0% in the second year, how much is the investment worth, in real terms (after taking account of inflation), at the end of two years?

    A. $2131.30

    B. $2136.87

    C. $2138.15

    D. $2140.34

111.Suppose the inflation rate is 0.8% per half year and you can invest money at j_2 = 6%. If you invested $100,000 at the start of the year, how much will you have accumulated, in "real" terms (after taking into account inflation), at the end of the year?

    A. $104,324.14

    B. $104,330.71

    C. $104,412.71

    D. $104,448.40

112.In 1977, the annual inflation rate in Canada was 9.5%, while one-year interest rates were 7.9%. If you invest $1000 at the start of the year, how much money, in real terms, did you have at the end of the year, after adjusting for inflation?

    A. $984.00

    B. $985.39

    C. $1014.61

    D. $1016.00

113.In 1977, the annual inflation rate in Canada was 9.5%, while one-year interest rates were 7.9%. What was the real rate of return in Canada in 1977?

A. -1.60%

B. -1.46%

C. 1.46%

D. 1.60%

114.Jack earns a one-year real rate of return of 2.45% on an investment. If inflation is 2.00% for the year, what nominal rate of return j_1 did Jack earn for the one-year period?

A. 4.35%

B. 4.40%

C. 4.45%

D. 4.50%

115.In a particular year, the interest rate is 5% and the real rate of return is 3%. What is the rate of inflation for the same year?

A. 2.06%

B. 2.00%

C. 1.94%

D. 1.85%

116. The population of a given country was 24.3 million on January 1, 2001 and on January 1, 2011 it was 27.3 million people and the population growth rate over this time period was g% compounded annually. At this same rate of growth g, how many more years (from January 1, 2011) will it take this country's population to reach 30 million people?

    A. 8.1 years

    B. 9.5 years

    C. 9.2 years

    D. 18.1 years

117. During the spring growing season, a sunflower plant will increase its size by 60% every 7 days. If a plant is currently 5 cm tall, how tall will/should it be in 25 days?

    A. 26.8 cm

    B. 31.0 cm

    C. 39.1 cm

    D. 42.1 cm

118. Jack invested $1200 into an account for 5-years. The account paid interest at $j_1 = 4\%$ for the first 2-years and $j_1 = 6\%$ thereafter. If the annual inflation rate is 2% for each of these 5-years, what is the annual *real* rate of interest earned over the 5-years?

    A. 3.92%

    B. 3.13%

    C. 2.94%

    D. 1.96%

119. A person invests in a fund earning interest at $j_2 = 6\%$. The annual rate of inflation is 2% in year 1, 2.5% in year 2, and 3.0% in year 3. What is the annual real interest rate, compounded once a year, earned over the 3-year period?

    A. 3.42%

    B. 3.47%

    C. 3.50%

    D. 3.59%

120. Population growth in a given urban city was 4% for the calendar years 2003 to 2007 inclusive and 3% for the calendar years 2008 to 2010 inclusive. If the population of this city was 664,735 on December 31, 2010, what was the population of this city on December 31, 2002?

    A. 500,000

    B. 512,193

    C. 515,000

    D. 520,000

121. Jack invested $1200 into an account for 5-years with interest at $j_2 = 6\%$. If the annual inflation rate is 2% for the first 2-years and 2.5% thereafter, what is the annual real rate of interest earned over the 5-years?

    A. 3.71%

    B. 1.96%

    C. 3.13%

    D. 2.94%

122. The amount of clover on a lawn grows exponentially at a rate of j_{24} (compounded twice a month) such that it doubles every 6-months. If there are 5000 pieces of clover in your lawn today, how many did you have 4-months ago? (Answer to the nearest piece of clover)

A. 1984

B. 3150

C. 3333

D. 3969

123. How much money do you need today in order to have $3000 in 21 months time, if interest is compounded continuously at 9%?

A. $2741.79

B. $2564.34

C. $2562.83

D. $453.22

124. You deposit $10,000 today in a fund earning interest at $j_x = 8\%$. How much will you have accumulated at the end of 21 months?

A. $11,502.74

B. $11,497.40

C. $11,441.73

D. $10,832.87

125. You are investing a sum of money. Rank the following interest in order of which one will give you the most interest.

a. $j_2 = 8\%$

b. $j_{52} = 7.9\%$

c. $\delta = j_\infty = 7.85\%$

A. b > a > c

B. a > c > b

C. c > a > b

D. b > c > a

126. You plan to invest $\$P$ today for 15 months, at which time you wish to $\$15{,}000$. What is the value of P if you can earn interest at 7% compounded continuously?

A. $13,743.28

B. $13,746.78

C. $13,783.56

D. $13,985.91

127. You wish to have $10,000 45 months from now. To accomplish this goal, you deposit $\$P$ in an account today paying interest continuously at $j_x = 8\%$. What is P?

A. $9,231.16

B. $7408.18

C. $7415.56

D. $7493.09

128. What is the value, in 18 months, of an investment of $10,000 made today if interest is compounded continuously at 6.5%?

   A. $32,219.93

   B. $11,024.11

   C. $11,021.21

   D. $10,987.96

129. What nominal interest rate compounded continuously is equivalent to 10% compounded quarterly?

   A. 9.53%

   B. 9.75%

   C. 9.88%

   D. 10.38%

2 Key

1. $10,000 was deposited into an investment account earning interest at a nominal rate of 9% compounded monthly for eight years. How much interest was earned in the fifth year?

    A. $1468.72

    B. $1342.76

    C. $1303.11

    D. $1270.42

    I = a.v. at end of 5 years - a.v. at end of 4 years
    = 10,000 [(1.0075)^{60} - (1.0075)^{48}] = $1342.76

2. You invest $1500 today and another $2000 18-months from today in a fund earning $j_4 = 8\%$ for the first 18 months followed by $j_2 = 6\%$ thereafter. How much do you have at the end of 4 years?

A. $4007.79

B. $4274.59

C. $4276.84

D. $4377.73

$S = 1500\,(1.02)^6\,(1.03)^5 + 2000\,(1.03)^5 = \$4276.84$

3. A loan of $15,000 is taken out with interest at $j_4 = 8\%$. What is the total amount of interest due on the loan in the second year?

A. $1338.41

B. $1298.92

C. $1296.00

D. $1200.00

I = a.v. at end of 2 years - a.v. at end of 1 year

$= 15{,}000\,[(1.02)^8 - (1.02)^4] = \$1338.41$

4.   Jim deposits $5000 in an account earning j_{12} = 9%. He leaves it there for 5 years. How much

interest did he earn in the last year (that is, between years 4 and 5)?

A. $671.38

B. $644.13

C. $635.21

D. $565.82

I = a.v. at end of 5 years - a.v. at end of 4 years

= 5000 [(1.0075)^{60} - (1.0075)^{48}] = $671.38

5.   You invest $5000 into a fund paying interest at j_6 = 9%. How much is in the fund after 3

years?

A. $6350.00

B. $6475.15

C. $6511.30

D. $6536.70

S = 5000 (1+0.09/6)$^{6 \times 3}$ = 5000 (1.015)^{18} = $6536.70

6. What is the total amount of interest earned between the end of 18 months and the end of 36 months on an investment of $1000 if the interest rate is $j_{12} = 9\%$?

    A. $308.65

    B. $164.69

    C. $154.94

    D. $143.96

$I = 1000 [(1.0075)^{36} - (1.0075)^{18}] = \$164.69$

7. A long-term promissory note for $40,000 is taken out on June 15, 2010. The interest rate on the note is $j_4 = 7\%$ and the note is due on Dec 15, 2015. What is the maturity value of the note?

    A. $58,597.50

    B. $58,589.15

    C. $58,398.79

    D. $57,581.47

Jun 15/10 to Jun 15/15 = 5 yrs × 4 = 20 + Sep 15 + Dec 15 = $n = 22$ $S = 40,000(1.0175)^{22} = \$58,589.15$

8.   A long-term promissory note for $40,000 is taken out on June 15, 2010. The interest rate on the note is j_4 = 7% and the note is due on December 15, 2015. What is the maturity value of the note?

A. $58,589.15

B. $58,398.79

C. $58,597.50

D. $57,581.47

June 15, 2010 to June 15, 2015 = 5 yrs × 4 = 20 + Sep 15 + Dec 15 = 22 periods

Maturity value = 40 000$(1.0175)^{22}$ = $58 589.15

9. You deposit $10 000 today in a fund that earns interest at j_1 = 4.5%. However, at the end of every year, an expense charge of 0.50% of the accumulated amount of the fund is withdrawn. How much do you have at the end of 3-years?

A. $11,241.34

B. $11,248.64

C. $11,354.60

D. $11,411.66

S = 10 000(1.045)³ (1 −0.005)³ = $11 241.34

10. What simple interest rate, r, is equivalent to j_4 = 14% over 18 months?

A. 14.48%

B. 14.75%

C. 15.28%

D. 16.74%

I = [1 + r(18/12)] = (1 + 0.14/4)¹·⁵ ˣ ⁴] = (1.035)⁶

Which solves for r = 0.152837 = 15.28%

11.   You shop around for the best interest rate and have narrowed your choices to the following:

Bank I: j_1 = 12%

Bank II: j_4 = 11.55%

Bank III: j_{12} = 11.30%

You wish to have $\$S$ in 3 years. What is the <u>present value</u> of S? Put the banks in order, from lowest to highest present value of S.

A. I < II < III

B. III < II < I

<u>C.</u> II < I < III

D. III < I < II

Bank II: j = $(1 + 0.1155/4)^4$ - 1 = 0.1206 = 12.06%

Bank III: j = $(1 + 0.1130/12)^{12}$ - 1 = 0.11904 = 11.904%

The higher the interest rate, the lower the present value.

Thus, II < I < III

12.   What simple interest rate, r, is equivalent to j_{12} = 9% over a 2-year period?

A. 9.82%

B. 9.41%

C. 9.38%

D. 8.30%

[1 + r(2)] = (1.0075)^{24} which solves for r = 9.82%

13.   You are investing a sum of money. Rank the following interest in order of which one will give you the most interest.

a. j_2 = 8.00%

b. j_{12} = 7.95%

c. j_{52} = 7.90%

A. c > b > a

B. b > c > a

C. a > b > c

D. b > a > c

a. $j = (1.04)^2 - 1 = 8.16\%$

b. $j = (1 + 0.0795/12)^{12} - 1 = 8.246\%$

c. $j = (1 + 0.0790/52)^{52} - 1 = 8.214\%$

Thus, b > c > a

14.   What nominal interest rate compounded semi-annually is equivalent to j_{52} = 13%?

A. 12.60%

B. 13.41%

C. 13.86%

D. 14.34%

$j_2 = 2[(1 + 0.13/52)^{52/2} - 1] = 13.41\%$

15.   Which of the following interest rates results in the most interest being charged on a loan?

A. j_1 = 15.0%

B. j_4= 14.2%

C. j_{12} = 14.1%

D. j_{52} = 14.0%

B. $j = (1 + 0.142/4)^4 - 1 = 14.974\%$

C. $j = (1 + 0.141/12)^{12} - 1 = 15.048\%$

D. $j = (1 + 0.14/52)^{52} - 1 = 15.006\%$

16.   What simple interest rate, r, is equivalent to $j_{12} = 8\%$ over 9 months?

A. 8.30%

B. 8.22%

C. 7.92%

D. 4.62%

$[1 + r(9/12)] = (1 + 0.08/12)^9$ solves for $r = 8.22\%$

17.   What simple interest rate r is equivalent to $j_4 = 8\%$ if money is invested for 4 years?

A. 8.24%

B. 8.33%

C. 9.01%

D. 9.32%

$1 + 4r = (1.02)^{16}$ solves for $r = 9.32\%$

18.   What simple interest rate r is equivalent to j_{12} = 9% if money is invested for 3.5 years?

A. 8.96%

B. 9.83%

C. 10.53%

D. 11.27%

$1 + 3.5r = (1.0075)^{42}$ solves for r = 10.53%

19.   What simple interest rate, r, is equivalent to j_6 = 8% over 8 months?

A. 16.77%

B. 8.16%

C. 15.08%

D. 7.74%

$[1 + (8/12)r] = (1 + 0.08/6)^4$, which solves for r = 8.16%

20. Rank the following interest rates in the order in which they would give the highest to lowest amount of interest on an investment:

a. j_2 = 15.25%

b. j_4 = 15.1%

c. j_{12} = 14.85%

A. $a > b > c$

B. $c > a > b$

C. $c > b > a$

D. $b > c > a$

j_2 = 0.1525 is equivalent to j_1 = $(1.07625)^2 - 1 = 0.158314$

j_4 = 0.151 is equivalent to j_1 = $(1 + 0.151/4)^4 - 1 = 0.159768$

j_{12} = 0.1485 is equivalent to j_1 = $(1 + 0.1485/12)^{12} - 1 = 0.159036$

Thus, $b > c > a$

21. Your portfolio of investments consists of a $10,000 loan due at the end of 5 years with interest at j_1 = 10%, and a $25,000 loan due at the end of 10 years with interest at j_{12} = 6%. What is the present value of this portfolio at j_2 = 8%? (Answer to nearest dollar)

A. $18,165

B. $28,109

C. $31,639

D. $32,029

a.v. 1 = 10,000 $(1.10)^5$ = 16,105.10

a.v. 2 = 25,000 $(1.005)^{120}$ = 45,484.92

Thus, A = 16,105.10 $(1.04)^{-10}$ + 45,484.92 $(1.04)^{-20}$ = $31,638.75

22. You buy a motor boat worth $13,400. You can pay cash, or chose one of two payment options:

Option 1: Pay $10,000 in one year and $5000 in two years
Option 2: Pay $17,400 in 3 years

If the interest rate on both options is $j_{12} = 9\%$, which one should you take and how much cheaper is it compared to paying cash?

A. Best option is to pay cash

B. 1; $17.19

C. 1; $78.46

D. 2; $103.81

Option 1: $A = 10{,}000\,(1.0075)^{-12} + 5000\,(1.0075)^{-24} = 13{,}321.54$

Option 2: $A = 17{,}400\,(1.0075)^{-36} = 13{,}296.19$

Both cheaper than cash, but Option 2 is cheapest by 13,400 - 13,296.19 = $103.81

23. A woman plans to withdraw $1800 18-months from now and $2400 36-months from now. How much does she need to deposit today if the interest rate is j_{12} = 12% for the first 2 years and j_{12} = 6% thereafter?

 A. $3182.25

 B. $3285.18

 C. $3510.38

 D. $3765.40

$A = 1800 \, (1.01)^{-18} + 2400 \, (1.01)^{-24} \, (1.005)^{-12} = \$3285.18$

24. A promissory note for $10,000, dated July 1, 2007, is due in four years with interest at j_2 = 8%. On October 1, 2008, it was sold to an investor who discounted the note at j_4 = 9%. What was the purchase price of the note on October 1, 2008?

 A. $10,714.46

 B. $10,955.53

 C. $11,176.77

 D. $11,975.31

$S = 10,000 \, (1.04)^8 = 13685.69$

Proceeds $= 13,685.69 \, (1.0225)^{-11} = \$10,714.46$

Note: Oct 1, 2008 to July 1, 2011 is 2 years, 9 months = 11 quarters

25. A company has a loan that is due on December 30, 2009. At that time they are required to pay $20,000. What was the original amount of the loan if it was taken out on September 30, 2007 at $j_4 = 12\%$?

A. $15,290.08
B. $15,328.33
C. $15,498.49
D. $15,516.81

Sept 30/07 to Dec 30/09 = 2 years, 3 months = 9 quarters
$A = 20,000 \ (1.03)^{-9} = \$15,328.33$

26. You take out a loan of $25,000 from the ABC company. It is due in 5 years with interest at $j_2 =$ 6%. After 18 months, ABC sells your loan to the XYZ company at a price that will earn XYZ a rate of return of $j_4 = 5\%$. What price does XYZ pay?

A. $28,264.75

B. $28,234.61

C. $27,318.18

D. $26,934.58

$S = 25{,}000(1.03)^{10} = \$33{,}597.91$

$P = 33{,}597.91(1 + 0.05/4)^{--14} = \$28{,}234.61$

27. A long term promissory notes for $20 000 is signed on April 15, 2010. It is due on October 15, 2013 at $j_2 = 6\%$. The maturity value of the note is $24 597.48. The note is sold on April 15, 2011 to a bank that discounts the note at $j_4 = 8\%$. What are the proceeds?

A. $21,218.00

B. $20,582.07

C. $20,292.30

D. $20,178.50

Oct 15/13 to Apr 15, 2011 = 2.5 years × 4 = 10 quarters

Proceeds = 24 597.48 $(1.02)^{-10}$ = $20 178.50

28.   An individual borrowed $10,000 nine months ago and another $6,000 three months ago and

he wishes to pay off this loan with a payment of $X today. You are given that j_2 = 10% and that

the practical method of crediting/charging interest is used. Determine $X.

A. $16,918.90

B. $16,912.50

C. $16,907.46

D. $16,900.26

× = 10,000 (1.05) [1 + (0.10) 3/12] + 6,000 [1 + (0.10) 3/12] = $16,912.50

29.   What is the accumulated value of $15,000 over 6 years and 5 months if j_4 = 10% and the exact

method of accumulating is used? (Answer to the nearest dollar)

A. $27,411

B. $27,981

C. $28,039

D. $28,271

S = 15,000 (1.025)$^{25 + 2/3}$ = $28,270.74

30. You invest $50,000 today in a fund earning j_4 = 12%. How much have you accumulated 65 months later using the practical method?

    A. $81,038

    B. $93,945

    C. $94,866

    D. $94,875

$S = 50,000 \ (1.03)^{21} \ [1 + (0.12) \ 2/12] = \$94875.02$

31. What is the present value of $100,000 due exactly 4 years and 8 months from today if j_2 = 9% and the practical method of discounting is used?

    A. $66,324.55

    B. $66,310.35

    C. $66,296.00

    D. $65,358.66

$S = 100,000 \ (1.045)^{-10} \ [1 + (0.09) \ 4/12] = \$66,324.55$

32.   You invest $20,000 today in a fund earning interest at j_1 = 4%. How much will you have in 5 years, 270 days if the exact method of accumulating is used?

    A. $25,063.05

    B. $25,059.46

    C. $25,053.05

    D. $25,049.36

    $S = 20{,}000\ (1.04)^{5\ +\ 270/365} = \$25{,}049.36$

33.   You invest $50,000 today in a fund earning j_4 = 12%. How much have you accumulated 5 years and 5 months later using the exact method?

    A. $93,935.73

    B. $93,944.88

    C. $94,865.84

    D. $94,875.02

    $S = 50{,}000\ (1.03)^{21\ +\ 2/3} = \$94{,}865.84$

34. The maturity value of a promissory note due on Sept. 14, 2010 is $6200. What are the

    proceeds of the note using the practical (approximate) method on Jun. 2, 2007 if j_2 = 10%?

    A. $4454.51

    B. $4498.36

    C. $4502.80

    D. $4760.25

    Sept 14, 2010 to Mar 14, 2007 = 3.5 years = 7 half years

    Mar 14, 2007 to June 2, 2007 = 80 days

    Thus, P = 6200 $(1.05)^{-7}$ [(1 + (0.10) 80/365] = $4502.80

35. What is the accumulated value of $5000 at the end of 4 years, 11 months if j_4 = 9% using the

    exact method?

    A. $7588.52

    B. $7638.07

    C. $7708.09

    D. $7744.89

    S = 5000 $(1.0225)^{19 + 2/3}$ = $7,744.89

36. Using the exact method, what is the present value of $100,000 due in 19 months if $j_4 = 12\%$? (Answer to nearest dollar.)

    A. $82,935

    B. $82,927

    C. $82,919

    D. $82,901

$A = 100{,}000\,(1.03)^{-(6 + 1/3)} = \$82{,}927.31$

37. What is the accumulated value of $5000 for 20 months at $j_2 = 11\%$ using the practical method?

    A. $5978.85

    B. $5976.93

    C. $5957.00

    D. $5949.88

$S = 5000\,(1.055)^3\,[1 + (0.11)\,2/12] = \$5978.85$

38. Three payments of $10,000 are made at the end of 3, 9 and 15 months respectively. Calculate the total accumulated value of these payments at the end of two years using the exact method with j_6 = 6%.

    A. $30,756.65

    <u>B.</u> $32,334.08

    C. $32,340.10

    D. $34,869.82

i = 0.01 every 2-months

$S = 10,000[(1.01)^{10.5} + (1.01)^{7.5} + (1.01)^{4.5}] = \$32,334.08$

39. A loan of A is taken out today. You are given that this loan is to be paid off with a payment of $20,000 in 3 years and 8 months. Determine A, if j_2 = 10% and the practical method of crediting/charging interest is used.

    <u>A.</u> $13,988.01

    B. $13,984.33

    C. $13,980.62

    D. $13,762.40

3 yrs, 8 months = 7.33333 years; We discount for 8 half years then accumulate 4 months; $A = 20,000(1.05)^{-8} [1 + 0.05(4/6)] = \$13,988.01$

40.   Mrs. Singh owes Mr. Valdy $55,513.78 in 14-months. Mr. Valdy agrees to let her repay the

loan with a payment of $35,000 in 6-months, $10,000 in 8-months and X in 14-months. If

money is worth $j_4 = 6\%$, what is the value of X, using 14-months as the focal date along with

the exact method of crediting/charging interest?

A. $8793.97

B. $9204.40

C. $9230.06

D. $9794.03

$55{,}513.78 = 35{,}000(1.015)^{2.66666} + 10{,}000(1.015)^2 + X$, solves for $X = \$8793.97$

41. A long term promissory note is due on April 5, 2013. The maturity value of the note on that date is $4720.56. On June 7, 2010, the holder of the notes sells it to a bank who discounts the note at j_2 = 14%. Using the practical method of crediting/charging interest, calculate the proceeds of the sale.

A. $3217.60

B. $3218.30

C. $3219.24

D. $3221.52

Apr 5/13 to Apr 5/10 = 6 half years, Apr 5/10 to Jun 7/10 = 63 days

$P = 4720.56(1.07)^{-6} [1 + 0.14(63/365)] = \$3221.52$

42. A promissory note with a maturity value of $20,000 is sold to a bank 32-months before maturity. The bank discounts the note using j_2 =16%. What are the proceeds, if the <u>practical</u> method is used?

A. $13,275.57
B. $13,258.11
C. $13,266.92
D. $12,939.48

32 months = 5.33333 half years, so we discount for 6 half years, then accumulate for 4 months. Thus, S = 20,000(1.08)$^{-6}$ [1 + 0.08(4/6)] = $13,275.57

43.   A non-interest bearing long term promissory note is due on February 1, 2011. The loan

amount was $30,000. On October 15th, 2010 the note was sold to a bank that charges interest

at $j_{12} = 12\%$. How much did the bank pay for this note? Assume the practical (or approximate)

method is used for fractional time periods.

A. $28,962.10

B. $28,952.61

C. $28,829.41

D. $28,675.35

Feb 1/11 to Oct 1/10 = 4 months; Oct 1 to Oct 15 = 14 days

$P = 30,000(1.01)^{-4} [1 + 0.12(14/365)] = \$28,962.10$

44. A non-interest bearing long term promissory note is due on February 1, 2011. The loan amount was $30,000. On October 15th, 2010 the note was sold to a bank that charges interest at j_{12} = 12%. How much did the bank pay for this note? Assume the exact method is used for fractional time periods.

A. $28,959.25

B. $28,973.20

C. $28,977.85

D. $29,104.21

Feb 1/11 to Nov 1/10 = 3 months; Oct 15 to Nov 1 = 17 days; Oct 1 to Nov 1 = 31 days

$P = 30{,}000(1.01)^{-[3 + (17/31)]} = \$28{,}959.25$

45. Using the practical method, what is the accumulated value of $20,000 over 7 years and 10 months if the investment earns interest at j_2 = 10%?

A. $42,898.52

B. $42,953.22

C. $42,964.52

D. $44,350.47

$S = 20{,}000(1.05)^{15} [1 + 0.05(4/6)] = \$42{,}964.52$

46.   A loan of $A is taken out today. The loan is to be paid off with a payment of $20,000 in 44 months. If the interest rate on the loan is j_2 = 10% and the practical method of crediting/charging interest is used, what is the value of A?

A. $13,988.01

B. $13,762.40

C. $13,984.33

D. $13,980.62

44 months = 7 1/3 half years = 8; need to discount past time 0 by 2/3^{rds} of a half year = 4 months; Thus, A = 20 000(1.05)$^{-8}$ [1 + (0.10)4/12] = $13,988.01

47. An individual borrowed $10 000 nine months ago and another $6000 three months ago and he wishes to pay off this loan with a payment of $X today. You are given that $j_2 = 10\%$ and that the practical method of crediting/charging interest is used. Determine X.

A. $16 918.90

B. $16 912.50

C. $16 907.46

D. $16 900.26

× = 10 000(1.05)[1 + (0.10)(3/12)] + 6000[1 + (0.10)3/12] = $16 912.50

48. Mrs. Singh owes Mr. Valdy $55 513.78 in 14-months. Mr. Valdy agrees to let her repay the loan with a payment of $35 000 in 6-months, $10 000 in 10-months and $X in 14-months. If money is worth $j_4 = 6\%$, what is the value of X, using 14-months as the focal date along with the exact method of crediting/charging interest?

A. $8894.58

B. $8895.72

C. $8896.37

D. $8897.69

$55513.78 = 35000(1.015)^{(2 + 2/3)} + 10\ 000(1.015)^{(1 + 1/3)} + X$, which solves as $X = \$8895.72$

49. A lump sum of $25,000 is due in 4-years and 5 months. What is the present value of this amount using the practical method if the interest rate is $j_2 = 8\%$?

  A. $17,681.77

  B. $17,679.86

  C. $17,677.99

  D. $17, 685.52

n = 4 yrs, 5 months = 8 5/6 half years; so discount for 9 half years then accumulate for 1 month:

$A = 25\ 000(1.04)^{-9}\ [1 + (0.08)(1/12)] = \$17\ 681.77$

50. What is the present value of $100,000 due in 5-years and 10-months using the practical method if the interest rate is $j_4 = 12\%$?

    A. $49,685.31

    B. $50,167.50

    C. $50,172.39

    <u>D.</u> $50,177.24

5 years, 10 months = 23 1/3 quarter years; thus, discount 24 quarters, then accumulate for 2 months

$A = 100\,000(1.03)^{-24}[1 + (0.12)(2/12)] = \$50\,177.24$

51. You deposit $1000 today in an account that pays interest at $j_2 = 8\%$ for the next 5 years and j_2 = 6% thereafter. How many complete interest periods will it take for you to accumulate <u>at least</u> double your original investment?

A. 11 periods

B. 18 periods

<u>C.</u> 21 periods

D. 24 periods

$2000 = 1{,}000 \, (1.04)^{10} \, (1.03)^n$

$(1.03)^n = 1.351128338$ which solves for $n = 10.18$

Thus, need a total of $10 + 10.18 = 20.18 = 21$ periods

52.   You invest $2130.22 today. Four and a half years later, you see that this investment has
        grown to $3316.08. What nominal rate of interest, j_{12}, have you been earning?

        A. 9.25%

        B. 9.88%

        C. 10.08%

        D. 10.33%

        $3316.08 = 2130.22 (1 + i)^{4.5 \times 12}$

        $(1 + i)^{54} = 1.556684286$ which solves for $i = 0.008229196$

        OR $j_{12} = 9.875 = 9.88\%$

53.   A $2000 loan is to be repaid with payments of $1200 in 1 year, $800 in 4 years, and $400 in n
        years, assuming a nominal interest rate of 6% compounded annually. Determine n.

        A. 4.59

        B. 6.37

        C. 9.18

        D. 14.74

        $2000 = 1200 (1.06)^{-1} + 800 (1.06)^{-4} + 400 (1.06)^{-n}$

        $(1.06)^{-n} = 0.585623994$ which solves for $n = 9.18$ years

54. $15,000 is invested into an account that earns interest at $j_4 = x\%$. There are no other deposits made into the account. At the end of 15 years, the accumulated value of the account is $45,000. Determine x.

A. 1.85%

B. 2.00%

C. 7.39%

D. 8.00%

$45,000 = 15,000 (1 + x/4)^{60}$ Solves for $x = 7.39\%$

55. A deposit of $100 is made into an account earning j_{12} = 18%. Another $100 is deposited into a 2nd account earning j_2 = 10%. At what time, n (where n is in years), would the accumulated value of the first account be twice as much as the accumulated value in the 2nd account? (Answer in years)

A. 8.5

B. 9.3

C. 9.9

D. 10.2

$100 (1.015)^{12n} = 200 (1.05)^{2n}$

$[(1.015)^{12}/(1.05)^2]^n = 2$ which solves for n = 8.5486 = 8.5 years

56. How long does it take for a loan of $5000 to accumulate $1000 of interest if j_2 = 10%?

A. 1 year, 10 months, 13 days

B. 1 year, 10 months, 29 days

C. 3 years, 8 months, 26 days

D. 3 years, 9 months, 28 days

$6000 = 5000 (1.05)^n$

n = 3.736850652 ÷ 2 = 1.868425 years = 1 year, 10 months, 13 days

57.   An investment doubles in 9 ½ years. What nominal rate of interest j_4 is being earned?

    A. 7.32%

    B. 7.36%

    C. 7.43%

    D. 7.57%

    $(1 + j_4/4)^{38} = 2$ Solves for $j_4 = 7.36\%$

58.   You invest $1000 today at $j_{12} = 6\%$. After 2 years, the interest rate changes to $j_{12} = 12\%$. How many years <u>from today</u> will it take the $1000 to grow to $10,000?

    A. 21.28 years

    B. 20.28 years

    C. 19.28 years

    D. 18.28 years

    $10,000 = 1000 (1.005)^{24} (1.01)^n$ Solves for $n = 219.378$ months $= 18.28$ years

    Thus total $= 2 + 18.28 = 20.28$ years

59.   How long will it take for $750 to accumulate to $1000 if $j_2 = 9\%$?

A. 6 years, 175 days

B. 6 years, 196 days

C. 3 years, 88 days

D. 3 years, 98 days

$1000 = 750 (1.045)^n$ Solves for $n = 6.535720775$ half years

OR $n = 3.267860387$ years = 3 years, 98 days

60.   You wish to have $4000 in 3-years time. If you invest $3000 today, what nominal rate j_4 must you earn on your investment to reach your goal?

A. 9.62%

B. 9.71%

C. 10.06%

D. 11.11%

$4000 = 3000 (1 + j_4/4)^{12}$ Solves for $j_4 = 9.71\%$

61.   If money triples in 6 years, what rate of interest, j_2, is being earned?

A. 9.6%

B. 10.0%

<u>C.</u> 19.2%

D. 20.1%

$3 = 1 (1 + j_2/2)^{12}$ Solves for $r\, j_2 = 19.174\%$

62. $4000 is deposited into an account earning j_2 = 8% for the first 2 years and j_2 = 10% thereafter. How long will it take for it to grow to $9041.67?

A. 6 yrs, 9 months

<u>B.</u> 8 yrs, 9 months

C. 13 yrs, 6 months

D. 17 yrs, 6 months

$9041.67 = 4000 (1.04)^4 (1.05)^n$, which solves for n = 13.5 half years = 6.75 years

Total = 8.75 years = 8 years, 9 months

63. If money triples in value in 8 years, what nominal rate of interest compounded semi-annually is being earned?

    A. 7.11%

    B. 7.36%

    <u>C.</u> 14.22%

    D. 14.72%

$3 = (1 + i)^{16}$, which solves for $j_2 = 2i = 14.22\%$

64. $25,000 was deposited into an investment account earning interest at a nominal rate of $j_2 = x\%$ for 10 years. You are given that the corresponding total amount of interest earned in the first four years is $9,012.22. Determine x.

    A. 6.25%

    B. 6.55%

    <u>C.</u> 7.85%

    D. 8.00%

$25{,}000 + 9{,}012.22 = 25{,}000(1 + x/2)^{8}$ which solves $x = 7.85\%$

65.   A car insurance company charges you a premium of $1452 a year for your car insurance policy. You have two options. Option 1 is to pay the $1452 in cash today. Option 2 is to make three payments of $499 at the following times: today, 3-months from now and 6-months from now. What nominal rate of interest, j_4, are you being charged?

A. 11.73%

B. 12.12%

C. 12.53%

D. 13.06%

$1452 = 499 + 499(1 + i)^{-1} + 499(1 + i)^{-2}$; Plugging the 4 given values into this equation, you get that at $i = 0.1253/4$, the right hand side = $1451.99 = $1452. (could also solve using the quadratic formula)

66. Which of the following rates would lead to the <u>shortest</u> length of time (n, in years) needed to double an initial investment of $1000?

    <u>A.</u> $j_1 = 9.15\%$

    B. $j_2 = 8.90\%$

    C. $j_4 = 8.84\%$

    D. $j_{12} = 8.77\%$

A. $2 = (1.0915)^n$ solves for $n = \underline{7.917\ \text{years}}$; B. $2 = (1.0455)^{2n}$ solves for $n = 7.96$ years
C. $2 = (1.0221)^{4n}$ solves for $n = 7.927$ years; D. $2 = (1.00730833)^{12n}$ solves for $n = 7.9325$ yr

67. If money doubles at a certain rate of interest compounded monthly in 6 years, how long will it take for the same amount of money to triple in value?

    A. 10.40 years

    <u>B.</u> 9.51 years

    C. 8.35 years

    D. Cannot be determined

$2 = (1 + i)^{72}$, which solves for $i = 0.009673533$
$3 = (1.009673533)^{12n}$ which solves for $n = 9.51$ years

68.   What is the nominal rate of interest convertible quarterly at which the discounted value (present value) of $15,000 due at the end of 186 months is $5000?

A. 9.56%

B. 7.39%

C. 7.27%

D. 7.15%

186 months = 15.5 years = 62 quarters

$5000 = 15{,}000(1 + i)^{-62}$ solves for $j_4 = 4i = 7.15\%$

69.   You are given that at a certain rate j_1, money will double itself in 12-years. At this same rate j_1, how many years will it take for $1500 to accumulate $700 of interest?

A. 8.2 years

B. 6.6 years

C. 5.6 years

D. 4.2 years

$2 = (1 + j_1)^{12}$, solves for $j_1 = 0.059463094$

$2200 = 1500(1.059463094)^n$ solves for $n = 6.6$ years

70. You deposit $1000 today in an account that pays interest at j_2 = 8% for the next 5-years and j_2 = 6% thereafter. How long in total (in years and days) will it take for you to <u>at least</u> double your original investment?

<u>A.</u> 10 years, 34 days

B. 10 years, 67 days

C. 10 years, 79 days

D. 10 years, 158 days

$2000 = 1000(1.04)^{10} (1.03)^n \rightarrow 2000 = 1480.244285(1.03)^n$

$\rightarrow (1.03)^n = 1.351128338 \rightarrow n = 10.18196372$ half years = 5.090531859 years

Total = 5 yrs + 5yrs + (0.090531859)(365) = 10 years, 34 days

71. A car insurance company charges you a premium of $1452 a year for your car insurance policy. You have two options. Option 1 is to pay the $1452 in cash today. Option 2 is to make two payments of $749 at the following times: today and 6-months from today. What nominal rate of interest, j_4, are you being charged?

A. 11.73%

B. 13.06%

C. 12.88%

D. 12.12%

$1452 = 749 + 749(1 + i)^{-2} \rightarrow (1 + i)^{-2} = 703/749 \rightarrow (1 + i)^2 = 1.065433855$

$i = 0.032198554 \rightarrow j_4 = 12.88\%$

72.   Paul deposited $1000 in a savings account paying interest at $j_1 = 4.5\%$. The account has now grown to $1246.18. If he had been able to invest the same amount over <u>twice</u> as long in a fund paying interest at $j_1 = 5.5\%$, to what amount would his investment now have accumulated?

A. $1498.43

B. $1882.35

C. $1653.64

<u>D.</u> $1708.14

First, solve for n: $1000(1.045)^n = 1246.18 \rightarrow n = 5$ years

Then solve for $S = 1000(1.055)^{10} = \$1708.14$

73.   You borrows $10,000 today at $j_2 = 8\%$. You pay back $7000 at the end of 2-years and another $7000 at the end of n-years (from today). What is the value of n? (years, days)

<u>A.</u> 7 yrs, 30 days

B. 7 yrs, 60 days

C. 14 yrs, 30 days

D. 14 yrs, 60 days

$10\,000 = 7000(1.04)^{-4} + 7000(1.04)^{-2n}$, which solves for $2n = 14.164$, which is 7 years, 30 days

74.   Mr. Harry Leggs borrows $5000 today, due with interest at j_4 = 8% in one lump sum at the end

        of 2 years. Instead, Mr. Leggs wishes to pay $2000 six months from today and $X in 18

        months. If money is worth j_{12} = 6%, what is X?

        A. $3252.09

        B. $3346.29

        C. $3465.95

        D. $3562.23

        Original debt = 5000 $(1.02)^8$ = $5858.30

        Using 18 months as the focal date:

        2000 $(1.005)^{12}$ + X = 5858.30 $(1.005)^{-6}$ Solves for X = $3562.23

75.   A loan of $5000 is taken out today. It is due with interest at j_4 = 8% in 2 years. Instead, the borrower negotiates with the lender to pay $2500 in 1 year and X in 3 years. If the lender can reinvest any payment at j_2 = 5%, what is the value of X?

A. $2493.59

B. $3038.93

<u>C.</u> $3395.34

D. $3581.68

Original debt = 5000 $(1.02)^8$ = $5858.30

Using 3 years as the focal date:

2500 $(1.025)^4$ + X = 5858.30 $(1.025)^2$ Solves for X = $3395.34

76. A woman borrowed money and owes $3000 one-year from now and $3000 three-years from now. The loan is renegotiated so that the woman can instead pay $X two-years from now and $4000 four-years from now which will fully pay back the loan. If the interest rate on the loan is $j_2 = 8\%$, what is the value of X?

A. $2599.25

B. $2588.42

C. $2580.78

D. $2306.39

Focal date 2 years: $X + 4000 (1.04)^{-4} = 3000 (1.04)^2 + 3000 (1.04)^{-2}$

Solves for $X = $2599.25

77. A debt of $5700 is due, with interest at j_2 = 8%, in three years. It is agreed instead that the loan will be repaid with a payment of X in one year and $3000 in two years. If money is worth j_4 = 4%, what is the value of X?

    A. $3282.18

    B. $3348.50

    C. $3391.45

    D. $3777.51

Original debt = 5700 $(1.04)^6$ = $7212.32

Focal date 1 year: X + 3000 $(1.01)^{-4}$ = 7212.32 $(1.01)^{-8}$

Solves for X = $3777.51

78. Payments of $1000 due in 6 months, $1500 due in 9 months, and $1200 due in 15 months are to be exchanged for a single payment X due in 12 months. What is X if j_4 = 6%?

    A. $3770.73

    B. $3734.99

    C. $3809.54

    D. $3927.05

At time 12 months: X = 1000 $(1.015)^2$ + 1500 (1.015) + 1200 $(1.015)^{-1}$ = $3734.99

79.   You borrow $2000 today. The loan is due in 3 years, with interest at j_1 = 9%. It is agreed that
you will instead pay $1000 one year from now and $$X$ two years from now. If money is worth j_2
= 6%, what is the value of X?

A. $1190.12

B. $1286.20

<u>C.</u> $1380.48

D. $1529.16

Original debt = 2000 (1.09)³ = $2590.06

Focal date 2 years: 1000 (1.03)² + X = 2590.06 (1.03)⁻²

Solves for X = $1380.48

80.   A debt of $7000 is due with interest at j_2 = 8% at the end of 3 years. To repay this debt, a payment of $1500 is made at the end of 1 year, followed by a payment of $$X$ at the end of 2 years. If money is worth j_4 = 10%, what is the value of X so that the loan is fully paid off?

A. $4685.94

B. $4713.64

C. $5172.40

D. $6873.10

Focal date 2 years: 1500 $(1.025)^4$ + X = 7000 $(1.025)^{-4}$

Solves for X = $4685.94

81. A student borrows $2,000 today and they agree to pay off the loan with one payment of $2,590.06 to be made at the end of 3 years time. It is then agreed that, instead of paying off the loan with one payment, the student can pay off the loan with a payment of $1000 one year from now and $X two years from now. Given that $j_2 = 6\%$, determine X.

A. $1190.12

B. $1286.20

C. $1380.48

D. $1529.16

Focal date = end of 2 years;

$1000(1.03)^2 + X = 2590.06(1.03)^{-2}$, which solves for $X = \$1380.48$

82. You borrow $2000 today. This loan is due in 3-years with interest at $j_1 = 9\%$. It is agreed that you will instead pay $1000 one-year from now and X two-years from now. If money is worth $j_2 = 6\%$, what is the value of X?

    A. $1190.12
    B. $1286.20
    <u>C.</u> $1380.48
    D. $1529.16

    Same <u>Solution</u> as #87, except the maturity value of the loan must be calculated first: $S =$ 2000(1.09)³ = $2590.06

83. You owe your parents $2500 today. You agree to pay this back by making a payment of $500 now, $600 six months from now and X 18-months from now. What is X if $j_4 = 6\%$?

    A. $1417.60
    B. $1473.22
    C. $1482.36
    <u>D.</u> $1550.07

    Focal date = today;

    2500 = 500 + 600(1.015)⁻² + X(1.015)⁻⁶, which solves for X = $1550.07

84. You borrow $5000 today. The loan is due in 5 years, with interest at j_1 = 7%. It is agreed that you can instead pay $1000 one year from now, X two years from now and $2000 three years from now. If money is worth j_4 = 8%, what is the value of X?

   A. $2599.39

   B. $2648.80

   C. $2788.70

   D. $2794.38

   Maturity value of loan = 5000(1.07)^5 = $7012.76; Focal date = end of 5 years

   7012.76 = 1000(1.02)^{16} + X(1.02)^{12} + 2000(1.02)^8, solves for X = $2599.39

85. A $1000 loan is taken out today. The loan is repaid with a payment of $400 at the end of the 1st year, $800 at the end of the 5th year, and a payment of $X at the end of the 10th year. If $j_4 = 12\%$, what is X?

A. $220.97

B. $657.84

C. $737.26

D. $1406.54

Focal date = end of 10 years

$X = 1000(1.03)^{40} - 400(1.03)^{36} - 800(1.03)^{20} = \$657.84$

86. You borrow $2500 today. The loan is due in 5-years, with interest at $j_2 = 8\%$. It is agreed that you can instead pay $X two years from now and $1500 three years from now. If money is worth $j_{12} = 6\%$, what is the value of X?

A. $1679.54

B. $1537.81

C. $1405.04

D. $675.25

Maturity value of loan = $2500(1.04)^{10} = \$3700.61$; Focal date = end of 5 years

$3700.61 = X(1.005)^{36} + 150(1.005)^{24}$, solves for $X = \$1679.54$

87.   A woman plans to withdraw $1800 18-months from now, and $2400 36-months from now. How much does she need to deposit today if the interest rate is j_{12} = 12% for the first 2 years and j_{12} = 6% thereafter?

A. $3182.25

B. $3765.40

C. $3510.38

D. $3285.18

A = 1800(1.01)$^{-18}$ + 2400(1.005)$^{-12}$ (1.01)$^{-24}$ = $3285.18

88.   A loan of $5000 is taken out today. It is due with interest at j_4 = 8% in 2 years. Instead, the

borrower negotiates with the lender to replace this loan with a payment of $2500 in 1-year and

another payment of $X in 3-years. If the lender can reinvest any payment at j_2 = 5%, what is

the value of X?

A. $3038.93

B. $2493.59

C. $3581.68

D. $3395.34

Maturity value = $5000(1.02)^8$ = 5858.30

Equation of value at time 6 (end of 3 years):

$X + 2500(1.025)^4 = 5858.30(1.025)^2$; Solves for X = $3395.34

89. A woman who died left an estate worth $200 000 to be split among her two children, currently age 8 and 12. Each child is to receive an <u>equal</u> amount, X, from the estate when they reach age 18. If the money can be invested at $j_2 = 6\%$, how much does each child receive when they turn 18? (Answer to nearest dollar)

   A. $142,576
   <u>B.</u> $159,355
   C. $179,356
   D. $180,611

   The 12-year old gets X in 6 years (12 periods), while the 8-year old gets X in 10 years (20 periods). Thus,
   $200\ 000 = X(1.03)^{-12} + X(1.03)^{-20}$, which solves for $X = \$159\ 355$

90.   An investment has the following interest rates: j_2 = 6% for the first 30 months, followed by j_4 = 8% for the next 36 months, followed by j_6 = 9% for the last 18 months. What is the equivalent j_2 earned over the 7 year period?

A. 6.24%

B. 6.68%

C. 7.56%

D. 7.70%

$(1 + j_2/2)^{14}$ = $(1.03)^5$ $(1.02)^{12}$ $(1.015)^9$ Solves for j_2= 7.56%

91.   A fund pays interest at j_1 = 5% for the first 3 years, j_4 = 10% for one year, and j_{12} = 12% for one year. What is the equivalent nominal interest rate, j_2, earned over the 5 years?

A. 7.56%

B. 7.43%

C. 7.40%

D. 7.23%

$(1 + j_2/2)^{10}$ = $(1.05)^3$ $(1.025)^4$ $(1.01)^{12}$ Solves for j_2= 7.43%

92.   You are investing a sum of money for 4 years. You earn a simple interest rate of $r = 10\%$ for the first 2 years and $j_{12} = 6\%$ for the last 2 years. What is the equivalent effective annual rate of return, j, you earn over each of the 4 years?

   A. 8.81%

   B. 8.07%%

   C. 7.98%

   D. 7.84%

   $(1 + j)^4 = [1 + (0.10)2] (1.005)^{24}$ Solves for $j = 7.84\%$

93.   You invest a sum of money at $j_{12} = 15\%$ for 3 years, followed by $j_4 = 12\%$ for 4 years. What equivalent rate of return, j_1, do you earn over each of the 7 years?

   A. 13.29%

   B. 13.50%

   C. 13.79%

   D. 14.05%

   $(1 + j)^7 = (1.0125)^{36} (1.03)^{16}$ Solves for $j = 14.05\%$

94. You invest $1000 in a fund earning j_1 = 6% in the first year, j_2 = x% in the 2nd year, and j_4 = 8% in the 3rd year. If the accumulated value is $1264.98 after three years, what is the value of x?

A. 10.00%

B. 10.25%

C. 10.50%

D. 10.75%

$1264.98 = 1,000 (1.06) + (1 + X/2)^2 (1.02)^4$

Solves for X = 10.00%

95. P is deposited today in a fund which earns j_{12} = 6% for the 1st year, j_4 = 6% for the 2nd year and j_2 = 6% thereafter. At the end of 4 years, there is $12,000 in the fund. What is P?

A. $9461.84

B. $9505.12

C. $9747.82

D. $10,038.06

$12,000 = P (1.005)^{12} (1.015)^4 (1.03)^4$

Solves for P = $9461.84

96.   Jim Dandy invests a sum of money today. He earns the following interest rates over the next

5-years:

j_2 = 10% for the first 2-years

j_4 = 8% for the next 2-years

j_{12} = 6% for the last year

What annual effective rate of return, j_1, did Jim earn over the 5-year period?

A. Less than 8%

B. 8% or more, but less than 8.5%

C. 8.5% or more, but less than 9%

D. more than 9%

$(1 + j)^5 = (1.05)^4 (1.02)^8 (1.005)^{12}$

Solves for j = 8.62%

97.   The 1996 Canada Savings Bond issue offered the following annual rates, guaranteed over 10 years: 3% in the first year, followed by 4%, 5%, 6%, 6.50%, 6.75%, 7%, 7,25%, 8% and 8.75% in the 10th year. If you buy one of these bonds today and cash it in after 5 years, what annual rate of return do you earn?

A. 4.89%

B. 5.39%

C. 6.21%

D. 6.50%

$(1+ j)^5$ = (1.03) (1.04) (1.05) (1.06) (1.065)

98. A single deposit of $25,000 is made into an account that earns interest at j_4 = 7% for one year, j_2 = 6% for the next year and j_6 = 3% thereafter. How much interest is earned in the fourth year?

    A. $143.93

    B. $863.58

    <u>C.</u> $889.82

    D. $916.85

accumulated value after 3 years = $25{,}000(1.0175)^4(1.03)^2(1.005)^6 = 29{,}291.96$

accumulated value after 4 years = $29{,}291.96(1.005)^6 = \$30{,}181.78$

$I = 30{,}181.78 - 29{,}291.96 = \$889.82$

99. An investment has the following interest rates: j_4 = 8% for the first 2 years, followed by j_2 = 8% for the next 4 years,, followed by j_{12} = 6% for the last 28 months. What is the equivalent nominal rate of interest, compounded 3 times a year, j_3, earned over this time period?

    A. 5.56%

    <u>B.</u> 7.43%

    C. 9.99%

    D. 11.31%

$(1.02)^8 (1.04)^8 (1.005)^{28} = (1 + j_3/3)^{25}$, which solves for j_3 = 7.43%

100. You invest $1000 for 3 years in a fund earning j_1 = 6% in the first year, j_2 = x% in the second year, and j_4 = 8% in the third year. If the accumulated value is $1264.98 after three years, what is the value of x?

    A. 10.00%

    B. 10.25%

    C. 10.50%

    D. 10.75%

    $1000(1.06)(1 + x/2)^2 (1.02)^4$ = $1264.98 which solves for × = 10.00%

101. What is the effective annual rate, j, over 7 years that is equivalent to j_6 = 6% for the first two years, j_{12} = 9% for the next three years, and j_2 = 4% for the last two years?

    A. 6.00%

    B. 6.31%

    C. 6.69%

    D. 6.91%

    $(1 + j)^7 = (1.01)^{12} (1.0075)^{36} (1.02)^4$, which solves for j = 6.91%

102. What is the equivalent effective annual rate, j, over 8-years that is equivalent to $j_6 = 8\%$ for the first three years, $j_{12} = 6\%$ for the next three years, and $j_2 = 5\%$ for the last two years?

A. 6.02%

B. 6.13%

C. 6.50%

D. 6.67%

$(1 + j)^8 = (1.013333)^{18} (1.005)^{36} (1.025)^4$, which solves for $j = 6.67\%$

103. You invest some money and earn the following rates of interest: simple interest of 15% for 9 months, followed by $j_6 = 12\%$ for 18 months, followed by $j_4 = 5\%$ for 9 months. What is the equivalent rate of interest, j_2 earned over the 36 months?

A. 10.97%

B. 11.03%

C. 11.06%

D. 11.23%

$(1 + j_2/2)^6 = [1 + 0.15(9/12)] (1.02)^9 (1.0125)^3$, which solves for $j_2 = 11.03\%$

104. An investment has the following interest rates: $j_4 = 8\%$ for the first 2-years, followed by $j_2 = 8\%$ for the next 4-years, followed by $j_{12} = 6\%$ for the last 28-months. What is the equivalent nominal rate of interest, compounded 3 times a year, j_3, earned over this time period of 100 months?

A. 9.99%

B. 7.43%

C. 5.56%

D. 11.31%

$(1 + j_3/3)^{25} = (1.02)^8(1.04)^8(1.005)^{28} \rightarrow j_3/3 = 0.02477545 \rightarrow j_3 = 7.43\%$

where: 100 months divided by 4 = 25 three-month periods

105. Jackie invested $500 in an investment fund that pays interest at $j_2 = 5.3\%$ for the first two years, $j_{12} = 7\%$ for the next three years, and $j_{365} = 4.5\%$ for the last year. What effective interest rate, j, did she earn over the 6 years?

    <u>A.</u> 6.17%

    B. 7.23%

    C. 6.78%

    D. 6.01%

$(1 + j)^6 = (1+ 0.053/2)^4 (1+ 0.07/12)^{36} (1+ 0.045/365)^{365}$, which solves for $j = 6.17\%$

106. An investment earns the following interest rates: 10% simple interest for 24 months, followed by 8% compounded quarterly for 36 months. What is the equivalent nominal rate compounded semi-annually that is earned over the 5-years?

    A. 7.34%

    B. 7.49%

    <u>C.</u> 8.58%

    D. 8.76%

$(1 + j_2/2)^{10} = [1 + (0.10)(24/12)] (1.02)^{12}$, which solves for $j_2 = 8.58\%$

107. Suppose the inflation rate in a country is 1% per month. How many years will it take for the purchasing power of $1 today to be cut in half?

A. 11.62

B. 9.20

C. 6.12

D. 5.81

$1 = 0.5 (1.01)^n$, solves for $n = 69.6607$ months = 5.81 years

108. If inflation is 3.4% per year, what does the purchasing power of $1 today become in 10 years?

A. $0.716

B. $0.746

C. $1.340

D. $1.397

$(1.034)^{-10} = \$0.7158 = \$0.716$

109. If there will be 3 times as many fruit flies in a vegetable garden in 10 days as there are today, what rate of growth, compounded twice a day, does this represent?

A. 11.29%

B. 11.61%

C. 12.29%

D. 23.22%

$(1 + j_2/2)^{20} = 3$, solves for r $j_2 = 11.29\%$

110. A person invests $2000 today in a fund earning interest at $j_1 = 6\%$. If the rate of inflation is 2.1% in the first year and 3.0% in the second year, how much is the investment worth, in real terms (after taking account of inflation), at the end of two years?

A. $2131.30

B. $2136.87

C. $2138.15

D. $2140.34

$S_{real} = 2000 \, (1.06)^2/(1.021)(1.03) = \$2136.87$

111. Suppose the inflation rate is 0.8% per half year and you can invest money at j_2 = 6%. If you invested $100,000 at the start of the year, how much will you have accumulated, in "real" terms (after taking into account inflation), at the end of the year?

    A. $104,324.14

    B. $104,330.71

    C. $104,412.71

    D. $104,448.40

S_{real} = 100,000 $(1.03)^2/(1.008)^2$ = $104,412.71

112. In 1977, the annual inflation rate in Canada was 9.5%, while one-year interest rates were 7.9%. If you invest $1000 at the start of the year, how much money, in real terms, did you have at the end of the year, after adjusting for inflation?

    A. $984.00

    B. $985.39

    C. $1014.61

    D. $1016.00

S_{real} = 1000 (1.079)/1.095 = $985.39

113. In 1977, the annual inflation rate in Canada was 9.5%, while one-year interest rates were 7.9%. What was the real rate of return in Canada in 1977?

A. -1.60%

B. -1.46%

C. 1.46%

D. 1.60%

i_{real} = (0.079 - 0.095)/1.095 = -1.46%

114. Jack earns a one-year real rate of return of 2.45% on an investment. If inflation is 2.00% for the year, what nominal rate of return j_1 did Jack earn for the one-year period?

A. 4.35%

B. 4.40%

C. 4.45%

D. 4.50%

0.0245 = (i - 0.02)/1.02 which solves for i = 4.50%

115. In a particular year, the interest rate is 5% and the real rate of return is 3%. What is the rate of inflation for the same year?

A. 2.06%

B. 2.00%

C. 1.94%

D. 1.85%

$0.03 = (0.05 - r)/(1+r)$ which solves for $r = 1.94\%$

116. The population of a given country was 24.3 million on January 1, 2001 and on January 1, 2011 it was 27.3 million people and the population growth rate over this time period was $g\%$ compounded annually. At this same rate of growth g, how many more years (from January 1, 2011) will it take this country's population to reach 30 million people?

A. 8.1 years

B. 9.5 years

C. 9.2 years

D. 18.1 years

$27.3 = 24.3 (1 + g)^{10}$, which solves for $g = 0.011709056$

117. During the spring growing season, a sunflower plant will increase its size by 60% every 7

days. If a plant is currently 5 cm tall, how tall will/should it be in 25 days?

A. 26.8 cm

B. 31.0 cm

C. 39.1 cm

D. 42.1 cm

$S = 5 \, (1.60)^{(25/7)} = 26.8$ cm

118. Jack invested $1200 into an account for 5-years. The account paid interest at $j_1 = 4\%$ for the

first 2-years and $j_1 = 6\%$ thereafter. If the annual inflation rate is 2% for each of these 5-years,

what is the annual *real* rate of interest earned over the 5-years?

A. 3.92%

B. 3.13%

C. 2.94%

D. 1.96%

$(1 + i_{real})^5 = (1.04)^2 \, (1.06)^3/(1.02)^5$, which solves for $i_{real} = 3.13\%$

119. A person invests in a fund earning interest at j_2 = 6%. The annual rate of inflation is 2% in year 1, 2.5% in year 2, and 3.0% in year 3. What is the annual real interest rate, compounded once a year, earned over the 3-year period?

A. 3.42%

B. 3.47%

C. 3.50%

D. 3.59%

$(1 + i_{real})^3 = (1.03)^6/(1.02)(1.025)(1.03)$, which solves for i_{real} = 3.50%

120. Population growth in a given urban city was 4% for the calendar years 2003 to 2007 inclusive and 3% for the calendar years 2008 to 2010 inclusive. If the population of this city was 664,735 on December 31, 2010, what was the population of this city on December 31, 2002?

A. 500,000

B. 512,193

C. 515,000

D. 520,000

$P = 664,735 (1.04)^{-5} (1.03)^{-3} = 500,000$

121. Jack invested $1200 into an account for 5-years with interest at j_2 = 6%. If the annual inflation rate is 2% for the first 2-years and 2.5% thereafter, what is the annual real rate of interest earned over the 5-years?

    A. 3.71%

    B. 1.96%

    C. 3.13%

    D. 2.94%

    $(1 + i_{real})^5 = (1.03)^{10}/[(1.02)^2(1.025)^3]$, which solves for i_{real} = 3.71%

122. The amount of clover on a lawn grows exponentially at a rate of j_{24}(compounded twice a month) such that it doubles every 6-months. If there are 5000 pieces of clover in your lawn today, how many did you have 4-months ago? (Answer to the nearest piece of clover)

A. 1984

B. 3150

C. 3333

D. 3969

$(1 + j_{24}/24)^{12} = 2$, which solves for $i = j_{24}/24 = 0.059463094$ per 2-month period
Thus, $5000(1.05943094)^{-8} = 3149.8 = 3150$

123. How much money do you need today in order to have $3000 in 21 months time, if interest is compounded continuously at 9%?

A. $2741.79

B. $2564.34

C. $2562.83

D. $453.22

$A = 3000 \, e^{-0.09 \, (21/12)} = 3000 \, e^{-0.1575} = \$2562.83$

124. You deposit $10,000 today in a fund earning interest at j_x = 8%. How much will you have

accumulated at the end of 21 months?

A. $11,502.74

B. $11,497.40

C. $11,441.73

D. $10,832.87

$S = 10,000\ e^{0.08\ (21/12)} = 10,000\ e^{0.14} = \$11,502.74$

125. You are investing a sum of money. Rank the following interest in order of which one will give you the most interest.

a. $j_2 = 8\%$

b. $j_{52} = 7.9\%$

c. $\delta = j_\infty = 7.85\%$

A. b > a > c

B. a > c > b

C. c > a > b

D. b > c > a

a. $j_1 = (1.04)^2 - 1 = 8.160\%$

b. $j_1 = (1 + 0.079/52)^{52} - 1 = 8.214\%$

c. $j_1 = e^{0.0785} - 1 = 8.166\%$

Thus, b > c > a

126. You plan to invest $P today for 15 months, at which time you wish to $15,000. What is the value of P if you can earn interest at 7% compounded continuously?

    A. $13,743.28

    B. $13,746.78

    C. $13,783.56

    D. $13,985.91

$P = 15{,}000\ e^{-0.07\ (15/12)} = \$13{,}743.28$

127. You wish to have $10,000 45 months from now. To accomplish this goal, you deposit $P in an account today paying interest continuously at $j_x = 8\%$. What is P?

    A. $9,231.16

    B. $7408.18

    C. $7415.56

    D. $7493.09

$P = 10{,}000\ e^{-0.08\ (45/12)} = \$7408.18$

128. What is the value, in 18 months, of an investment of $10,000 made today if interest is compounded continuously at 6.5%?

    A. $32,219.93

    B. $11,024.11

    C. $11,021.21

    D. $10,987.96

$S = 10,000\ e^{0.065\ (18/12)} = \$11,024.11$

129. What nominal interest rate compounded continuously is equivalent to 10% compounded quarterly?

    A. 9.53%

    B. 9.75%

    C. 9.88%

    D. 10.38%

$(1.025)^4 = e^{\delta}$ Solves for $\delta = 4\ \ln(1.025) = 9.88\%$

2 Summary

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