Chapter 02

How to Calculate Present Values

Multiple Choice Questions

1. The present value of $100.00 expected two years from today at a discount rate of 6% is:

   A. $112.36.

   B. $106.00.

   C. $100.00.

   D. $89.00.

2. Present value is defined as:

   A. future cash flows discounted to the present by an appropriate discount rate.

   B. inverse of future cash flows.

   C. present cash flows compounded into the future.

D. future cash flows multiplied by the factor $(1 + r)^t$.

3. If the annual interest rate is 12.00%, what is the two-year discount factor?

A. 0.7972

B. 0.8929

C. 1.2544

D. 0.8065

4. If the present value of cash flow X is $240, and the present value of cash flow Y is $160, then the present value of the combined cash flows is:

A. $240.

B. $160.

C. $80.

D. $400.

5. The rate of return is also called the: I) discount rate; II) hurdle rate; III) opportunity cost of capital

A. I only.

B. I and II only.

C. I, II, and III.

D. I and III only.

6. The present value of $121,000 expected one year from today at an interest rate (discount rate) of 10% per year is:

   A. $121,000.

   B. $100,000.

   C. $110,000.

   D. $108,900.

7. The one-year discount factor, at a discount rate of 25% per year, is:

   A. 1.25.

   B. 1.0.

   C. 0.8.

   D. 0.75.

8. The one-year discount factor, at an interest rate of 100% per year, is:

   A. 1.50.

   B. 0.50.

   C. 0.25.

   D. 1.00.

9. The present value of $100,000 expected at the end of one year, at a discount rate of 25% per year, is:

A. $80,000.

B. $125,000.

C. $100,000.

D. $75,000.

10. If the one-year discount factor is 0.8333, what is the discount rate (interest rate) per year?

A. 10%

B. 20%

C. 30%

D. 40%

11. If the present value of $480 to be paid at the end of one year is $400, what is the one-year discount factor?

A. 0.8333

B. 1.20

C. 0.20

D. 1.00

12. If the present value of $250 expected one year from today is $200, what is the one-year discount rate?

    A. 10%

    B. 20%

    C. 25%

    D. 30%

13. If the one-year discount factor is 0.90, what is the present value of $120 expected one year from today?

    A. $100

    B. $96

    C. $108

    D. $133

14. If the present value of $600, expected one year from today, is $400, what is the one-year discount rate?

    A. 15%

    B. 20%

    C. 25%

    D. 50%

15. The present value formula for a cash flow expected one period from now is:

A. $PV = C_1 \times (1 + r)$.

B. $PV = C_1/(1 + r)$.

C. $PV = C_1/r$.

D. $PV = (1 + r)/C_1$.

16. The net present value formula for one period is:

A. $NPV = C_0 + [C_1/(1 + r)]$.

B. NPV = PV required investment.

C. $NPV = C_0/C_1$.

D. $NPV = C_1/C_0$.

17. An initial investment of $400,000 is expected to produce an end-of-year cash flow of $480,000.

What is the NPV of the project at a discount rate of 20%?

A. $176,000

B. $80,000

C. $0 (zero)

D. $64,000

18. If the present value of a cash flow generated by an initial investment of $200,000 is $250,000, what is the NPV of the project?

A. $250,000

B. $50,000

C. $200,000

D. -$50,000

19. What is the present value of the following cash flows at a discount rate of 9%?

Year 1	Year 2	Year 3
$100,000	$150,000	$200,000

A. $372,431.81

B. $450,000.00

C. $405,950.68

D. $412,844.04

20. At an interest rate of 10%, which of the following sequences of cash flows should you prefer?

	Year 1	Year 2	Year 3
A)	500	300	100
B)	100	300	500
C)	300	300	300
D)	Any of the above as they all add up to $900		

A. option A

B. option B

C. option C

D. option D

21. What is the net present value of the following cash flow sequence at a discount rate of 11%?

t=0	t=1	t=2
-120,000	300,000	-100,000

A. $69,108.03

B. $231,432.51

C. $80,000.00

D. $88,000.00

22. What is the net present value of the following sequence of annual cash flows at a discount rate of 16% APR?

t=1	t=2
-100,000	300,000

A. $136,741.97

B. $122,948.87

C. $158,620.69

D. $139,418.23

23. What is the net present value (NPV) of the following sequence of cash flows at a discount rate of 9%?

t = 0	t = 1	t=2	t=3
-250,000	100,000	150,000	200,000

A. $122,431.81

B. $200,000.00

C. $155,950.68

D. $177,483.77

24. Which of the following statements regarding the NPV rule and the rate of return rule is false?

A. Accept a project if its NPV > 0.

B. Reject a project if the NPV < 0.

C. Accept a project if its rate of return > 0.

D. Accept a project if its rate of return > opportunity cost of capital.

25. An initial investment of $500 produces a cash flow of $550 one year from today. Calculate the rate of return on the project.

A. 10%

B. 15%

C. 20%

D. 25%

26. According to the net present value rule, an investment in a project should be made if the:

A. net present value is greater than the cost of investment.

B. net present value is greater than the present value of cash flows.

C. net present value is positive.

D. net present value is negative.

27. Which of the following statements regarding the net present value rule and the rate of return rule is false?

A. Accept a project if NPV > cost of investment.

B. Accept a project if NPV is positive.

C. Accept a project if return on investment exceeds the rate of return on an equivalent-risk investment in the financial market.

D. Reject a project if NPV is negative.

28. The opportunity cost of capital for a risky project is:

A. the expected rate of return on a government security having the same maturity as the project.

B. the expected rate of return on a well-diversified portfolio of common stocks.

C. the expected rate of return on a security of similar risk as the project.

D. The expected rate of return on a typical bond portfolio.

29. A perpetuity is defined as a sequence of:

A. equal cash flows occurring at equal intervals of time for a specific number of periods.

B. equal cash flows occurring at equal intervals of time forever.

C. unequal cash flows occurring at equal intervals of time forever.

D. unequal cash flows occurring at equal intervals of time for a specific number of periods.

30. Which of the following is generally considered an example of a perpetuity?

A. Interest payments on a 10-year bond

B. Interest payments on a 30-year bond

C. Interest payments on a consol

D. Interest payments on government bonds

31. You would like to have enough money saved after your retirement such that you and your heirs can receive $100,000 per year in perpetuity. How much would you need to have saved at the time of your retirement in order to achieve this goal? (Assume that the perpetuity payments start one year after the date of your retirement. The annual interest rate is 12.5%.)

A. $1,000,000

B. $10,000,000

C. $800,000

D. $1,125,000

32. What is the present value of $10,000 per year in perpetuity at an interest rate of 10%?

A. $10,000

B. $100,000

C. $200,000

D. $1,000

33. You would like to have enough money saved to receive $80,000 per year in perpetuity after retirement for you and your heirs. How much would you need to have saved in your retirement fund to achieve this goal? (Assume that the perpetuity payments start one year from the date of your retirement. The annual interest rate is 8%.)

A. $7,500,000

B. $750,000

C. $1,000,000

D. $800,000

34. You would like to have enough money saved to receive a $50,000 per year perpetuity after retirement. How much would you need to have saved in your retirement fund to achieve this goal? (Assume that the perpetuity payments start on the day of your retirement. The annual interest rate is 8%.)

A. $1,000,000

B. $675,000

C. $625,000

D. $500,000

35. You would like to have enough money saved to receive an $80,000 per year perpetuity after retirement. How much would you need to have saved in your retirement fund to achieve this goal? (Assume that the perpetuity payments start on the day of your retirement. The annual interest rate is 10%.)

A. $1,500,000

B. $880,000

C. $800,000

D. $80,000

36. An annuity is defined as a set of:

A. equal cash flows occurring at equal intervals of time for a specified period.

B. equal cash flows occurring at equal intervals of time forever.

C. unequal cash flows occurring at equal intervals of time forever.

D. unequal cash flows occurring at equal intervals of time for a specified period.

37. If you are paid $1,000 at the end of each year for the next five years, what type of cash flow did you receive?

A. uneven cash flow stream

B. an annuity

C. an annuity due

D. a perpetuity

38. If the three-year present value annuity factor is 2.673 and the two-year present value annuity factor is 1.833, what is the present value of $1 received at the end of the three years?

A. $1.19

B. $0.84

C. $0.89

D. $0.92

39. If the five-year present value annuity factor is 3.60478 and the four-year present value annuity factor is 3.03735, what is the present value at the $1 received at the end of five years?

A. $0.63552

B. $1.76233

C. $0.56743

D. $1.2132

40. What is the eight-year present value annuity factor at a discount rate of 11%?

A. 5.7122

B. 11.8594

C. 5.1461

D. 6.9158

41. What is the six-year present value annuity factor at an interest rate of 9%?

A. 7.5233

B. 4.4859

C. 1.6771

D. 3.1432

42. What is the present value of a $1,000 per year annuity for five years at an interest rate of 12%?

A. $6,352.85

B. $3,604.78

C. $567.43

D. $2,743.28

43. What is the present value of a six-year, $5,000 per year annuity at a discount rate of 10%?

A. $21,776.30

B. $3,371.91

C. $16,760.78

D. $18,327.82

44. After retirement, you expect to live for 25 years. You would like to have $75,000 income each year. How much should you have saved in your retirement account to receive this income, if the interest rate is 9% per year? (Assume that the payments start on the day of your retirement.)

A. $736,693.47

B. $802,995.88

C. $2,043,750.21

D. $1,427,831.93

45. After retirement, you expect to live for 25 years. You would like to have $75,000 income each year. How much should you have saved in your retirement account to receive this income if the interest rate is 9% per year? (Assume that the payments start one year after your retirement.)

A. $736,693.47

B. $83,431.17

C. $1,875,000

D. $1,213,487.12

46. For $10,000, you can purchase a five-year annuity that will pay $2,504.57 per year for five years. The payments occur at the end of each year. Calculate the effective annual interest rate implied by this arrangement.

A. 8%

B. 9%

C. 10%

D. 11%

47. If the present value annuity factor for 10 years at 10% interest rate is 6.1446, what is the present value annuity factor for an equivalent annuity due?

A. 6.1446

B. 7.3800

C. 6.7590

D. 5.7321

48. If the present value annuity factor is 3.8896, what is the present value annuity factor for an equivalent annuity due if the interest rate is 9%?

A. 3.5684

B. 4.2397

C. 3.8896

D. 5.3127

49. For $10,000, you can purchase a five-year annuity that will pay $2,358.65 per year for five years. The payments occur at the beginning of each year. Calculate the effective annual interest rate implied by this arrangement.

A. 8%

B. 9%

C. 10%

D. 11%

50. John House has taken a $250,000 mortgage on his house at an interest rate of 6% per year. If the mortgage calls for 20 equal, annual payments, what is the amount of each payment?

A. $21,796.14

B. $10,500.00

C. $16,882.43

D. $24,327.18

51. John House has taken a 20-year, $250,000 mortgage on his house at an interest rate of 6% per year. What is the value of the mortgage after the payment of the fifth annual installment?

A. $128,958.41

B. $211,689.53

C. $141,019.50

D. $248,719.21

52. If the present value of $1.00 received n years from today at an interest rate of r is 0.3855, then what is the future value of $1.00 invested today at an interest rate of r% for n years?

A. $1.3855

B. $2.594

C. $1.701

D. not enough information is given to solve the problem

53. If the present value of $1.00 received n years from today at an interest rate of r is 0.621, then what is the future value of $1.00 invested today at an interest rate of r% for n years?

A. $1.000

B. $1.610

C. $1.621

D. not enough information is given to solve the problem

54. If the future value of $1 invested today at an interest rate of r% for n years is 9.6463, what is the present value of $1 to be received in n years at r% interest rate?

A. $9.6463

B. $1.0000

C. $0.1037

D. $0.4132

55. If the future value annuity factor at 10% and five years is 6.1051, calculate the equivalent present value annuity factor:

A. 6.1051

B. 3.7908

C. 6.7156

D. 4.8127

56. If the present value annuity factor at 10% for 10 years is 6.1446, what is the equivalent future value annuity factor?

A. 3.1080

B. 15.9375

C. 2.5937

D. 8.4132

57. If the present value annuity factor at 12% for five years is 3.6048, what is the equivalent future value annuity factor?

A. 2.0455

B. 6.3529

C. 1.7623

D. 5.1237

58. If the present value annuity factor at 8% for 10 years is 6.71, what is the equivalent future value annuity factor?

A. 3.108

B. 14.486

C. 2.159

D. 5.384

59. You are considering investing in a retirement fund that requires you to deposit $5,000 per year, and you want to know how much the fund will be worth when you retire. What financial technique should you use to calculate this value?

A. Future value of a single payment

B. Future value of an annuity

C. Present value of an annuity

D. Present value of a perpetuity

60. Mr. Hopper expects to retire in 25 years, and he wishes to accumulate $750,000 in his retirement fund by that time. If the interest rate is 10% per year, how much should Mr. Hopper put into his retirement fund each year in order to achieve this goal? (Assume that he makes payments at the end of each year.)

A. $4,559.44

B. $2,500

C. $7,626.05

D. $8,418.29

61. Mr. Hopper expects to retire in 30 years, and he wishes to accumulate $1,000,000 in his retirement fund by that time. If the interest rate is 12% per year, how much should Mr. Hopper put into his retirement fund at the end of each year in order to achieve this goal?

A. $4,143.66

B. $8,287.32

C. $4,000.00

D. $12,483.17

62. You would like to have enough money saved to receive a growing annuity for 20 years, growing at a rate of 5% per year, with the first payment of $50,000 occurring exactly one year after retirement. How much would you need to save in your retirement fund to achieve this goal? (The interest rate is 10%.)

A. $1,000,000.00

B. $425,678.19

C. $605,604.20

D. $827,431.28

63. You would like to have enough money saved to receive a growing annuity for 25 years, growing at a rate of 4% per year, with the first payment of $60,000 occurring exactly one year after retirement. How much would you need to save in your retirement fund to achieve this goal? (The interest rate is 12%.)

A. $1,500,000.00

B. $632,390

C. $452,165

D. $1,043,287

64. The managers of a firm can maximize stockholder wealth by:

A. taking all projects with positive NPVs.

B. taking all projects with NPVs greater than the cost of investment.

C. taking all projects with NPVs greater than the present value of cash flows.

D. taking only the highest NPV project each year.

65. If you invest $100 at 12% APR for three years, how much would you have at the end of three years using simple interest?

A. $136.00

B. $140.49

C. $240.18

D. $187.13

66. If you invest $100 at 12% APR for three years, how much would you have at the end of three years using compound interest?

A. $136

B. $140.49

C. $240.18

D. $173.18

67. Which of the following statements is true?

A. The process of discounting is the inverse of the process of compounding.

B. Ending balances using simple interest are always greater than ending balances using compound interest at positive interest rates.

C. The present value of an annuity due is always less than the present value of an equivalent ordinary annuity at positive interest rates.

D. The future value of an annuity due is always less than the present value of an equivalent ordinary annuity at positive interest rates.

68. The concept of compound interest is best described as:

A. interest earned on an investment.

B. the total amount of interest earned over the life of an investment.

C. interest earned on interest.

D. the inverse of simple interest.

69. Ms. Colonial has just taken out a $150,000 mortgage at an interest rate of 6% per year. If the mortgage calls for equal monthly payments for 20 years, what is the amount of each payment? (Assume monthly compounding or discounting.)

A. $1,254.70

B. $1,625.00

C. $1,263.06

D. $1,074.65

70. An investment having a 10.47% effective annual rate (EAR) has what APR? (Assume monthly compounding.)

A. 10.99%

B. 9.57%

C. 10.00%

D. 8.87%

71. An investment at 12% APR compounded monthly is equal to an effective annual rate of:

A. 12.68%

B. 12.36%

C. 12.00%

D. 11.87%

72. Mr. Williams expects to retire in 30 years and would like to accumulate $1 million in his pension fund. If the annual interest rate is 12% APR, how much should Mr. Williams put into his pension fund each month in order to achieve his goal? (Assume that Mr. Williams will deposit the same amount each month into his pension fund, using monthly compounding.)

A. $286.13

B. $771.60

C. $345.30

D. $437.13

73. An investment at 10% compounded continuously has an equivalent annual rate of:

A. 10.250%.

B. 10.517%.

C. 10.381%.

D. none of the options.

74. The present value of a $100 per year perpetuity at 10% per year interest rate is $1000. What would be the present value of this perpetuity if the payments were compounded continuously?

A. $1000.00

B. $1049.21

C. $1024.40

D. $986.14

75. You just inherited a trust that will pay you $100,000 per year in perpetuity. However, the first payment will not occur for exactly four more years. Assuming an 8% annual interest rate, what is the value of this trust?

A. $918,787

B. $992,290

C. $1,000,000

D. $1,250,000

76. You just inherited a trust that will pay you $100,000 per year in perpetuity. However, the first payment will not occur for exactly four more years. Assuming a 10% annual interest rate, what is the value of this trust?

A. $683,013

B. $751,315

C. $1,000,000

D. $1,100,000

77. You just inherited a trust that will pay you $100,000 per year in perpetuity. However, the first payment will not occur for exactly five more years. Assuming an 8% annual interest rate, what is the value of this trust?

A. $850,729

B. $918,787

C. $1,000,000

D. $1,250,000

78. You just inherited a trust that will pay you $100,000 per year in perpetuity. However, the first payment will not occur for exactly five more years. Assuming a 10% annual interest rate, what is the value of this trust?

A. $620,921

B. $683,013

C. $1,000,000

D. $1,100,000

True / False Questions

79. The rate of return, discount rate, hurdle rate, and opportunity cost of capital all have the same meaning.

True False

80. A dollar today is worth more than a dollar tomorrow if the interest rate is

positive. True False

81. One can find the present value of a future cash flow by dividing it by an appropriate discount factor.

True False

82. One can find a project's net present value by subtracting the present value of its required investment from the present value of its future cash flows.

True False

83. The opportunity cost of capital is higher for safe investments than for risky

ones. True False

84. A safe dollar is always worth less than a risky dollar because the rate of return on a safe investment is generally low and the rate of return on a risky investment is generally high.

True False

85. "Accept investments that have positive net present values" is called the net present value

rule. True False

86. Generally, one should accept investments that offer rates of return in excess of their opportunity costs of capital.

True False

87. The rate of return on any perpetuity is equal to its cash flow multiplied by its

price. True False

88. An annuity is an asset that pays a fixed amount each period for a specified number of periods.

True False

89. The value of a five-year annuity is equal to the sum of two perpetuities. One makes its first payment in year 1, and the other makes its first payment in year 6.

True False

90. An equal-payment home mortgage is an example of an

annuity. True False

91. In the amortization of a mortgage loan with equal payments, the fraction of each payment devoted to interest steadily increases over time and the fraction devoted to reducing the loan balance decreases steadily.

True False

92. The present value of a growing perpetuity, with cash flow C1 occurring one year from now, is given by:

$[C_1/(r - g)]$, where r >

g. True False

93. The calculation of compound interest assumes reinvestment of interest payments at the given rate of return.

True False

Short Answer Questions

94. Briefly explain the term discount rate.

95. Intuitively explain the concept of present value.

96. State the net present value rule.

97. Briefly explain the concept of risk.

98. State the rate of return rule.

99. Discuss why a dollar tomorrow cannot be worth less than a dollar the day after tomorrow.

100.Define the term perpetuity.

101. Describe how you would go about finding the present value of any annuity given the formula for the present value of a perpetuity.

102.What is the difference between simple interest and compound interest?

103.Briefly explain continuous compounding.

Chapter 02 How to Calculate Present Values Answer Key

Multiple Choice Questions

1. The present value of $100.00 expected two years from today at a discount rate of 6% is:

A. $112.36.

B. $106.00.

C. $100.00.

D. $89.00.

PV = 100/(1.06^2) = 89.00.

Type: Easy

2. Present value is defined as:

A. future cash flows discounted to the present by an appropriate discount rate.

B. inverse of future cash flows.

C. present cash flows compounded into the future.

D. future cash flows multiplied by the factor $(1 + r)^t$.

Type: Easy

3. If the annual interest rate is 12.00%, what is the two-year discount factor?

A. 0.7972

B. 0.8929

C. 1.2544

D. 0.8065

DF2 = 1/(1.12^2) = 0.7972.

Type: Easy

4. If the present value of cash flow X is $240, and the present value of cash flow Y is $160, then the present value of the combined cash flows is:

A. $240.

B. $160.

C. $80.

D. $400.

PV (x + y) = PV (x) + PV (y) = 240 + 160 = 400.

Type: Easy

5. The rate of return is also called the: I) discount rate; II) hurdle rate; III) opportunity cost of capital

A. I only.

B. I and II only.

C. I, II, and III.

D. I and III only.

Type: Easy

6. The present value of $121,000 expected one year from today at an interest rate (discount rate) of 10% per year is:

A. $121,000.

B. $100,000.

C. $110,000.

D. $108,900.

PV = (121,000)/(1.10) = 110,000.

Type: Easy

7. The one-year discount factor, at a discount rate of 25% per year, is:

A. 1.25.

B. 1.0.

C. 0.8.

D. 0.75.

Discount factor = 1/1.25 = 0.8.

Type: Easy

8. The one-year discount factor, at an interest rate of 100% per year, is:

A. 1.50.

B. 0.50.

C. 0.25.

D. 1.00.

Discount factor = 1/(1 + 1.00) = 0.5.

Type: Easy

9. The present value of $100,000 expected at the end of one year, at a discount rate of 25% per year, is:

A. $80,000.

B. $125,000.

C. $100,000.

D. $75,000.

PV = (100,000)/(1 + 0.25) = 80,000.

Type: Easy

10. If the one-year discount factor is 0.8333, what is the discount rate (interest rate) per year?

A. 10%

B. 20%

C. 30%

D. 40%

DF = $1/(1 + r)^{1}$ = 0.8333; 1 + r = 1/0.8333; r = 20%.

Type: Medium

11. If the present value of $480 to be paid at the end of one year is $400, what is the one-year discount factor?

A. 0.8333

B. 1.20

C. 0.20

D. 1.00

Discount factor is = 400/480 = 0.8333.

Type: Medium

12. If the present value of $250 expected one year from today is $200, what is the one-year discount rate?

A. 10%

B. 20%

C. 25%

D. 30%

1 + r = 250/200 = 1.25; r = 25%.

Type: Medium

13. If the one-year discount factor is 0.90, what is the present value of $120 expected one year from today?

A. $100

B. $96

C. $108

D. $133

PV = (120)(0.90) = 108.

Type: Medium

14. If the present value of $600, expected one year from today, is $400, what is the one-year discount rate?

A. 15%

B. 20%

C. 25%

D. 50%

1 + r = (600)/(400) = 1.5; r = 50%.

Type: Medium

15. The present value formula for a cash flow expected one period from now is:

A. $PV = C_1 \times (1 + r)$.

B. $PV = C_1/(1 + r)$.

C. $PV = C_1/r$.

D. $PV = (1 + r)/C_1$.

Type: Medium

16. The net present value formula for one period is:

A. $NPV = C_0 + [C_1/(1 + r)]$.

B. NPV = PV required investment.

C. $NPV = C_0/C_1$.

D. $NPV = C_1/C_0$.

Type: Medium

17. An initial investment of $400,000 is expected to produce an end-of-year cash flow of $480,000. What is the NPV of the project at a discount rate of 20%?

A. $176,000

B. $80,000

C. $0 (zero)

D. $64,000

NPV = -400,000 + (480,000/1.2) = 0.

Type: Medium

18. If the present value of a cash flow generated by an initial investment of $200,000 is $250,000, what is the NPV of the project?

A. $250,000

B. $50,000

C. $200,000

D. -$50,000

NPV = -200,000 + 250,000 = 50,000.

Type: Easy

19. What is the present value of the following cash flows at a discount rate of 9%?

Year 1	Year 2	Year 3
$100,000	$150,000	$200,000

A. $372,431.81

B. $450,000.00

C. $405,950.68

D. $412,844.04

PV = (100,000/1.09) + (150,000/(1.09^2)) + 200,000/(1.09^3) = 372,431.81.

Type: Medium

20. At an interest rate of 10%, which of the following sequences of cash flows should you prefer?

	Year 1	Year 2	Year 3
A)	500	300	100
B)	100	300	500
C)	300	300	300
D)	Any of the above as they all add up to $900		

A. option A

B. option B

C. option C

D. option D

PV(A) = 777.61; PV(B) = 714.50; PV(C) = 746.05; A is preferred.

Type: Medium

21. What is the net present value of the following cash flow sequence at a discount rate of 11%?

t=0	t=1	t=2
-120,000	300,000	-100,000

A. $69,108.03

B. $231,432.51

C. $80,000.00

D. $88,000.00

NPV = -120,000 + (300,000/1.11) -(100,000/(1.11^2)) = 69,108.03.

Type: Medium

22. What is the net present value of the following sequence of annual cash flows at a discount rate of 16% APR?

t=1	t=2
-100,000	300,000

A. $136,741.97

B. $122,948.87

C. $158,620.69

D. $139,418.23

PV = (-100,000/1.16) + (300,000/(1.16^2)) = 136,741.97.

Type: Medium

23. What is the net present value (NPV) of the following sequence of cash flows at a discount rate of 9%?

t = 0	t = 1	t=2	t=3
-250,000	100,000	150,000	200,000

A. $122,431.81

B. $200,000.00

C. $155,950.68

D. $177,483.77

NPV = -250,000 + (100,000/1.09) + (150,000/(1.09^2)) + (200,000/(1.09^3)).

NPV = 122,431.81.

Type: Medium

24. Which of the following statements regarding the NPV rule and the rate of return rule is false?

A. Accept a project if its NPV > 0.

B. Reject a project if the NPV < 0.

C. Accept a project if its rate of return > 0.

D. Accept a project if its rate of return > opportunity cost of capital.

Type: Difficult

25. An initial investment of $500 produces a cash flow of $550 one year from today. Calculate the rate of return on the project.

A. 10%

B. 15%

C. 20%

D. 25%

Rate of return = (550 - 500)/500 = 10%.

Type: Easy

26. According to the net present value rule, an investment in a project should be made if the:

A. net present value is greater than the cost of investment.

B. net present value is greater than the present value of cash flows.

C. net present value is positive.

D. net present value is negative.

Type: Difficult

27. Which of the following statements regarding the net present value rule and the rate of return rule is false?

A. Accept a project if NPV > cost of investment.

B. Accept a project if NPV is positive.

C. Accept a project if return on investment exceeds the rate of return on an equivalent-risk investment in the financial market.

D. Reject a project if NPV is negative.

Type: Difficult

28. The opportunity cost of capital for a risky project is:

A. the expected rate of return on a government security having the same maturity as the project.

B. the expected rate of return on a well-diversified portfolio of common stocks.

C. the expected rate of return on a security of similar risk as the project.

D. The expected rate of return on a typical bond portfolio.

Type: Difficult

29. A perpetuity is defined as a sequence of:

A. equal cash flows occurring at equal intervals of time for a specific number of periods.

B. equal cash flows occurring at equal intervals of time forever.

C. unequal cash flows occurring at equal intervals of time forever.

D. unequal cash flows occurring at equal intervals of time for a specific number of periods.

Type: Easy

30. Which of the following is generally considered an example of a perpetuity?

A. Interest payments on a 10-year bond

B. Interest payments on a 30-year bond

C. Interest payments on a consol

D. Interest payments on government bonds

Type: Easy

31. You would like to have enough money saved after your retirement such that you and your heirs can receive $100,000 per year in perpetuity. How much would you need to have saved at the time of your retirement in order to achieve this goal? (Assume that the perpetuity payments start one year after the date of your retirement. The annual interest rate is 12.5%.)

A. $1,000,000

B. $10,000,000

C. $800,000

D. $1,125,000

PV = (100,000/0.125) = 800,000.

Type: Medium

32. What is the present value of $10,000 per year in perpetuity at an interest rate of 10%?

A. $10,000

B. $100,000

C. $200,000

D. $1,000

PV = (10,000/0.10) = 100,000.

Type: Easy

33. You would like to have enough money saved to receive $80,000 per year in perpetuity after retirement for you and your heirs. How much would you need to have saved in your retirement fund to achieve this goal? (Assume that the perpetuity payments start one year from the date of your retirement. The annual interest rate is 8%.)

A. $7,500,000

B. $750,000

C. $1,000,000

D. $800,000

PV = (80,000/0.08) = 1,000,000.

Type: Medium

34. You would like to have enough money saved to receive a $50,000 per year perpetuity after retirement. How much would you need to have saved in your retirement fund to achieve this goal? (Assume that the perpetuity payments start on the day of your retirement. The annual interest rate is 8%.)

A. $1,000,000
B. $675,000
C. $625,000
D. $500,000

PV = [50,000/0.08)] × (1.08) = 675,000; or PV = 50,000 + 50,000/0.08.

Type: Difficult

35. You would like to have enough money saved to receive an $80,000 per year perpetuity after retirement. How much would you need to have saved in your retirement fund to achieve this goal? (Assume that the perpetuity payments start on the day of your retirement. The annual interest rate is 10%.)

A. $1,500,000
B. $880,000
C. $800,000
D. $80,000

PV = [(80,000/0.10)] × (1.1) = 880,000; or PV = 80,000 + 80,000/0.10.

Type: Difficult

36. An annuity is defined as a set of:

A. equal cash flows occurring at equal intervals of time for a specified period.

B. equal cash flows occurring at equal intervals of time forever.

C. unequal cash flows occurring at equal intervals of time forever.

D. unequal cash flows occurring at equal intervals of time for a specified period.

Type: Easy

37. If you are paid $1,000 at the end of each year for the next five years, what type of cash flow did you receive?

A. uneven cash flow stream

B. an annuity

C. an annuity due

D. a perpetuity

Type: Easy

38. If the three-year present value annuity factor is 2.673 and the two-year present value annuity factor is 1.833, what is the present value of $1 received at the end of the three years?

A. $1.19

B. $0.84

C. $0.89

D. $0.92

PV = (2.673 - 1.833) × (1) = 0.84.

Type: Difficult

39. If the five-year present value annuity factor is 3.60478 and the four-year present value annuity factor is 3.03735, what is the present value at the $1 received at the end of five years?

A. $0.63552

B. $1.76233

C. $0.56743

D. $1.2132

PV = (3.60478 - 3.03735) × (1) = 0.56743.

Type: Difficult

40. What is the eight-year present value annuity factor at a discount rate of 11%?

A. 5.7122

B. 11.8594

C. 5.1461

D. 6.9158

PV annuity factor = (1/0.11) - (1/((0.11)(1.11^8))) = 5.1461.

Type: Medium

41. What is the six-year present value annuity factor at an interest rate of 9%?

A. 7.5233

B. 4.4859

C. 1.6771

D. 3.1432

PV annuity factor = (1/0.09) - (1/((0.09)(1.09^6))) = 4.4859.

Type: Medium

42. What is the present value of a $1,000 per year annuity for five years at an interest rate of 12%?

A. $6,352.85

B. $3,604.78

C. $567.43

D. $2,743.28

PV annuity factor = [(1/0.12) - (1/((0.12)(1.12^ 5)))] × 1000 = 3,604.78.

Type: Medium

43. What is the present value of a six-year, $5,000 per year annuity at a discount rate of 10%?

A. $21,776.30

B. $3,371.91

C. $16,760.78

D. $18,327.82

PV = [(1/0.10) - (1/((0.10)(1.10^6)))] × 5000 = 21,776.30.

Type: Medium

44. After retirement, you expect to live for 25 years. You would like to have $75,000 income each year. How much should you have saved in your retirement account to receive this income, if the interest rate is 9% per year? (Assume that the payments start on the day of your retirement.)

A. $736,693.47

B. $802,995.88

C. $2,043,750.21

D. $1,427,831.93

PV = [[(1/0.09) - (1/((0.09)(1.09^25)))] × 75,000] × (1.09) = 802,995.88. Alternatively, [(75,000/.09) × [1 - (1/(1.09^25))]] × (1.09) = 802,995.88.

Type: Difficult

45. After retirement, you expect to live for 25 years. You would like to have $75,000 income each year. How much should you have saved in your retirement account to receive this income if the interest rate is 9% per year? (Assume that the payments start one year after your retirement.)

A. $736,693.47

B. $83,431.17

C. $1,875,000

D. $1,213,487.12

PV = [(1/0.09) - (1/((0.09)(1.09^25)))] × 75,000 = 736,693.47. Alternatively, [(75,000/.09) × [1 - (1/(1.09^25)]] = 736,693.47.

Type: Difficult

46. For $10,000, you can purchase a five-year annuity that will pay $2,504.57 per year for five years. The payments occur at the end of each year. Calculate the effective annual interest rate implied by this arrangement.

A. 8%

B. 9%

C. 10%

D. 11%

Using a financial calculator: N = 5; PV = -10,000; PMT = 2504.57; FV = 0.

Compute: I = 8.0% [calculator setting: END].

Type: Medium

47. If the present value annuity factor for 10 years at 10% interest rate is 6.1446, what is the present value annuity factor for an equivalent annuity due?

A. 6.1446

B. 7.3800

C. 6.7590

D. 5.7321

Annuity due: 6.1446 × 1.1 = 6.7590.

Type: Difficult

48. If the present value annuity factor is 3.8896, what is the present value annuity factor for an equivalent annuity due if the interest rate is 9%?

A. 3.5684

B. 4.2397

C. 3.8896

D. 5.3127

Annuity due factor = 3.8896 × 1.09 = 4.2397.

Type: Medium

49. For $10,000, you can purchase a five-year annuity that will pay $2,358.65 per year for five years. The payments occur at the beginning of each year. Calculate the effective annual interest rate implied by this arrangement.

A. 8%

B. 9%

C. 10%

D. 11%

Using a financial calculator: N = 5; PV = -10,000; PMT = 2358.65; FV = 0.

Compute: I = 9.0% [Calculator setting: BEGIN (BGN)].

Type: Medium

50. John House has taken a $250,000 mortgage on his house at an interest rate of 6% per year. If the mortgage calls for 20 equal, annual payments, what is the amount of each payment?

A. $21,796.14

B. $10,500.00

C. $16,882.43

D. $24,327.18

Use a financial calculator: PV = 250,000; I - = 6%; N = 20; FV = 0.

Compute PMT = -$21,796.14.

Type: Difficult

51. John House has taken a 20-year, $250,000 mortgage on his house at an interest rate of 6% per year. What is the value of the mortgage after the payment of the fifth annual installment?

A. $128,958.41

B. $211,689.53

C. $141,019.50

D. $248,719.21

Step 1: I = 6%; N = 20; PV = 250,000; FV = 0. Compute PMT = 21,796.14.
Step 2: I = 6%; N = 15; PMT = 21,796.14. Compute PV = 211,689. 53.

Type: Difficult

52. If the present value of $1.00 received n years from today at an interest rate of r is 0.3855, then what is the future value of $1.00 invested today at an interest rate of r% for n years?

A. $1.3855

B. $2.594

C. $1.701

D. not enough information is given to solve the problem

FV = 1/(0.3855) = 2.594.

Type: Difficult

53. If the present value of $1.00 received n years from today at an interest rate of r is 0.621, then what is the future value of $1.00 invested today at an interest rate of r% for n years?

A. $1.000

B. $1.610

C. $1.621

D. not enough information is given to solve the problem

FV = 1/(0.621) = 1.61.

Type: Difficult

54. If the future value of $1 invested today at an interest rate of r% for n years is 9.6463, what is the present value of $1 to be received in n years at r% interest rate?

A. $9.6463

B. $1.0000

C. $0.1037

D. $0.4132

PV = 1/9.6463 = 0.1037.

Type: Difficult

55. If the future value annuity factor at 10% and five years is 6.1051, calculate the equivalent present value annuity factor:

A. 6.1051

B. 3.7908

C. 6.7156

D. 4.8127

PV = 6.1051/(1.1)^5 = 3.7908.

Type: Difficult

56. If the present value annuity factor at 10% for 10 years is 6.1446, what is the equivalent future value annuity factor?

A. 3.1080

B. 15.9375

C. 2.5937

D. 8.4132

FV annuity factor = 6.1446 × (1.1^10) = 15.9375.

Type: Difficult

57. If the present value annuity factor at 12% for five years is 3.6048, what is the equivalent future value annuity factor?

A. 2.0455

B. 6.3529

C. 1.7623

D. 5.1237

FV annuity factor = 3.6048 × (1.12^5) = 6.3529.

Type: Difficult

58. If the present value annuity factor at 8% for 10 years is 6.71, what is the equivalent future value annuity factor?

A. 3.108

B. 14.486

C. 2.159

D. 5.384

FV annuity factor = 6.71 × (1.08^10) = 14.486.

Type: Difficult

59. You are considering investing in a retirement fund that requires you to deposit $5,000 per year, and you want to know how much the fund will be worth when you retire. What financial technique should you use to calculate this value?

A. Future value of a single payment

B. Future value of an annuity

C. Present value of an annuity

D. Present value of a perpetuity

Type: Easy

60. Mr. Hopper expects to retire in 25 years, and he wishes to accumulate $750,000 in his retirement fund by that time. If the interest rate is 10% per year, how much should Mr. Hopper put into his retirement fund each year in order to achieve this goal? (Assume that he makes payments at the end of each year.)

A. $4,559.44

B. $2,500

C. $7,626.05

D. $8,418.29

Future value annuity factor = [(1.1^25) - 1]/(0.1) =

98.347; payment = 750,000/98.347 = 7626.05.

Type: Difficult

61. Mr. Hopper expects to retire in 30 years, and he wishes to accumulate $1,000,000 in his retirement fund by that time. If the interest rate is 12% per year, how much should Mr. Hopper put into his retirement fund at the end of each year in order to achieve this goal?

A. $4,143.66

B. $8,287.32

C. $4,000.00

D. $12,483.17

Future value annuity factor = [(1.12^30 - 1]/(0.12) = 241.3327;

payment = 1,000,000/241.3327 = 4143.66.

Type: Difficult

62. You would like to have enough money saved to receive a growing annuity for 20 years, growing at a rate of 5% per year, with the first payment of $50,000 occurring exactly one year after retirement. How much would you need to save in your retirement fund to achieve this goal? (The interest rate is 10%.)

A. $1,000,000.00

B. $425,678.19

C. $605,604.20

D. $827,431.28

PV = (50,000)[(1/(0.1 - 0.05)) - {(1/(0.1 - 0.05)}{(1.05^20)/(1.10^20)}] = 605,604.20.

Type: Difficult

63. You would like to have enough money saved to receive a growing annuity for 25 years, growing at a rate of 4% per year, with the first payment of $60,000 occurring exactly one year after retirement. How much would you need to save in your retirement fund to achieve this goal? (The interest rate is 12%.)

A. $1,500,000.00

B. $632,390

C. $452,165

D. $1,043,287

PV = (60,000) [(1/(0.12 - 0.04)) - {(1/(0.12 - 0.04)}{(1.04^25)/(1.12^25)}] = 632,390.

Type: Difficult

64. The managers of a firm can maximize stockholder wealth by:

A. taking all projects with positive NPVs.

B. taking all projects with NPVs greater than the cost of investment.

C. taking all projects with NPVs greater than the present value of cash flows.

D. taking only the highest NPV project each year.

Type: Medium

65. If you invest $100 at 12% APR for three years, how much would you have at the end of three years using simple interest?

A. $136.00

B. $140.49

C. $240.18

D. $187.13

FV = 100 + (100 x 0.12 × 3) = $136.

Type: Medium

66. If you invest $100 at 12% APR for three years, how much would you have at the end of three years using compound interest?

A. $136

B. $140.49

C. $240.18

D. $173.18

FV = 100 × (1.12^3) = $140.49.

Type: Medium

67. Which of the following statements is true?

A. The process of discounting is the inverse of the process of compounding.

B. Ending balances using simple interest are always greater than ending balances using compound interest at positive interest rates.

C. The present value of an annuity due is always less than the present value of an equivalent ordinary annuity at positive interest rates.

D. The future value of an annuity due is always less than the present value of an equivalent ordinary annuity at positive interest rates.

Type: Difficult

68. The concept of compound interest is best described as:

A. interest earned on an investment.

B. the total amount of interest earned over the life of an investment.

C. interest earned on interest.

D. the inverse of simple interest.

Type: Medium

69. Ms. Colonial has just taken out a $150,000 mortgage at an interest rate of 6% per year. If the mortgage calls for equal monthly payments for 20 years, what is the amount of each payment? (Assume monthly compounding or discounting.)

A. $1,254.70

B. $1,625.00

C. $1,263.06

D. $1,074.65

PMT = 150,000/[(1/0.005) - 1/((0.005 × ((1 + 0.005)^240)))] = $1,074.65.

Type: Difficult

70. An investment having a 10.47% effective annual rate (EAR) has what APR? (Assume monthly compounding.)

A. 10.99%

B. 9.57%

C. 10.00%

D. 8.87%

NOM = [(1.1047)^(1/12) - 1] × 12 = 0.1 = 10.00%.

Type: Medium

71. An investment at 12% APR compounded monthly is equal to an effective annual rate of:

A. 12.68%

B. 12.36%

C. 12.00%

D. 11.87%

EAR = ((1 + 0.12/12)^12) - 1 = 0.12681 = 12.68%.

Type: Medium

72. Mr. Williams expects to retire in 30 years and would like to accumulate $1 million in his pension fund. If the annual interest rate is 12% APR, how much should Mr. Williams put into his pension fund each month in order to achieve his goal? (Assume that Mr. Williams will deposit the same amount each month into his pension fund, using monthly compounding.)

A. $286.13

B. $771.60

C. $345.30

D. $437.13

PMT = 1,000,000/{[(1/0.01) - (1/(0.01 × (1.01^360)))] × (1.01^360)} = $286.13.

Type: Difficult

73. An investment at 10% compounded continuously has an equivalent annual rate of:

A. 10.250%.

B. 10.517%.

C. 10.381%.

D. none of the options.

(e^(0.1)) - 1 = 0.10517 = 10.517%.

Type: Difficult

74. The present value of a $100 per year perpetuity at 10% per year interest rate is $1000. What would be the present value of this perpetuity if the payments were compounded continuously?

A. $1000.00

B. $1049.21

C. $1024.40

D. $986.14

(e^r) = 1.1; r = ln(1.1) = 0.09531; PV = 100/0.09531 = $1049.21.

Type: Difficult

75. You just inherited a trust that will pay you $100,000 per year in perpetuity. However, the first payment will not occur for exactly four more years. Assuming an 8% annual interest rate, what is the value of this trust?

A. $918,787

B. $992,290

C. $1,000,000

D. $1,250,000

PV (@ t = 3) = 100,000/0.08 = $1,250,000; PV (@ t = 0) = 1,250,000/(1.08)^3 = $992,290.

Type: Difficult

76. You just inherited a trust that will pay you $100,000 per year in perpetuity. However, the first payment will not occur for exactly four more years. Assuming a 10% annual interest rate, what is the value of this trust?

A. $683,013

B. $751,315

C. $1,000,000

D. $1,100,000

PV (@ t = 3) = 100,000/0.10 = $1,000,000; PV (@ t = 0) = 1,000,000/(1.10)^3 = $751,315.

Type: Difficult

77. You just inherited a trust that will pay you $100,000 per year in perpetuity. However, the first payment will not occur for exactly five more years. Assuming an 8% annual interest rate, what is the value of this trust?

A. $850,729

B. $918,787

C. $1,000,000

D. $1,250,000

PV (@ t = 3) = 100,000/0.08 = $1,250,000; PV (@ t = 0) = 1,250,000/(1.08)^4 = $918,787.

Type: Difficult

78. You just inherited a trust that will pay you $100,000 per year in perpetuity. However, the first payment will not occur for exactly five more years. Assuming a 10% annual interest rate, what is the value of this trust?

A. $620,921

B. $683,013

C. $1,000,000

D. $1,100,000

PV (@ t = 3) = 100,000/0.10 = $1,000,000; PV (@ t = 0) = 1,000,000/(1.10)^4 = $683,013.

Type: Difficult

True / False Questions

79. The rate of return, discount rate, hurdle rate, and opportunity cost of capital all have the same meaning.

TRUE

Type: Medium

80. A dollar today is worth more than a dollar tomorrow if the interest rate is positive.

TRUE

Type: Easy

81. One can find the present value of a future cash flow by dividing it by an appropriate discount factor.

FALSE

Type: Medium

82. One can find a project's net present value by subtracting the present value of its required investment from the present value of its future cash flows.

TRUE

Type: Medium

83. The opportunity cost of capital is higher for safe investments than for risky ones.

FALSE

Type: Medium

84. A safe dollar is always worth less than a risky dollar because the rate of return on a safe investment is generally low and the rate of return on a risky investment is generally high.

FALSE

Type: Difficult

85. "Accept investments that have positive net present values" is called the net present value rule.

TRUE

Type: Medium

86. Generally, one should accept investments that offer rates of return in excess of their opportunity costs of capital.

TRUE

Type: Medium

87. The rate of return on any perpetuity is equal to its cash flow multiplied by its price.

FALSE

Type: Medium

88. An annuity is an asset that pays a fixed amount each period for a specified number of periods.

TRUE

Type: Easy

89. The value of a five-year annuity is equal to the sum of two perpetuities. One makes its first payment in year 1, and the other makes its first payment in year 6.

FALSE

Type: Difficult

90. An equal-payment home mortgage is an example of an annuity.

TRUE

Type: Medium

91. In the amortization of a mortgage loan with equal payments, the fraction of each payment devoted to interest steadily increases over time and the fraction devoted to reducing the loan balance decreases steadily.

FALSE

Type: Difficult

92. The present value of a growing perpetuity, with cash flow C1 occurring one year from now, is given by:
$[C_1/(r - g)]$, where $r > g$.

TRUE

Type: Difficult

93. The calculation of compound interest assumes reinvestment of interest payments at the given rate of return.

TRUE

Type: Medium

Short Answer Questions

94. Briefly explain the term discount rate.

The discount rate is the rate of return used for discounting future cash flows to obtain present values. The discount rate can be obtained by looking at the rate of return on an equivalent-risk investment opportunity in the capital market.

Type: Difficult

95. Intuitively explain the concept of present value.

If you have $100 today, you can invest it and start earning interest on it. On the other hand, if you have to make a payment of $100 one year from today, you do not need to invest $100 today, but a lesser amount. The lesser amount invested today plus the interest earned on it should add up to $100. The present value of $100 one year from today at an interest rate of 10% is $90.91. [PV = 100/1.1 = 90.91.]

Type: Difficult

96. State the net present value rule.

Invest in projects with positive net present values. Net present value is the difference between the present value of future cash flows from the project and the present value of the initial investment.

Type: Medium

97. Briefly explain the concept of risk.

If the future cash flows from an investment are not certain, then we call such an investment risky. That means there is an uncertainty about the future cash flows or future cash flows could be different from expected cash flows. The degree of uncertainty varies from investment to investment. Uncertain cash flows are discounted using a higher discount rate than certain cash flows. This is only one method of dealing with risk. There are many ways to consider risk while making financial decisions.

Type: Difficult

98. State the rate of return rule.

Invest as long as the rate of return on the investment exceeds the rate of return on equivalent-risk investments in the capital market.

Type: Medium

99. Discuss why a dollar tomorrow cannot be worth less than a dollar the day after tomorrow.

If a dollar tomorrow were worth less than a dollar a day after tomorrow, it would be possible to earn a very large amount of money through a "money-machine" effect. This is only possible if someone else is losing a very large amount of money. These conditions can only exist for a short period and cannot exist in equilibrium as the source of money is quickly exhausted. Thus, a dollar tomorrow cannot be worth less than a dollar the day after tomorrow.

Type: Difficult

100. Define the term perpetuity.

A perpetuity is defined as a sequence of equal cash flows occurring each period forever.

Type: Medium

101. Describe how you would go about finding the present value of any annuity given the formula for the present value of a perpetuity.

The present value of any annuity can be thought of as the difference between two perpetuities: one payment starting in year 1 (immediate) and one starting in year (n + 1)(delayed). By calculating the difference between the present values of these two perpetuities today we can find the present value of an annuity.

Type: Medium

102. What is the difference between simple interest and compound interest?

When money is invested at compound interest, each interest payment is reinvested to earn more interest in subsequent periods. In the simple interest case, the interest is paid only on the initial investment.

Type: Medium

103. Briefly explain continuous compounding.

As the frequency of compounding increases, the effective rate on an investment also increases. In the case of continuous compounding, the compounding frequency goes to infinity. In this case, the nature of the function also changes. The effective interest rate is given by (e^r - 1), where the value of e = 2.718, where e is the base for natural logarithms.

Type: Difficult