Time Value of Money Problems

1. What will a deposit of $4,500 at 10% compounded semiannually be worth if left in the bank for six years?

- a. $8,020.22
- b. $7,959.55
- c. $8,081.55
- d. $8,181.55

2. What will a deposit of $4,500 at 7% annual interest be worth if left in the bank for nine years?

- a. $8,273.25
- b. $8,385.78
- c. $8,279.23
- d. $7,723.25

3. What will a deposit of $4,500 at 12% compounded monthly be worth at the end of 10 years?

- a. $14,351.80
- b. $14,851.80
- c. $13,997.40
- d. $14,304.80

4. How much will $1,000 deposited in a savings account earning an annual interest rate of 6 percent be worth at the end of 5 years?

- a. $1,338
- b. $1,348
- c. $1,388
- d. $1,438

5. How much will $1,000 deposited in a savings account earning a compound annual interest rate of 6 percent be worth at the end of 3 years?

- a. $1,199
- b. $1,191
- c. $1,891
- d. $1,389

6. Given an annual opportunity cost of 10%, what is the future value of a $1,000 ordinary annuity for 1 year?

- a. $1,200
- b. $1,120
- c. $1,100
- d. $1,210

7. Given an annual opportunity cost of 10%, what is the future value of a $1,000 ordinary annuity for 10 years?

- a. $15,937
- b. $15,739
- c. $10,000
- d. $12,000

8. If you require a 9 percent annual return on your investments, you would prefer $15,000 five years from today rather than an ordinary annuity of $1,000 per year for 15 years.

- a. True
- b. False

9. How long does it take for $5,000 to grow into $6,724.44 at 10% compounded quarterly?

- a. 2 years.
- b. 3 years.
- c. 4 years.
- d. 30 months.

10. How long does it take for $856 to grow into $1,122 at an annual interest rate of 7%?

- a. 2 years.
- b. 6 years.
- c. 4 years.
- d. 30 months.

11. How much will an ordinary annuity of $650 per year be worth in eight years at an annual interest rate of 6 percent?

- a. $8,975.38
- b. $6,897.76
- c. $7,021.80
- d. $6,433.38

12. How much will an ordinary annuity of $650 per year be worth in eight years at an annual interest rate of 8 percent?

- a. $4,800.27
- b. $6,366.10
- c. $6,913.79
- d. $6,822.79

13. How much must you deposit at the end of each year in an account that pays an annual interest rate of 20 percent, if at the end of 5 years you want $10,000 in the account?

- a. $1,500
- b. $1,250.66
- c. $1,393.47
- d. $1,343.72

14. The Wintergreens are planning ahead for their son's education. He's eight now and will start college in 10 years. How much will they have to set aside at the end of each year to have $65,000 in 10 years if the annual interest rate is 7%?

- a. $4,704.55
- b. $4,500
- c. $3,975.89
- d. $4,624.55

15. What annual interest rate would you need in order to have an ordinary annuity of $7,500 per year accumulate to $279,600 in 15 years?

- a. 8.75%
- b. 10.2%
- c. 12%
- d. 14%

16. What annual interest rate is implied if you lend someone $1,850 and are repaid $2,078.66 in two years?

- a. 4%
- b. 5%
- c. 6%
- d. 5.5%

17. What nominal annual interest rate is implied if you borrow $12,500 and repay $21,364.24 in three years with monthly compounding?

- a. 12%
- b. 15%
- c. 17%
- d. 18%

18. You have $10,000 to invest. Assuming annual compounding, how long will it take for the $10,000 to double if it is invested at an annual interest rate of 14 percent?

- a. 6 years.
- b. 4.5 years.
- c. 5.29 years.
- d. 6.14 years.

19. The Tried and True Corporation had earnings of $0.20 per share in 1978. By 1995, a period of 17 years, its earnings had grown to $1.01 per share. What was the compound annual rate of growth in the company's earnings?

- a. 11%
- b. 10%
- c. 12%
- d. 11.5%

20. What is the present value of $800 to be received at the end of 8 years, assuming an interest rate of 20 percent, quarterly compounding?

- a. $165.00
- b. $172.39
- c. $167.89
- d. $169.89

21. What is the present value of $800 to be received at the end of 8 years, assuming an annual interest rate of 8 percent?

- a. $425
- b. $432
- c. $441
- d. $437

22. What would you pay for an ordinary annuity of $2,000 paid every six months for 12 years if you could invest your money elsewhere at a nominal interest rate of 10% compounded semiannually?

- a. $13,798.60
- b. $25,500.35
- c. $27,597.20
- d. $26,957.20

23. Thirty years ago, Jesse Jones bought 10 acres of land for $1,000 per acre in what is now downtown Houston. If this land grew in value at an annual interest rate of 8 percent, what is it worth today?

- a. $100,630
- b. $180,630
- c. $100,900
- d. $101,630

24. What would you be willing to pay for a $1,000 bond paying $70 interest at the end of each year and maturing in 25 years if you wanted the bond to yield an annual interest rate of 7 percent? (Note: At maturity, the bond will be retired and the holder will receive $1,000 in cash. Bonds typically are issued with $1,000 face, or par, values. The actual market value at any point in time will tend to rise as interest rates fall and fall as interest rates rise.)

- a. $1,100
- b. $958
- c. $1,000
- d. $979

25. What would you be willing to pay for a $1,000 bond paying $70 interest at the end of each year and maturing in 25 years if you wanted the bond to yield an annual interest rate of 12 percent? (Note: At maturity, the bond will be retired and the holder will receive $1,000 in cash. Bonds typically are issued with $1,000 face, or par, values. The actual market value at any point in time will tend to rise as interest rates fall and fall as interest rates rise.)

- a. $601.08
- b. $608.01
- c. $607.41
- d. $701.08

26. A $10,000 car loan has payments of $361.52 due at the end of each month for three years. What is the nominal interest rate?

- a. 15%
- b. 18%
- c. 16%
- d. 10%

27. Joe Ferro's uncle is going to give him $250 a month for the next two years starting today. If Joe deposits every payment in an account paying a nominal annual interest rate of 6% compounded monthly, how much will he have at the end of three years?

- a. $6,976.25
- b. $6,837.28
- c. $6,389.79
- d. $6,796.23

28. Find the present value of $1,000 to be received at the end of 2 years at a 12% nominal annual interest rate compounded quarterly.

- a. $795
- b. $789
- c. $767
- d. $779

29. Find the present value of $1,000 to be received at the end of 4 years at a nominal annual interest rate of 12%, compounded semiannually.

- a. $627
- b. $637
- c. $675
- d. $622

30. Given a 15% annual opportunity cost, $1.00 three years from now is worth more than $2.00 nine years from now.

- a. True
- b. False

31. Your great-uncle Claude is 82 years old. Over the years, he has accumulated savings of $80,000. He estimates that he will live another 10 years at the most and wants to spend his savings by then. (If he lives longer than that, he figures you will be happy to take care of him.) Uncle Claude places his $80,000 into an account earning 10 percent annually and sets it up in such a way that he will be making 10 equal annual withdrawals (the first one occurring 1 year from now) such that his account balance will be zero at the end of 10 years. How much will he be able to withdraw each year?

- a. $13,180.71
- b. $13,614.50
- c. $12,989.22
- d. $13,019.63

32. Your parents have discovered a $1,000 bond at the bottom of their safe deposit box. The bond was given to you by your late great-aunt Hilda on your second birthday. The bond pays an annual interest rate of 5 percent. Interest accumulates and is paid at the time the bond is redeemed. You are now 27 years old. What is the current worth of the bond (principal plus interest)?

- a. $3,500
- b. $3,421
- c. $3,327
- d. $3,386

33. Your mother is planning to retire this year. Her firm has offered her a lump sum retirement payment of $50,000 or a $6,000 lifetime ordinary annuity-whichever she chooses. Your mother is in reasonably good health and expects to live for at least 15 more years. Which option should she choose, assuming that an 8 percent annual interest rate is appropriate to evaluate the annuity?

- a. $51,354
- b. $52,535
- c. $51,862
- d. $52,328

34. A life insurance company has offered you a new "cash grower" policy that will be fully paid up when you turn 45. At that time, it will have a cash surrender value of $18,000. When you turn 65, the policy will have a cash surrender value of $37,728. What annual rate of interest is the insurance company promising you on your investment?

- a. 3%
- b. 4.4%
- c. 3.8%
- d. 4.1%

35. Strikler, Inc. has issued a $10 million, 10-year bond issue. The bonds require Strikler to establish a sinking fund and make 10 equal, end-of-year deposits into the fund. These deposits will earn 8 percent annually, and the sinking fund should have enough accumulated in it at the end of 10 years to retire the bonds. What are the annual sinking fund payments?

- a. $689,294
- b. $677,294
- c. $690,294
- d. $689,342

36. A Baldwin United Company agent has just presented the following offer. If you deposit $25,000 with the firm today, it will pay you $10,000 per year at the end of years 8 through 15. If you require a 15 percent annual rate of return on this type of investment, would you make this investment?

- a. $16,871
- b. $15,871
- c. $16,852
- d. $16,911

37. Determine the value at the end of 3 years of a $10,000 investment (today) in a bank certificate of deposit (CD) that pays a nominal annual interest rate of 8 percent, compounded monthly.

- a. $12,642.37
- b. $12,702.37
- c. $13,652.27
- d. $12,812.37

38. Determine the value at the end of 3 years of a $10,000 investment (today) in a bank certificate of deposit (CD) that pays a nominal annual interest rate of 8 percent, compounded semiannually.

- a. $13,652.19
- b. $13,751.21
- c. $12,653.19
- d. $12,563.21

39. An investment requires an outlay of $100,000 today. Cash inflows from the investment are expected to be $40,000 per year at the end of years 4, 5, 6, 7, and 8. If you require a 20 percent annual rate of return on this type of investment, should the investment be undertaken?

- a. Yes
- b. No

40. Calculate the present value of a perpetuity bond that is expected to pay $50 of interest per year if the investor requires an annual return of 8 percent.

- a. $625
- b. $655
- c. $565
- d. $602

41. Steven White is considering taking early retirement, having saved $400,000. White desires to determine how many years the savings will last if $40,000 per year is withdrawn at the end of each year. White feels the savings can earn 10 percent per year.

- a. 12 years.
- b. 15 years.
- c. 14.5 years.
- d. 10 years.

42. What is the monthly rate of interest that will yield an annual effective interest rate of 12 percent?

- a. 1.499%
- b. 0.949%
- c. 0.953%
- d. 1.949%

THE PROBLEM BANK - SOLUTIONS

Part 1 - Time Value of Money

Section 1 - Basic

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1. What will a deposit of $4,500 at 10% compounded semiannually be worth if left in the bank for six years?

a. $8,020.22
b. $7,959.55
c. **$8,081.55**
d. $8,181.55.

ANSWER: **c**

SOLUTION:

FV = PV [$FVIF_{i,n}$]
FV = $4,500 [$FVIF_{5\%,12}$] = $4,500 (1.7959) = $8,081.55

KEYSTROKES:

HP	**TI**
2 **['] [P/YR]**	4,500 **[+/-] [PV]**
4,500 **[+/-] [PV]**	12 **[N]**
12 **[N]**	10 **[I/Y]**
10 **[I/YR]**	**[CPT] [FV]**
[FV]	
Solution: 8,081.35	**Solution:** 8,081.35

---

2. What will a deposit of $4,500 at 7% annual interest be worth if left in the bank for nine years?

a. **$8,273.25**
b. $8,385.78
c. $8,279.23
d. $7,723.25

ANSWER: **a**

SOLUTION:

FV = PV [$FVIF_{i,n}$]
FV = $4,500 [$FVIF_{7\%,9}$] = $4,500 (1.8385) = $8,273.25

---

3. What will a deposit of $4,500 at 12% compounded monthly be worth at the end of 10 years?

a. $14,351.80
b. **$14,851.80**
c. $13,997.40

d. $14,304.80

ANSWER: **b**

SOLUTION:

$FV = PV\ [FVIF_{i,n}]$
$FV = \$4{,}500\ [FVIF_{1\%,120}] = \$4{,}500\ (3.3004) = \$14{,}851.80$

---

4. How much will $1,000 deposited in a savings account earning an annual interest rate of 6 percent be worth at the end of 5 years?

a. **$1,338**
b. $1,348
c. $1,388
d. $1,438

ANSWER: **a**

SOLUTION:

$FV_5 = \$1{,}000\ (FVIF_{6\%,5}) = \$1{,}000\ (1.338) = \$1{,}338$

---

5. How much will $1,000 deposited in a savings account earning an annual interest rate of 6 percent be worth at the end of 3 years?

a. $1,199
b. **$1,191**
c. $1,891
d. $1,389

ANSWER: **b**

SOLUTION:

$FV_3 = \$1{,}000\ (FVIF_{6\%,3}) = \$1{,}000\ (1.191) = \$1{,}191$

---

6. Given an annual opportunity cost of 10%, what is the future value of a $1,000 ordinary annuity for 1 year?

a. $1,200
b. $1,120
c. **$1,100**
d. $1,210

ANSWER: **c**

SOLUTION:

$FV_1 = (\$1{,}000)\ (FVIFA_{10\%,1}) = (\$1{,}000)\ (1.10) = \$1{,}100$

---

7. Given an annual opportunity cost of 10%, what is the future value of a $1,000 ordinary annuity for 10 years?

a. **$15,937**
b. $15,739
c. $10,000
d. $12,000

ANSWER: **a**

SOLUTION:

$FV_{10} = (\$1{,}000)\ (FVIFA_{10\%,10}) = (\$1{,}000)\ (15.937) = \$15{,}937$

---

8. If you require a 9 percent annual return on your investments, you would prefer $15,000 five years from today rather than an ordinary annuity of $1,000 per year for 15 years.

a. True
b. False

ANSWER: **a**

SOLUTION:

Present Value of $15,000 received in 5 years at 9%:
$PV = \$15{,}000\ (PVIF_{9\%,5}) = \$15{,}000\ (0.650) = \$9{,}750$
Present value of a 15 year, $1,000 ordinary annuity at 9%:
$PVA_{15} = \$1{,}000\ (PVIFA_{9\%,15}) = \$1{,}000\ (8.061) = \$8{,}061$
Therefore, you prefer $15,000 in five years because it has the highest present value.

KEYSTROKES:

HP	**TI**
A) 15,000 **[FV]** 5 **[N]** 9 **[I/YR]** **[PV]** **Partial Solution: -9,748.97 (cost = value)**	**A)** 15,000 **[FV]** 5 **[N]** 9 **[I/Y]** **[CPT] [PV]** **Partial Solution: -9,748.97 (cost = value)**
B) 1,000 **[PMT]** 15 **[N]** 9 **[I/YR]** **[PV]** **Partial Solution: -8,060.69 (cost = value)**	**B)** 1,000 **[PMT]** 15 **[N]** 9 **[I/Y]** **[CPT] [PV]** **Partial Solution: -8,060.69 (cost = value)**
Solution: -9,748.97 (higher cost = higher value)	**Solution:** -9,748.97 (higher cost = higher value)

---

9. How long does it take for $5,000 to grow into $6,724.44 at 10% compounded quarterly?

a. 2 years
b. **3 years**

c. 4 years
d. 30 months

ANSWER: **b**

SOLUTION:

$PV = FV_n [PVIF_{i,n}]$
$\$5,000 = \$6,724.44 [PVIF_{2.5\%,n}]$
$PVIF_{2.5\%,n} = 0.7436$
n = 12 quarters = 3 years

KEYSTROKES:

HP	TI
4 **['] [P/YR]**	**[** 2nd **] [P/Y]** 4 **[ENTER] [** ⇩ **]** 4 **[ENTER]**
5,000 **[** +/- **] [PV]**	5,000 **[** +/- **] [PV]**
6,724.44 **[FV]**	6,724.44 **[FV]**
10 **[I/YR]**	10 **[I/Y]**
[N]	**[CPT] [N]**
Solution: 12 quarters	**Solution:** 12 quarters

---

10. How long does it take for $856 to grow into $1,122 at an annual interest rate of 7%?

a. 2 years
b. 6 years
c. **4 years**
d. 30 months

ANSWER: **c**

SOLUTION:

$PV = FV_n [PVIF_{i,n}]$
$\$856 = \$1,122 [PVIF_{7\%,n}]$
$PVIF_{7\%,n} = 0.7629$
n = 4 years

---

11. How much will an ordinary annuity of $650 per year be worth in eight years at an annual interest rate of 6 percent?

a. $8,975.38
b. $6,897.76
c. $7,021.80
d. **$6,433.38**

ANSWER: **d**

SOLUTION:

$FVA_n = PMT\ [FVIFA_{i,n}]$
$FVA_8 = \$650\ [FVIFA_{6\%,8}] = \$650\ (9.8975) = \$6,433.38$

KEYSTROKES:

HP	TI
650 **[+/-] [PMT]**	650 **[+/-] [PMT]**
8 **[N]**	8 **[N]**
6 **[I/YR]**	6 **[I/Y]**
[FV]	**[CPT] [FV]**
Solution: 6,433.35	**Solution:** 6,433.35

12. How much will an ordinary annuity of $650 per year be worth in eight years at an annual interest rate of 8 percent?

a. $4,800.27
b. $6,366.10
c. **$6,913.79**
d. $6,822.79

ANSWER: **c**

SOLUTION:

$FVA_8 = \$650\ [FVIFA_{8\%,8}] = \$650\ (10.6366) = \$6,913.79$

13. How much must you deposit at the end of each year in an account that pays an annual interest rate of 20 percent, if at the end of 5 years you want $10,000 in the account?

a. $1,500
b. $1,250.66
c. $1,393.47
d. **$1,343.72**

ANSWER: **d**

SOLUTION:

$FVA_5 = \$10,000 = PMT\ (FVIFA_{20\%,5}) = PMT\ (7.442)$
$PMT = \$1,343.72$

14. The Wintergreens are planning ahead for their son's education. He's eight now and will start college in 10 years. How much will they have to set aside at the end of each year to have $65,000 in 10 years if the annual interest rate is 7%?

a. **$4,704.55**
b. $4,500
c. $3,975.89
d. $4,624.55

ANSWER: **a**

SOLUTION:

$FVA_n = PMT\ [FVIFA_{i,n}]$
$\$65,000 = PMT\ [FVIFA_{7\%,10}] = PMT\ (13.8164)$
$PMT = \$4,704.55$

---

15. What annual interest rate would you need in order to have an ordinary annuity of $7,500 per year accumulate to $279,600 in 15 years?

a. 8.75%
b. 10.2%
c. **12%**
d. 14%

ANSWER: **c**

SOLUTION:

$FVA_n = PMT\ [FVIFA_{i,n}]$
$\$279,600 = \$7,500\ [FVIFA_{i,15}]$
$FVIFA_{i,15} = 37.28$
$k = 12\%$

---

16. What annual interest rate is implied if you lend someone $1,850 and are repaid $2,078.66 in two years?

a. 4%
b. 5%
c. **6%**
d. 5.5%

ANSWER: **c**

SOLUTION:

$FV_n = PV\ [FVIF_{i,n}]$
$\$2,078.66 = \$1,850.00\ [FVIF_{i,2}]$
$FVIF_{k,2} = 1.1236$
$i = 6\%$

---

17. What nominal annual interest rate is implied if you borrow $12,500 and repay $21,364.24 in three years with monthly compounding?

a. 12%
b. 15%
c. 17%
d. **18%**

ANSWER: **d**

SOLUTION:

$FV_n = PV\ [FVIF_{i,n}]$
$\$21,364.24 = \$12,500.00\ [FVIF_{i,36}]$
$FVIF_{i,36} = 1.7091$
$i = 1.5\%$
$i_{Nom} = 1.5\% \times 12 = 18\%$

---

18. You have $10,000 to invest. Assuming annual compounding, how long will it take for the $10,000 to double if it is invested at an annual interest rate of 14 percent?

a. 6 years
b. 4.5 years
c. **5.29 years**
d. 6.14 years

ANSWER: **c**

SOLUTION:

72/14 = 5.14 years
Actual time (calculator accuracy) = 5.29 years

---

19. The Tried and True Corporation had earnings of $0.20 per share in 1978. By 1995, a period of 17 years, its earnings had grown to $1.01 per share. What was the compound annual rate of growth in the company's earnings?

a. 11%
b. **10%**
c. 12%
d. 11.5%

ANSWER: **b**

SOLUTION:

$PV = FV_{17}\ (PVIF_{i,17})$
$0.20 = 1.01\ (PVIF_{i,17})$
$PVIF_{i,17} = 0.198$
Therefore, i = 10% from a PVIF Table
Alternatively, $FV_{17} = PV(FVIF_{i,17})$
$1.01 = 0.20\ (FVIF_{i,17})$
$FVIF_{i,17} = 5.05$
Therefore, i = 10% from a FVIF Table

---

20. What is the present value of $800 to be received at the end of 8 years, assuming an interest rate of 20 percent, quarterly compounding?

a. $165.00
b. $172.39
c. **$167.89**
d. $169.89

ANSWER: **c**

SOLUTION:

PV = \$800 ($PVIF_{5\%,32}$) = \$167.89 (by calculator)

---

21. What is the present value of \$800 to be received at the end of 8 years, assuming an annual interest rate of 8 percent?

a. \$425
b. **\$432**
c. \$441
d. \$437

ANSWER: **b**

SOLUTION:

PV = \$800 (0.540) = \$432

---

22. What would you pay for an ordinary annuity of \$2,000 paid every six months for 12 years if you could invest your money elsewhere at a nominal interest rate of 10% compounded semiannually?

a. \$13,798.60
b. \$25,500.35
c. **\$27,597.20**
d. \$26,957.20

ANSWER: **c**

SOLUTION:

PVA_n = PMT [$PVIFA_{i,n}$]
PVA_{24} = \$2,000 [$PVIFA_{5\%,24}$] = \$2,000 (13.7986)
PVA_{24} = \$27, 597.20

---

23. Thirty years ago, Jesse Jones bought 10 acres of land for \$1,000 per acre in what is now downtown Houston. If this land grew in value at an annual interest rate of 8 percent, what is it worth today?

a. **\$100,630**
b. \$180,630
c. \$100,900
d. \$101,630

ANSWER: **a**

SOLUTION:

FV_{30} = 10 (\$1,000) ($FVIF_{8\%,30}$) = \$10,000 (10.063) = \$100,630

---

24. What would you be willing to pay for a \$1,000 bond paying \$70 interest at the end of each year and maturing in 25 years if you wanted the bond to yield an annual interest rate of 7 percent?

(Note: At maturity, the bond will be retired and the holder will receive $1,000 in cash. Bonds typically are issued with $1,000 face, or par, values. The actual market value at any point in time will tend to rise as interest rates fall and fall as interest rates rise.)

a. $1,100
b. $958
c. **$1,000**
d. $979

ANSWER: **c**

SOLUTION:

PV = $70 (11.654) + $1,000 (0.184) = $1,000 ($999.78 using tables; difference from $1,000 due to rounding)

---

25. What would you be willing to pay for a $1,000 bond paying $70 interest at the end of each year and maturing in 25 years if you wanted the bond to yield an annual interest rate of 12 percent? (Note: At maturity, the bond will be retired and the holder will receive $1,000 in cash. Bonds typically are issued with $1,000 face, or par, values. The actual market value at any point in time will tend to rise as interest rates fall and fall as interest rates rise.)

a. $601.08
b. **$608.01**
c. $607.41
d. $701.08

ANSWER: **b**

SOLUTION:

PV = $70 (7.843) + $1,000 (0.059) = $608.01

---

26. A $10,000 car loan has payments of $361.52 due at the end of each month for three years. What is the nominal interest rate?

a. 15%
b. **18%**
c. 16%
d. 10%

ANSWER: **b**

SOLUTION:

PVA = PMT $[PVIFA_{i,n}]$
$\$10,000 = \$361.52\ [PVIFA_{i,36}]$
$PVIFA_{i,36} = 27.661$
$k_i = 1.5\%$
$k_{Nom} = 12 \times 1.5\% = 18\%$

---

27. Joe Ferro's uncle is going to give him $250 a month for the next two years starting today. If Joe deposits every payment in an account paying a nominal annual interest rate of 6% compounded monthly, how much will he have at the end of three years?

a. $6,976.25
b. $6,837.28
c. $6,389.79
d. **$6,796.23**

ANSWER: **d**

SOLUTION:

1) FVA_{24}(Annuity Due) = PMT $[FVIFA_{i,n}]$ (1 + k)
FVA_{24} = \$250 $[FVIFA_{0.5\%,24}]$ (1.005)
FVA_{24} = \$250 (25.4320) (1.005) = \$6,389.79
which stays in the bank for another year:
2) FV_{12} = \$6,389.79 $[FVIF_{0.5\%,12}]$
=\$6,389.79 (1.0617) = \$6,784.04
OR \$6,783.89 by calculator

KEYSTROKES:

HP	**TI**
['] [BEG/END]	**[2nd] [BEG] [2nd] [ENTER]**
12 **['] [P/YR]**	**[2nd] [P/Y]** 12 **[ENTER] [⇩]** 12 **[ENTER]**
250 **[+/-] [PMT]**	250 **[+/-] [PMT]**
24 **[N]**	24 **[N]**
6 **[I/YR]**	6 **[I/Y]**
[FV]	**[CPT] [FV]**
Partial Solution: 6,389.78	**Partial Solution: 6,389.78**
['] [CLEAR ALL]	**[2nd] [QUIT]**
6,389.78 **[+/-] [PV]**	6,389.78 **[+/-] [PV]**
12 **[N]**	12 **[N]**
6 **[I/YR]**	6 **[I/Y]**
[FV]	**[CPT] [FV]**
Solution: 6,783.89	**Solution:** 6,783.89

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28. Find the present value of \$1,000 to be received at the end of 2 years at a 12% nominal annual interest rate compounded quarterly.

a. \$795
b. **\$789**
c. \$767
d. \$779

ANSWER: **b**

SOLUTION:

PV = (\$1,000) $(PVIF_{3\%,8})$ = (\$1,000) (0.789) = \$789

---

29. Find the present value of $1,000 to be received at the end of 4 years at a nominal annual interest rate of 12%, compounded semiannually.

a. **$627**
b. $637
c. $675
d. $622

ANSWER: **a**

SOLUTION:

PV = ($1,000) ($PVIF_{6\%,8}$) = ($1,000) (0.627) = $627

---

30. Given a 15% annual opportunity cost, $1.00 three years from now is worth more than $2.00 nine years from now.

a. **True**
b. False

ANSWER: **a**

SOLUTION:

PV = ($1.00) ($PVIF_{15\%,3}$) = ($1.00) (0.658) = $0.66
PV = ($2.00) ($PVIF_{15\%,9}$) = ($2.00) (0.284) = $0.57
Based on these calculations, $1.00 at end of three years is worth more.

---

31. Your great-uncle Claude is 82 years old. Over the years, he has accumulated savings of $80,000. He estimates that he will live another 10 years at the most and wants to spend his savings by then. (If he lives longer than that, he figures you will be happy to take care of him.) Uncle Claude places his $80,000 into an account earning 10 percent annually and sets it up in such a way that he will be making 10 equal annual withdrawals (the first one occurring 1 year from now) such that his account balance will be zero at the end of 10 years. How much will he be able to withdraw each year?

a. $13,180.71
b. $13,614.50
c. $12,989.22
d. **$13,019.63**

ANSWER: **d**

SOLUTION:

PVA_{10} = $80,000 = PMT ($PVIFA_{10\%,10}$) = PMT (6.145)
PMT = $13,018.71
Calculator solution = $13,019.63

KEYSTROKES:

HP **TI**

80,000 **[+/-] [PV]**
0 **[FV]**
10**[N]**
10**[I/YR]**
[PMT]
Solution: 13,019.63

80,000 **[+/-] [PV]**
0 **[FV]**
10**[N]**
10**[I/Y]**
[CPT] [PMT]

Solution: 13,019.63

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32. Your parents have discovered a $1,000 bond at the bottom of their safe deposit box. The bond was given to you by your late great-aunt Hilda on your second birthday. The bond pays an annual interest rate of 5 percent. Interest accumulates and is paid at the time the bond is redeemed. You are now 27 years old. What is the current worth of the bond (principal plus interest)?

a. $3,500
b. $3,421
c. $3,327
d. **$3,386**

ANSWER: **d**

SOLUTION:

FV_{25} = $1,000 ($FVIF_{5\%,25}$) = $1,000 (3.386) = $3,386

---

33. Your mother is planning to retire this year. Her firm has offered her a lump sum retirement payment of $50,000 or a $6,000 lifetime ordinary annuity-whichever she chooses. Your mother is in reasonably good health and expects to live for at least 15 more years. Which option should she choose, assuming that an 8 percent annual interest rate is appropriate to evaluate the annuity?

a. **$51,354**
b. $52,535
c. $51,862
d. $52,328

ANSWER: **a**

SOLUTION:

PVA_{15} = $6,000 ($PVIFA_{8\%,15}$) = $6,000 (8.559) = $51,354
Because the lifetime annuity has a higher expected present value than the $50,000 lump sum payment, she should take the annuity.

---

34. A life insurance company has offered you a new "cash grower" policy that will be fully paid up when you turn 45. At that time, it will have a cash surrender value of $18,000. When you turn 65, the policy will have a cash surrender value of $37,728. What annual rate of interest is the insurance company promising you on your investment?

a. 3%
b. 4.4%
c. **3.8%**
d. 4.1%

ANSWER: **c**

SOLUTION:

$18,000 = $37,728 ($PVIF_{i,20}$)
$PVIF_{i,20}$ = 0.4771
From a PV Table, i = 3.8% (by interpolation, rounded)

---

35. Strikler, Inc. has issued a $10 million, 10-year bond issue. The bonds require Strikler to establish a sinking fund and make 10 equal, end-of-year deposits into the fund. These deposits will earn 8 percent annually, and the sinking fund should have enough accumulated in it at the end of 10 years to retire the bonds. What are the annual sinking fund payments?

a. $689,294
b. $677,294
c. **$690,294**
d. $689,342

ANSWER: **c**

SOLUTION:

FVA_{10} = $10,000,000 = PMT ($FVIFA_{8\%,10}$) = PMT (14.487)
PMT = $690,294

---

36. A Baldwin United Company agent has just presented the following offer. If you deposit $25,000 with the firm today, it will pay you $10,000 per year at the end of years 8 through 15. If you require a 15 percent annual rate of return on this type of investment, would you make this investment?

a. **$16,871**
b. $15,871
c. $16,852
d. $16,911

ANSWER: **a**

SOLUTION:

PV = $10,000 ($PVIFA_{15\%,8}$) ($PVIF_{10\%,7}$)
PV = $10,000 (4.487) (0.376)
PV = $16,871
Because the present value of the promised payments is substantially less than the required deposit of $25,000, this is an undesirable investment.

---

37. Determine the value at the end of 3 years of a $10,000 investment (today) in a bank certificate of deposit (CD) that pays a nominal annual interest rate of 8 percent, compounded monthly.

a. $12,642.37
b. **$12,702.37**
c. $13,652.27
d. $12,812.37

ANSWER: **b**

SOLUTION:

$FV_n = PV [1 + (i_{Nom}/m)]^{mn}$
$FV_3 = \$10,0000 [1 + (0.08/12)]^{36} = \$12,702.37$ (by calculator)

---

38. Determine the value at the end of 3 years of a $10,000 investment (today) in a bank certificate of deposit (CD) that pays a nominal annual interest rate of 8 percent, compounded semiannually.

a. $13,652.19
b. $13,751.21
c. **$12,653.19**
d. $12,563.21

ANSWER: **c**

SOLUTION:

$FV_n = PV_0 [1 + (i_{Nom}/m)]^{mn}$
$FV_3 = \$10,0000 [1 + (0.08/2)]^{6} = \$12,653.19$

---

39. An investment requires an outlay of $100,000 today. Cash inflows from the investment are expected to be $40,000 per year at the end of years 4, 5, 6, 7, and 8. If you require a 20 percent annual rate of return on this type of investment, should the investment be undertaken?

a. Yes
b. **No**

ANSWER: **b**

SOLUTION:

$NPV = \$40,000 (PVIFA_{20\%,5}) (PVIF_{20\%,3}) - \$100,000$
$NPV = \$40,000 (2.991) (0.579) - \$100,000$
$NPV = \$-30,728$
The project should not be undertaken.

---

40. Calculate the present value of a perpetuity bond that is expected to pay $50 of interest per year forever if the investor requires an annual return of 8 percent.

a. **$625**
b. $655
c. $565
d. $602

ANSWER: **a**

SOLUTION:

PV (Perpetuity) = $50/0.08 = $625

41. Steven White is considering taking early retirement, having saved $400,000. White desires to determine how many years the savings will last if $40,000 per year is withdrawn at the end of each year. White feels the savings can earn 10 percent per year.

a. 12 years
b. 15 years
c. 14.5 years
d. **10 years**

ANSWER: **d**

SOLUTION:

PVA_n = PMT ($PVIFA_{10\%,n}$)
\$400,000 = \$40,0000 ($PVIFA_{10\%,n}$)
$PVIFA_{10\%,n}$ = 10
Therefore, at 10% per year his \$400,000 savings will last forever, i. e. \$400,000 x 0.10 = \$40,000

42. What is the monthly rate of interest that will yield an annual effective interest rate of 12 percent?

a. 1.499%
b. **0.949%**
c. 0.953%
d. 1.949%

ANSWER: **b**

SOLUTION:

$EFF\% = (1 + ({}^{i}NOM / M))^{M} - 1$
$12\% = (1 + ({}^{i}NOM / 12))^{12} - 1$
$1.12 = (1 + ({}^{i}NOM / 12))^{12}$
$1.00949 = 1 + ({}^{i}NOM / 12)$
$0.00949 = {}^{i}NOM / 12$
${}^{i}NOM / 12 = .949\%$