**Present Value Review Problems**

1. **True False** State whether the following statements are true (T) or False (F)
2. Money has time value because you forgo something certain today for something uncertain tomorrow.
3. The uncertainty factor increases with time – the more distant the cash flows, the more uncertain they become.
4. The shorter the compounding period (meaning,more compounding periods per year), the higher is the effective rate of interest.
5. With high inflation rate, the interest rates tend to increase.
6. One of the reasons for attributing time value to money is that individuals prefer future consumption to current consumption.
7. The nominal rate of interest is equal to the effective rate of interest when interest is compounded annually.
8. The rule of 72 is more precise (provides a better estimate) than the rule of 69 to find the period required to double your initial amount when the interest is compounded continuously.
9. Financial analysis requires an explicit consideration of time value of money because most financial problems at corporate and individual level involves cash flows occurring at different points in time.
10. A bank that pays 10% interest compounded annually pays a higher effective rate of interest than a bank that pays 10% interest compounded quarterly.
11. The calculation for Free Cash Flows used in DCF Valuation Model = EBIT (1-tax Rate) + noncash expenditures – Increase in Working Capital – CAPEX
12. A regular (deferred) annuity is one in which a series of periodic cash flows of equal amount occur at the beginning of each period.
13. The rule of 72 is useful in determining the future value of an annuity given the rate of interest.
14. Frequency of compounding has no effect on interest earned.
15. Maximum benefit of compounding occurs when money is compounded daily.
16. Present value of an uneven stream of cash flows can be calculated with the help of present value of annuity table.
17. While investing money it is always better to insist on a higher frequency of compounding.
18. Increased frequency of compounding means the same thing as decrease in compounding period.
19. The marginal benefits from increased compounding frequency decrease with each successive increase in compounding frequency.
20. In case of most of banks, fixed deposit money is compounded quarterly.
21. Effective rate of interest depends on the compounding period.
22. Higher the compounding period, higher is the effective rate of interest.
23. When the bond rate of interest of a bond payable is greater than the market rate of interest, the selling price of the bond will be less than the principal amount of the bond.
24. In simple interest, interest for each year in same.
25. The process of determining present value is often called discounting.
26. Continuous compounding results in the maximum possible future value for given rate of interest and time period.
27. A perpetuity is an annuity that continues for 100 years.
28. In perpetuity, the principal amount remains intact.
29. The present value of any future sum is inversely related with rate of interest.
30. Continuous compounding occurs when interest is compounding daily.
31. Sinking fund factor is used to determine the periodic fixed amount that must be invested regularly to accumulate a specified sum at the end of a given period at a given rate of interest.
32. When debt(loan) is amortized in periodic fixed installments, the principal component of installment declines over time.
33. The compound value of any sum invested today varies directly with rate of interest (r) and time period (n).
34. Money has time value because a sum of money to be received in future is more valuable than the same amount today.
35. The process of compounding assumes discounting at same rate.
36. An annuity due is one in which periodic cast flows of equal amount occur at the beginning of each period.
37. Compounding over the same time period, annuity due will have a higher future value than ordinary annuity.
38. An amortization schedule tells us about the interest component and principal repayment component of each fixed installment paid by borrower towards loan repayment.
39. Annuity tables can be used for all types of cash flows.
40. For a given rate of interest(r) and given number of years(n), the present value annuity factor will be greater than future value annuity factor.
41. In present value tables, all values are less than 1.
42. Present value of annuity due is equal to present value of ordinary annuity x(1 + r).
43. Future value of annuity due = present value of ordinary annuity x (1 + r)
44. 1 ÷ PVAF (Present value Annuity Factor) is knows as capital recovery factors.
45. 1 ÷ FVAF (Future value Annuity Factor) is known as sinking fund factors.
46. The price of any asset today is the present value of all the future cash flows associated with the asset.
47. Bond prices vary inversely with the market rate of interest.
48. An annuity is a stream of constant cash flows occurring at regular intervals of time.
49. A perpetuity is an annuity that continues for ever i.e., till infinity.
50. The present value of a mixed stream of cash flows is the sum of the present values of the individual cash flows.
51. An investment option that comes with specified present value and future value after given period has hidden (implied) rate of interest.

**II. Multiple Choice**

**1.** Calculate the present value of each cash flow using a discount rate of 7%. Which do

you most prefer most? Show and explain all supporting calculations!

**Cashflow A**: receive $60 today and then receive $60 in four years.  
**Cashflow B**: receive $20 every year, forever, starting today.  
**Cashflow C**: receive $60 every year for five years, with the first payment being next year, and then subsequently receive $40 every year for 10 years..

**2.** You are evaluating a perpetuity. The first payment is $100, and it arrives in one year. Each subsequent annual payment will increase by 10%. If the discount rate is 8%, what is the present value of this perpetuity?

a. $5,500

b. $1,000

c. $1,250

d. The present value is infinite

**3.** You invest $10,000 at the end of August 2004. In August 2009, the investment is worth $12,000. What was your compound annual rate of return over the period?

a. 3.09%

b. 3.71%

c. 4.00%

d. 4.21%

**4.** If a bank lends you $10,000 and requires that you make payments of $2,500 at the end of each of the next five years, what interest rate is the bank charging?

a. 4.56%

b. 5.61%

c. 7.93%

d. 11.18%

**5**. What is the total amount accumulated after three years if someone invests $1,000 today with a

simple annual interest rate of 5 percent? With a compound annual interest rate of 5 percent?

A. $1,150, $1,103

B. $1,110, $1,157.60

C. $1,150, $1, 157.60

D. $1,110, $1,103

**6.** Which of the following has the largest future value if $1,000 is invested today?

A. Five years with a simple annual interest rate of 10 percent

B. 10 years with a simple annual interest rate of 8 percent

C. Eight years with a compound annual interest rate of 8 percent

D. Eight years with a compound annual interest rate of 7 percent

**7**. Interest rates in the following question are compound rates unless otherwise stated. Suppose an investor wants to have $10 million to retire 15 years from now. How much would

she have to invest today with an annual rate of return equal to 8 percent?

A. $3,152,386.30

B. $666,666.67

C. $500,000.00

D. $250,000.00

**8** Which of the following is  false?

A. The longer the time period, the smaller the present value, given a $100 future value and

holding the interest rate constant.

 B. The greater the interest rate, the greater the present value, given a $100 future value and

holding the time period constant.

C. A future dollar is always less valuable than a dollar today if interest rates are positive.

D. The discount factor is the reciprocal of the compound factor.

**9.** Maggie deposits $10,000 today and is promised a return of $17,000 in eight years. What is the

implied annual rate of return?

A. 6.86 percent

B. 7.06 percent

C. 5.99 percent

D. 6.07 percent

**10**. To triple $1 million, Mika invested today at an annual rate of return of 9 percent. How long

will it take Mika to achieve his goal?

A. 15.5 years

B. 13.9 years

C. 12.7 years

D. 10 years

**11.** Calculate the PV of the following cash flow using a 7% discount rate.  
 15 payments of $100 starting 5 years from today.

**12.** Which of the following concepts is incorrect?

A. An ordinary annuity has payments at the end of each year.

B. An annuity due has payments at the beginning of each year.

C. A perpetuity is considered a perpetual annuity.

D. An ordinary annuity has a greater PV than an annuity due, if they both have the same periodic payments, discount rate and time period.

**13.** If the market rate of a bond payable is greater than the bond rate

a. The selling price of the bond will be greater than the principal amount

b. The selling price of the bond will be less than the principal amount

**14..** If a principal of $800 amounts to $1000 after five years of investment, then what annual interest rate is being received?

**15.** How long would it take $800 to double in value if the interest rate were 5.0% per compounded annually?

**16.**You can deposit $10,000 per year at the end of the year into an account that pays 12% interest. If you deposit such amounts for 5 years and start drawing money out of the account in equal annual installments, how much could you draw out each year for 10 years if you start making the withdrawals at the end of the year after last payment?

**17.** If you deposit $45,000 into an account earning 8% annual interest compounded quarterly, how much would you have in 3 years?

**18.** Consider a stimulus program that intends to spend $300 billion every year at end of year, for three years. Assuming a 3% discount rate,  
**a)** what is the present value of the program?

**b)** how much would the present value increase if the $300 billion were spent at the beginning of each year rather than at the end?

**19**. What is the selling price of a 10 year bond payable with a principal amount of $100,00, bond rate of 10% and market rate of interest 8%?

**20.** Acto Corporation reported the following information in financial disclosures

EBIT $100,00

Selling and Adminstrative Expenses $ 40,000 ( which includes $10,000 of patent amotization and factory depreciation.)

Plant, Property, and Equipment Investment $30,000

Dividends paid on Preferred Stock $5,000

Interest paid on Long Term Liabilities $7,000

Tax Rate 30

Increase in Investment in Working Capital $5,000

The FCF calculation for this information is :

* 1. $33,000
  2. ($10,000)
  3. $45,000
  4. $55,000

**21**. In 3 years you are to receive $5,000. If the interest rate were to suddenly increase, the present value of that future amount to you would

1. fall.
2. rise.

c. not be determined without more information

**22**. You are considering investing in a zero-coupon bond that sells for $250. At maturity in 16 years it will be redeemed for $1,000. What approximate annual rate of growth does this represent?

a.8 percent.

b.9 percent.

c.12 percent.

d.25 percent.

**23**. As a result of an injury settlement with your insurance you have the choice between

1. (1)  receiving $5,000 today or
2. (2)  $6,500 in three years.

If you could invest your money at 8% compounded annually, which option should you pick?

1. (1), because it has a higher PV.
2. You are indifferent between the two choices.
3. (2), because it has a higher PV.
4. You do not have enough information to make that decision.

**24**. When you retire you expect to live for another 15 years. During those 15 years you want to be able to withdraw $45,000 at the beginning of each year for living expenses. How much money do you have to have in your retirement account to make this happen.Assume that you can earn 8% on your investments.

a. $1,350,000.00

b. $415,989

c. $547,128.27

d. $723,745.49

**25**. Your firm considering purchasing another company which will generate Free Cash Flows of $2,000,000 per year for 10 years. They expect to resale the company for $10,000,000 at the end of 10 years. If the discount rate is 10%, what is the value of the firm?

a. $26,074,510

b. $22,583,530

c. $16,144,200

d. $28,328,770

**I. True False Answers**

1 T

2. T

3. T

4 T

5 F

6 T

7 F, opposite is true

8 T

9 F

10 T

11 F

12 F

13 F

14 F

15 F

16 T

17 T

18 T

19 T

20 T

21 F For example, you have a higher effective interest if your rate is compounded quarterly than if it is compounded annually.

22 F. It is the opposite

23 T

24 T.

25. T Continuous compounding calculates interest assuming constant compounding over an infinite number of periods

26 F

27 T

28 T

29 F

30 T

31 F

32 T

33 F

34 T

35 T

36 T

37 T

38 F

39 F

40 T

41 T

42 F

43 T

44 T

45 T

46 T

47 T

48 T

49 T 50 T

**II. Multiple Choice Answers**

**1.C** The PV of cashflow C is largest and thus most preferred.

PV of A = 60+(60\*.7629) = $105.77.  
PV of B = 20+20/0.07= $305.87  
PV of C = $466.32

40 (PV Annuity, 10periods, 7%) = 40 (7.0236)= 280.94

280.94 (PV of $1, 5,7%) (.7130) =200.31

60 ( PV of Annuity, 5,7%) = 60(4.1002) = 246.01

200.31 + 246.01= 446.32

or PV Annuity 40 for 15 years + PV Annuity of 20 for 5 Years at 7%

40 (9.1079) + 20 (4.1002) = 364.316 + 82.004= 446.32

**2. D** The PV is infinite since the growth rate exceeds the discount rate.

**3. B** N= 5  
PV = 10,000 FV = 12,000 PV factor x 12,000 = 10,000; factor = .8333 between 3% and 4% closer to 4% so 3.7%

**4. C**  
PV = 10,000 = Annuity x (PV annuity,?%, 5 periods) = 2500 x factor; factor = 4.0 which is between 7% and 8% closer to 8%  
I = ? = 7.93

**5. C**.

Simple interest rate: $1,000 + ($1,000)(5%)(3) = $1,150

Compound interest rate: $1,000( FV factor 5%, 3 periods; 1,1576)= $1,157.6

**6. C.**

A) $1,000 + ($1,000)(10%)(5) = $1,500

B) $1,000 + ($1,000)(8%)(10) = $1,800

C) $1,000(1.8509) = $1,850.93

D) $1,000(1.7182)= $1,718.20

Therefore, C is the largest.

**7. A**.

PV = 10,000,000(PV of $1, 8%, 15 periods) .3152 = 3,152,000

Or

FV= PV (FV of $1, 8%,15) (3.1723) = 10,000,000 = PV (3.1723),

PV=$10,000,000/3.1722=$3,152,386.30

The difference is due to rounding of the factors 1/3.1723=.3152286 and 1/.3152=3.1725888

**8.** **B**. The greater the interest rate, the smaller the present value, given a $100 future

value and holding time period constant.

**9.: A.**

FV=PV(FV factor)

 17,000=10,000FV factor(?%, 8 years)

 factor is between 6% and 7% but closer to 7% so =6.86%

**10. : C.**

FV=PV(FV factor)

(3)(1,000,000)=1,000,000(FV factor, 9%, ? years) factor = 3.0, which is between 12 and 13 years, but a little less than 13% so

n=12.7 years

**11.Answer:** PV=100 \* (PV Annuity factor, 15,7%) = 910.79

PV = FV (PV factor) = 910.79 (PV factor, 4 years, 7%)(..7629) = 694.84

100 100 100 100 100 100 100 100 100 100 100 100 100 100 100

l l l l l l l l l l l l l l l l l l l l

910.79

694.84

**12. D** is false. Annuity due payments start in time 0, therefore the PV of an Annuity Due is greater than PV of Ordinary Annuity

**13. b**. The selling price of the bond will be less than the principal amount

**14**. FV = PV x FV of $1 factor, 1000=800(FV of $1, 5 periods factor); factor =1.25, ?r, 5 periods is between 4% and 5% ~ 4.4%

**15**. 72/4.2=approximately 17 years

**16.** Step 1: 10,000(FV Annuity, 12%,5 years)= 10,000 x 6.3528 =63,528;

Step 2: PV = Annuity x (PVA factor 12%,10years)

63,258 = Annuity (5.6502) ; Annuity =$ 11,243.495

10,000 10,000 10,000 10,000 10,000 P P P P P P P P P P

l l l l l l l l l l l l l l l l

63,258

**17.** (8%/4, 3 years x 4 compounding periods per year)

FV = PV (FV of $1, 2%, 12)

45,000 (1.2682) = 57,069

**18**.

a) PV = Annuity( PV Annuity,3%,3,)= 300b (2.8286) = $848.58b 0 300b 300b 300b

b): 300b +(PV factor of Annuity 3%, 2) 300b= 300 b + 300b(1.9135) = $874.04b.

300b 300b 300b

l l l

874.04

**300b x 2.91347 = 874. 04b where the 2.91347 is from the PV of an Annuity due Table 3%,3 periods**

**Difference to part a is $25.46b**

**19.** Interest Annuity = Principal x Bond Rate of Interest

Selling price of the bond = PV of Principal + PV of Interest Annuity

= 100,000(.4632) + 10,000(6.7101) = 113,421

**20.**  FCF = EBIT ( 1 – tax rate) - Increase in Working Capital – CapEx + depreciation and amortization

= 100,000(.7) -5,000 – 30,000 + 10,000= 45,000

**21**. fall

**22**. b. $250 (FVof $1 at X% for 16 periods) = $1,000

(FV of $1 at ?% for 16 periods) = $1,000/$250 = 4 between 9% and 10% closer to 9%

**23**. C. PV = FV x PV factor = 6500(.7938) = $5159.70 >5000

**24**. B. PV=45000 + 4500(PV Annuity, 14 years, 8%) =45,000+ 45,000(8.2442) = 415,989

**25**. FCF (PV Annuity, 10 years, 10%) + PV Factor (10,000,000) = Value of Firm 2,000,000 (6.1446) + 10,000,000 (.3855) = 12,289,200 + 3,855,000 = 16,144,200

In other words, if you pay $16,144,200 , you earn 10% on your investment