**Chapter 5 In Class Exercise**

1. Compute compound interest on $100 invested at 6% for three years with annual compounding.

Calculate the interest earned in the next three years.

1st year interest \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Principal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2nd year interest \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Principal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3rd year interest \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Principal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Total interest \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Final Principal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Math Calculation – future value calculation

*FVN* = *PV* (1 + *r*)*n*

Plug in:

PV =

r=

n=

So FVN=

Excel function

Using fv function in Excel ------ fv

future value =abs(fv(rate, nper, pmt, pv))

So calculate future value using excel.

Calculate principal five years later? Ten years later?

1. Present value

Definition:

Example: What will be the present value of $500 to be received 10 years from today if the discount rate is 6%?

1. Time line:
2. Math equation to calculate present value

***PV = FVn* {1/(1 *+ r*)*n*}**

Plug in FV =

 r=

 n=

 PV=

1. Excel function - pv

Using pv function in excel; present value = abs(pv(rate, nper, pmt, fv))

So present value =

1. What about $1000 to be received 10 years from today?
2. Number of years

Definition:

Example: How does it take to double your investment of $500 @ the rate of 6%?

1. Math equation to calculate number of years

***N = ln(FV/PV)/ ln(1+r)***

Plug in FV =

 r=

 PV=

 N=

1. Excel function - nper

Using nper function in excel; number of years = nper(rate, pmt, pv, -fv))

So nper =

1. Interest rate

Definition:

Example: What is rate for you to double your investment of $500 in ten years?

1. Math equation to calculate rate

***rate = (FV/PV)1/n - 1***

Plug in FV =

 n=

 PV=

 rate=

1. Excel function - rate

Using rate function in excel; rate = rate(nper, pmt, pv, -fv))

So rate=

1. Ordinary annuity: A serial equal dollar payment.

Future value of annuity

Example: What will be the *FV* of a 5-year, $500 annuity compounded at 6%?

1. Time line:
2. Math equation (not required)

*FVn = PMT* {(1 + *r*)*n –* 1/*r*}

1. Excel function – fv (still calculate fv, given annuity)

fv = abs(fv(rate, nper, 0, pv))

So calculate fv=

1. Present value of ordinary annuity

You are going to receive $500 annually @ 6% for five years. How much is your present value?

1. Time line
2. Math equation (not required)

*PV* of Annuity = *PMT* {[1 – (1 + *r*)–1]}/*r*

1. Excel function – pv (still calculate pv, given annuity)

pv = abs(pv(rate, nper, pmt, fv))

So calculate pv=

1. Ordinary Annuity calculation

To receive $2818.50 five years later at 6%, how much you should save annually?

1. Time line
2. Excel function – pmt

Pmt = abs(pmt(rate, nper, 0, fv)

So calculate pmt =

1. Annuity due
2. Difference between annuity due and ordinary annuity

If we assume that $500 invested every year at 6% to be annuity due, the future value will increase due to compounding for one additional year.

1. Time line
2. *Math – not required*

*FV*5 (annuity due) = *PMT* {[(1 + *r*)*n* – 1]/*r*} (1 + *r*)

1. Excel function – fv (still calculate fv, given annuity due)

fv = abs(fv(rate, nper, 0, fv, **1** ))

1. Summary: For annuity due, the payment is at the beginning period. Ordinary annuity’s payment is by the end of the period. Add 1 at the end of the function is for annuity due. That is all.
2. Find out interest rate charged.

Example: 12% APR credit card rate. So 12% is the actual interest rate you are paying?

1. APR: do not consider time value of money.

Definition:

Using the prior example, APR =

1. EAR: Consider time value of money. This is the actual interest rate.

Definition:

Calculation:

* 1. Math EAR = (1+APR/n)^n-1

Plug in: Apr=

 N=

 EAR=

* 1. EXCEL: EAR = effect(nominal, n) or = effect(apr, n)

SO EAR=

1. If your investment earns 10% a year, with quarterly compounding for 10 years, what should we use for “*r*” and “*N*”?

APR=

EAR=

1. Uneven cash flow

Annuity has even cash flow.

With uneven cash flow, you can use NPV function to calculate net present value.

Example:



NPV = npv(rate, cash flow in year 1, CF in year 2, …, CF in last year)

**Chapter 5 in Class Exercise**

1. You deposit $5,000 in a saving account at 10% compounded annually. How much is your first year interest? How much is your second year interest?
2. 500, 500
3. 500, 550
4. 500, 600
5. 500, 650
6. What is the future value of $5,000 invested for 3 years at 10% compounded annually?
7. 6,655
8. 6,000
9. 6,850
10. 6,255
11. You just bought a TV for $518.4 on credit card. You plan to pay back of $50 a month for this credit card debt. The credit card charges you 12% of interest rate on the monthly basis. So how long does it take to pay back your credit card debt?
12. 9 month
13. 10 month
14. 11 month
15. 12 month
16. You are going to deposit certain amount in the next four years. Your saving account offers 5% of annual interest rate.

First year: $800

Second year: $900

Third year: $1000

Fourth year: $1200.

How much you can withdraw four years later?

1. 3429.31
2. 4168.35
3. 3900.00
4. 4329.85

1. You are going to deposit certain amount in the next four years. Your saving account offers 5% of annual interest rate.

First year: $800

Second year: $900

Third year: $1000

Fourth year: $1200.

How much is the lump sum value as of today (NPV)?

1. 3429.31
2. 4168.35
3. 3900.00
4. 4329.85
5. Ten years ago, you invested $1,000. Today it is worth $2,000. What rate of interest did you earn?
A. 7.29 percent
B. 6.97 percent
C. 7.03 percent
D. 7.18 percent

7. At 5 percent interest, how long would it take to triple your money?
A. 22.52 years
B. 16.64 years
C. 28.41 years
D. 23.28 years

8. What is the effective annual rate if a bank charges you 12 percent compounded monthly?
A. 12.00 percent
B. 11.84 percent
C. 12.68 percent
D. 13.20 percent

9. Your father invested a lump sum 16 years ago at 8% interest for your education. Today, that account worth $50,000.00. How much did your father deposit 16 years ago?
A. $15,329.13
B. $13,157.41
C. $14594.50
D. $15,310.06

10. You are borrowing $300,000 to buy a house. The terms of the mortgage call for monthly payments for 30 years at 3% interest. What is the amount of each payment?
A. $1217.05
B. $1311.14
C. $1264.81
D. $1232.86

11. You deposit $200 at the beginning of each month into your saving account every month. After two years (24 deposits total), your account value is $6,000. Assuming monthly compounding, what is your monthly rate that the bank provides?

a. 1.92%

b. 2.12

c. 2.40%

d. 1.74%

1. You want to buy a fancy car. For this goal, you plan to save $5,500 per year, beginning immediately. You will make 4 deposits in an account that pays 8% interest. Under these assumptions, how much will you have 4 years from today?

a. $26,112

b. $26,918

c. $27,763

d. $26,766

1. Citi card is giving you a good deal. You can transfer your balance from your current credit card to Citi new card with $50 balance transfer fee. The new card charges at 5% a year. But your old card charges at 12% a year. Your balance in your old card is $5,000. If you can afford to pay back to the credit card of $250 a month. How much quicker does it take you to pay back your debt with the new card? (Hint: for the new card, your debt = 5000+50=5050; Assume monthly compounding by credit card companies).
	1. 3.95 months
	2. 2.81 months
	3. 3.14 months
	4. 5.00 months
2. Your girlfriend just won the Florida lottery. She has the choice of $40,000,000 today or a 20-year annuity of $2,850,000, with the first payment coming one year from today. If the mutual fund of hers provides 4% of return each year for the next 20 years, which payment option is more attractive to her?

a. $40,000,000

b. 20-year annuity of $1,850,000

c. The two are the same

d. Could not tell