

**Hello everyone,**

**There are several sample problems with solutions on the following pages. Some of the problems may be helpful when completing the home study exercise.**

**If you have any questions, let me know. My email address is [rbest@westga.edu](mailto:rbest@westga.edu).**

**Ron Best**

### Sample Problems – Money and Banking (Best)

1. If you wish to accumulate \$140,000 in 13 years, how much must you deposit today in an account that pays an annual interest rate of 14%?
2. What will \$247,000 grow to be in 9 years if it is invested today in an account with an annual interest rate of 11%?
3. How many years will it take for \$136,000 to grow to be \$468,000 if it is invested in an account with an annual interest rate of 8%?
4. At what annual interest rate must \$137,000 be invested so that it will grow to be \$475,000 in 14 years?
5. You wish to accumulate \$197,000 in 5 years. How much must you deposit today in an account that pays a quoted annual interest rate of 13% with semi-annual compounding of interest?
6. What will \$153,000 grow to be in 13 years if it is invested today in an account with a quoted annual interest rate of 10% with monthly compounding of interest?
7. How many years will it take for \$197,000 to grow to be \$554,000 if it is invested in an account with a quoted annual interest rate of 8% with monthly compounding of interest?
8. At what quoted annual interest rate must \$134,000 be invested so that it will grow to be \$459,000 in 15 years if interest is compounded weekly?
9. An annuity pays \$24,000 per year for 11 years (first payment one year from today). You feel the appropriate discount rate is 13%. What is the annuity worth to you today?
10. You deposit \$16,000 per year for 12 years (deposits at the end of each year) in an account that pays an annual interest rate of 14%. What will your account be worth at the end of 12 years?
11. You plan to borrow \$389,000 now and repay it in 25 equal annual installments (payments will be made at the end of each year). If the annual interest rate is 14%, how much will your annual payments be?
12. You are told that if you invest \$11,000 per year for 23 years (all payments made at the end of each year) you will have accumulated \$366,000 at the end of the period. What annual rate of return is the investment offering?
13. You are offered an annuity that will pay \$17,000 per year for 7 years (the first payment will be made today). If you feel that the appropriate discount rate is 11%, what is the annuity worth to you today?

14. If you deposit \$15,000 per year for 9 years (each deposit is made at the beginning of each year) in an account that pays an annual interest rate of 8%, what will your account be worth at the end of 9 years?
15. You plan to accumulate \$450,000 over a period of 12 years by making equal annual deposits in an account that pays an annual interest rate of 9% (assume all payments will occur at the beginning of each year). What amount must you deposit each year to reach your goal?
16. You are told that if you invest \$11,100 per year for 19 years (all payments made at the beginning of each year) you will have accumulated \$375,000 at the end of the period. What annual rate of return is the investment offering?
17. You are considering buying bonds in ACBB, Inc. The bonds have a par value of \$1,000 and mature in 37 years. The annual coupon rate is 10.0% and the coupon payments are annual. If you believe that the appropriate discount rate for the bonds is 13.0%, what is the value of the bonds to you? (Hint: Bond value – annual pmts)
18. XZYY, Inc. currently has an issue of bonds outstanding that will mature in 31 years. The bonds have a face value of \$1,000 and a stated annual coupon rate of 20.0% with annual coupon payments. The bond is currently selling for \$890. What is your expected quoted annual rate of return if you buy the bonds and hold them until maturity? (Hint: YTM – annual pmts)
19. Within Year, Inc. has bonds outstanding with a \$1,000 par value and a maturity of 17 years. The bonds have an annual coupon rate of 17.0% with semi-annual coupon payments. You would expect a quoted annual return of 14.0% if you purchased these bonds. What is the value of the bonds to you? (Hint: Bond value – non-annual pmts)
20. Yes They May, Inc. has a bond issue outstanding with a \$1,000 par value and a maturity of 40 years. The bonds have an annual coupon rate of 15.0% with quarterly coupon payments. The current market price for the bonds is \$1,035. What is the quoted annual yield-to-maturity for the bonds? (Hint: YTM – non-annual pmts)

### **Solutions to Sample Problems**

(These solutions assume you have periods per year set equal to one.)

$$1. n = 13$$

$$i/y = 14$$

$$FV = 140000$$

$$\text{solve for PV (answer} = \$25,489.71)$$

NOTE: The answer on most time value calculators will have a negative sign. This is simply a programming convention. Negative amounts are viewed as cash outflows (money paid or deposited). Positive amounts are viewed as cash inflows (money received). Unless you are solving for n or i/y, just ignore the negative sign.

2.  $n = 9$   
 $i/y = 11$   
 $PV = -247000$   
solve for FV (answer = \$631,835.12)

3.  $i/y = 8$   
 $PV = -136000$   
 $FV = 468000$   
solve for n (answer = 16.06 years)

NOTE: If you are solving for n or  $i/y$ , you must enter the PV and FV with opposite signs. By convention we usually think of PV as what we pay (negative) and the FV as what we receive (positive).

4.  $n = 14$   
 $PV = -137000$   
 $FV = 475000$   
solve for  $i/y$  (answer = 9.29%)

5.  $n = 10$  (5 years times 2 comp. periods per year)  
 $i/y = 6.5$  (13% annually divided by 2 comp. period per year)  
 $FV = 197000$   
solve for PV (answer = \$104,947.03)

6.  $n = 156$  (13 years times 12 comp. periods per year)  
 $i/y = 0.833333$  (10% annually divided by 12 comp. periods per year)  
 $PV = -153,000$   
solve for FV (answer = \$558,386.38)

7.  $i/y = 0.666667$  (8% annually divided by 12 comp. periods per year)  
 $PV = -197000$   
 $FV = 554000$   
solve for n (answer on calculator = 155.61)  
Since the interest rate was entered as a monthly rate, the answer for n is in months.  
The number of years equals the number of months divided by twelve.  
Number of years =  $(155.61)/12 = 12.97$  years

8.  $n = 780$  (15 years times 52 comp. periods per year)  
 $PV = -134,000$   
 $FV = 459,000$   
solve for  $i/y$  (answer on calculator = 0.157972)  
Since the number of periods was entered as weeks, the answer for  $i/y$  is the weekly rate.  
The annual rate equals the weekly rate times 52.  
Annual rate =  $(0.157972\%)(52) = 8.21\%$

9.  $n = 11$

$i/y = 13$

$PMT = -24000$

Make sure you are in end mode.

solve for PV (answer = \$136,486.59)

10.  $n = 12$

$i/y = 14$

$PMT = 16000$

Make sure you are in end mode.

solve for FV (answer = \$436,331.98)

11.  $n = 25$

$i/y = 14$

$PV = -389000$

Make sure you are in end mode.

solve for PMT (answer = \$56,598.88)

12.  $n = 23$

$FV = 366000$

$PMT = -11000$

Make sure you are in end mode.

solve for  $i/y$  (answer = 3.21%)

13.  $n = 7$

$i/y = 11$

$PMT = 17000$

Make sure you are in begin mode.

solve for PV (answer = \$88,919.14)

14.  $n = 9$

$i/y = 8$

$PMT = 15000$

Make sure you are in begin mode.

solve for FV (answer = \$202,298.44)

15.  $n = 12$

$i/y = 9$

$FV = 450000$

Make sure you are in begin mode.

solve for PMT (answer = \$20,497.98)

16.  $n = 19$   
 $FV = 375000$   
 $PMT = -11100$   
 Make sure you are in begin mode.  
 solve for  $i/y$  (answer = 5.48%)

**NOTE:** In the following bond valuation problem solutions, FV and PMT must be entered with the same sign. The PV must be the opposite sign. From the investors viewpoint, the PV is what we pay for the bond (negative) while the FV and PMT are what we receive from the bond (positive).

**Solutions**

17. Solve for PV.

<b>N</b>	<b>I/Y</b>	<b>**PV**</b>	<b>FV</b>	<b>PMT</b>
<b>37</b>	<b>13</b>	<b>771.74</b>	<b>1000</b>	<b>(0.10)(1000)</b>

18. Solve for I/Y.

<b>N</b>	<b>**I/Y**</b>	<b>PV</b>	<b>FV</b>	<b>PMT</b>
<b>31</b>	<b>22.48</b>	<b>-890</b>	<b>1000</b>	<b>(0.20)(1000)</b>

19. Solve for PV.

<b>N</b>	<b>I/Y</b>	<b>**PV**</b>	<b>FV</b>	<b>PMT</b>
<b>17 X 2</b>	<b>(14)/(2)</b>	<b>1192.81</b>	<b>1000</b>	<b>[0.17(1000)]/(2)</b>

20. Solve for I/Y.

<b>N</b>	<b>**I/Y**</b>	<b>PV</b>	<b>FV</b>	<b>PMT</b>
<b>40 X 4</b>	<b>3.622775</b>	<b>-1035</b>	<b>1000</b>	<b>[0.15(1000)]/(4)</b>

**Quoted annual rate** =  $3.622775 \times 4 = 14.49\%$   
 (The calculator gives us the quarterly rate of return.)

## Sample Problems – Home Study Examples

1. You are offered an investment with a quoted annual interest rate of 13% with quarterly compounding of interest. What is your effective annual interest rate?
2. You plan to buy a car that has a total "drive-out" cost of \$25,700. You will make a down payment of \$3,598. The remainder of the car's cost will be financed over a period of 5 years. You will repay the loan by making equal monthly payments. Your quoted annual interest rate is 8% with monthly compounding of interest. (The first payment will be due one month after the purchase date.) What will your monthly payment be?
3. You are considering leasing a car. You notice an ad that says you can lease the car you want for \$477.00 per month. The lease term is 60 months with the first payment due at inception of the lease. You must also make an additional down payment of \$2,370. The ad also says that the residual value of the vehicle is \$20,430. After much research, you have concluded that you could buy the car for a total "drive-out" price of \$33,800. What is the quoted annual interest rate you will pay with the lease?
4. John and Peggy recently bought a house. They financed the house with a \$125,000, 30-year mortgage with a nominal interest rate of 7 percent. Mortgage payments are made at the end of each month. What total dollar amount of their mortgage payments during the first three years will go towards repayment of principal?
5. You have just won the Lottery with a jackpot of \$40,000,000. Your winnings will be paid to you in 26 equal annual installments with the first payment made immediately. If you feel the appropriate annual discount rate is 8%, what is the present value of the stream of payments you will receive?
6. You plan to retire 33 years from now. You expect that you will live 27 years after retiring. You want to have enough money upon reaching retirement age to withdraw \$180,000 from the account at the beginning of each year you expect to live, and yet still have \$2,500,000 left in the account at the time of your expected death (60 years from now). You plan to accumulate the retirement fund by making equal annual deposits at the end of each year for the next 33 years. You expect that you will be able to earn 12% per year on your deposits. However, you only expect to earn 6% per year on your investment after you retire since you will choose to place the money in less risky investments. What equal annual deposits must you make each year to reach your retirement goal?

### Solutions to Sample Problems (The solutions assume you have periods per year set equal to 1.)

1.

$n = 4$  (number of comp. periods in one year)

$i/y = 3.25$  (13% annually divided by 4 comp. periods in one year)

$PV = -100$

solve for FV (answer = 113.65)

Subtract the 100 (percent) you initial had to get the EAR.

$EAR = 113.65 - 100 = 13.65\%$

2.

$n = 60$  (5 years times 12 payments per year)  
 $i/y = 0.6667$  (8% annually divided by 12 payments per year)  
 $PV = -22102$  (\$25,700 price minus down payment of \$3,598)

Make sure you are in end mode.

solve for PMT (answer = \$448.15)

3.

$n=60$  (total number of payments)  
 $PV = -31430$  (price of \$33,800 minus \$2,370 down payment)  
 $FV = 20,430$  (residual value)  
 $PMT = 477$

Make sure you are in begin mode.

solve for  $i/y$  (answer on calculator = 1.122834%)

Since the number of periods was entered as months, the answer for  $i/y$  is the monthly rate.

The annual rate equals the monthly rate times 12.

Annual rate =  $(1.122834\%)(12) = 13.47\%$

4.

First, determine the monthly payment.

$n = 360$  (30 years times 12 payments per year)  
 $i/y = 0.5833$  (7% annually divided by 12 payment per year)  
 $PV = 125000$

Make sure you are in end mode.

solve for PMT (answer = \$831.6281)

Second, solve for the outstanding principal after three years.

$n = 324$  (360 total payments minus 36 payments made)  
 $i/y = 0.5833$  (7% annually divided by 12 payment per year)  
 $PMT = 831.6281$

Make sure you are in end mode

solve for PV (answer = \$120,908.70)

Principal repaid = starting balance minus current balance

Principal repaid =  $\$125,000 - \$120,908.70 = \$4,091.30$

Interest paid = total of payments made – principal repaid

Interest paid =  $(36)(\$831.6281) - \$4,091.30 = \$29,938.61 - \$4,091.30 = \$25,847.31$

5.

$$n = 26$$

$$i/y = 8$$

$$PMT = (40,000,000)/(26)$$

Make sure you are in begin mode.

solve for PV (answer = \$17,961,194.14)

6.

You must solve this problem in two steps. First, calculate the PV at the time of retirement of the amount needed to give you the annuity and remaining sum wanted. Second, calculate the payment necessary each year over the period from now until retirement to generate the goal.

$$n = 27$$

$$i/y = 6$$

$$FV = 2500000$$

$$PMT = 180000$$

solve for PV (answer: = \$3,038,989.79)

(make sure you are in begin mode)

$$n = 33$$

$$i/y = 12$$

$$FV = 3038989.79$$

solve for PMT (answer: = \$8,874.79)

(make sure you are in end mode)