2-7 Future Value of Investments

Advanced Financial Algebra

How can you effectively plan for the future balance in an account?

- Compound interest means that you are paid interest on your balance AND on previous interest you have earned.

- Suppose you open an account that pays interest and make not further deposits. You can use this formula to figure out your future balance:

$$A = P(1 + -)^{(\ )}$$

- However, many people would like to add money every month or every year at regular intervals. That makes the future balance more work to calculate.

Future Value of Investments formula
DO <u>NOT</u> NEED TO *MEMORIZE*

○ P still stands for principal, but it is the amount you deposit EACH TIME, not once.

○ **Future value of investments formula:**

○
$$= \frac{\left(\ ((1+\dfrac{}{})^{(\ \ )} -\ )\right)}{\left(\dfrac{}{}\right)}$$

A = amount $ after time   P = Principal (periodic deposit $)   r = rate as a decimal

Example 1 – saving for retirement

○ Rich and Laura are both 45 years old and want to retire at the age of 65. They deposit $5,000 each year into a bank account that pays 1.25% interest, compounded annually. What is the account balance when Rich and Laura retire?

○ SOLUTION:

○ Use the future value of investments formula since retirement is in the future.

○ $= \dfrac{\left(\ \left(\left(1 + \dfrac{\ }{\ }\right)^{\left(\ \right)} - \ \right)\right)}{\left(\dfrac{\ }{\ }\right)} = \dfrac{\left(\ ,\ \ \left(\left(1 + \dfrac{.0125}{1}\right)^{(1\,*\,20)} - \ \right)\right)}{\left(\dfrac{.\ }{\ }\right)}$ = **$112,814.89 when they retire**

Example 2 – interest only?

○ How much interest will Rich and Laura earn over the 20-year period in example #1?

○ SOLUTION:

○ First, find out how much they saved total:

$5,000 per year for 20 years = 5000*20 = $100,000

○ Subtract final balance minus amount saved = $112,814.89 - $100,000

○ They earned **$12,814.89 in interest** during those 20 years.

Example 3 – evaluate the limit using graph

- Linda and Rob open an online savings account that has a 1% annual interest rate, compounded monthly. If they deposit $1,200 every month, how much will be in the account after 10 years?

- SOLUTION:

- Use the future value of investments formula since 10 years is in the future.

- P = $1,200   n = 12   r = 1% = .01   t= 10 years

- $$= \frac{\left(\ ((1 + -)^{(\ )} -)\ \right)}{\left(-\right)} = \frac{\left(\ ((1 + \frac{.01}{12})^{(12 * 10)} -)\ \right)}{\left(\frac{.}{-}\right)} = \underline{\textbf{\$151,379.85 in ten years}}$$

Assignment: pg 108 #8 only, pg 113 #4 & 8

○ Pg 108 #8

Caroline is opening a CD to save for college. She is considering a 3-year CD or a $3\frac{1}{2}$-year CD since she starts college around that time. She needs to be able to have the money to make tuition payments on time, and she does not want to have to withdraw money early from the CD and face a penalty. She has $19,400 to deposit.

a. How much interest would she earn at 1.2% compounded monthly for three years? Round to the nearest cent.

b. How much interest would she earn at 1.2% compounded monthly for $3\frac{1}{2}$ years? Round to the nearest cent.

c. Caroline decides on a college after opening the $3\frac{1}{2}$-year CD, and the college needs the first tuition payment a month before the CD matures.

Caroline must withdraw money from the CD early, after 3 years and 5 months. She faces two penalties. First, the interest rate for the last five months of the CD was lowered to 0.5%. Additionally, there was a $250 penalty. Find the interest on the last five months of the CD. Round to the nearest cent.

d. Find the total interest on the $3\frac{1}{2}$ year CD after 3 years and 5 months.

e. The interest is reduced by subtracting the $250 penalty. What does the account earn for the 3 years and 5 months?

f. Find the balance on the CD after she withdraws $12,000 after 3 years and five months.

g. The final month of the CD receives 0.5% interest. What is the final month's interest? Round to the nearest cent.

h. What is the total interest for the $3\frac{1}{2}$ year CD?

Assignment: pg 108 #8 only, pg 113 #4 & 8 cont.

- Pg 113 #4

When Derrick turned 15, his grandparents put $10,000 into an account that yielded 1.4% interest, compounded quarterly. When Derrick turns 18, his grandparents will give him the money to use toward his college education. How much does Derrick receive from his grandparents on his 18th birthday?

- #8

When Abram was born, his parents put $2,000 into an account that yielded 1.2% interest, compounded semiannually. When he turns 16, his parents will give him the money to buy a car. How much will Abram receive on his 16th birthday?