Time Value of Money- Note Organizer

$10 Today vs. $10 Next Year?

- Most people would rather have $10 today rather than waiting to be paid $10 next year
- 3 main reasons:
  - _____
    - You may not get paid in the future!
  - Inflation
    - As prices increase, that $10 will buy less in the future
  - _____
    - You can do something with that $10 today
      - Save, pay down loans, invest, spend, donate, etc.

Time Value of Money

- Having money in hand today is more valuable than waiting to maybe receive money in the future
  - RIO (Risk, Inflation, Opportunities)
- This is called the "_____"

Compound Interest

- Powerful financial tool!
- _____:
  - "Earning interest on top of interest"
  - The interest you earn in period 1 will earn interest in period 2…
- Example: You invest $1,000 today in an account that earns 10% annual return
  - How much will you earn over the next 3 years?
    - Year 1: $1,000 x 10% = $100 of interest
    - Year 2: ($1,000 + $100) x 10% = $110 of interest
      - Notice you earned $10 more dollars of interest in Year 2
      - The $100 of interest in Year 1 is treated as principal for the Year 2 calculation
    - Year 3: ($1,000 + $100 + $110) x 10% = $121 of interest
    - Compound Interest
      - Year 1 = $100 earned
      - Year 2 = $110 earned
      - Year 3 = $121 earned
      - Total interest earned = $331
    - If you earned "simple interest" you would only earn $300 of interest
      - $1,000 x 10% x 3 years = $300

Terms

- _____ = a one-time investment
  - Ex. You invest $500 today and invest nothing else after that
- Annuity = stream of regular payments
  - Ex. Car loan payments – they are the same amount every month for a stated number of years
- _____ = what you will have in your account in the future
- Present Value = what something is worth today

Types of Time Value Problems

- _____
  - Determines how much money an investment will be worth in the future if you invest money today
- Present Value of a Lump Sum
  - Determines how much you would rather have today instead of waiting to be paid (maybe) in the future
  - Also, it determines how much you need to invest today to reach a specific future value
- _____
  - Determines how much you will have in your account in the future if you invest regularly over time
  - Example: You invest $500/year into a retirement account that earns 8% return. How much will you have in your account after 50 years?

Solving Time Value Problems

- 4 methods:
  - Time Value of Money tables
  - _____
  - Financial calculators
  - Time Value of Money formulas
    **We will focus on the tables and spreadsheets

Using the Time Value Tables

- Same as the annual loan payment table
- Look up the column with the _____
- Follow the column down to the row with the number of years
- Multiply that factor by the _____ of the investment

Future Value of a Lump Sum

- Use Table 1
- Example: You invest $1,000 today in an account that earns 5%. How much will you have in your account after 5 years?
  - Factor for 5% for 5 years = 1.2763
  - FV = 1.2763 x $1,000 = $1,276.30

    - Your $1,000 grew to almost $1,300 in 5 years!!
- Assume that you leave your money in the account for 40 years – you do NOT add any more money. How much will you have in your account after 5 years at a 5% return?
    - Factor for 5% for 40 years = 7.0400
    - FV = 7.0400 x $1,000 = $7,040.00
        - Your initial investment of $1,000 grew to more than $7,000!!

Present Value of a Lump Sum

- Use Table 2
- PV is the "_____" of FV
- Example: You want to have $10,000 available after 5 years for a down payment on some land. How much do you need to invest today to reach this goal at a 6% return?
    - Factor for 6% for 5 years = 0.7473
    - PV = 0.7473 x $10,000 = $7,473
- From this example:
    - If you invest $7,473 today
    - It earns 6% each year (compound interest)
    - It will grow to $10,000 in 5 years

Future Value of an Annuity

- Use Table 6
- Example: You invest $1,000/yr for 30 years. It earns 7% return. How much will you have after 30 years?
    - You might think somewhere around $30,000
        - $1,000/yr x 30 yr = $30,000
    - Factor for 7% for 30 years = 101.0730
    - FV = $101.0730 x $1,000/yr = $101,073
        - That's a lot more than the $30,000 you invested!!

Using a Time Value Spreadsheet

- _____!
    - You can change key factors to see the impact
- For Future Value calculations
    - Click on the "_____" tab
    - You can change any number with a blue font
        - It will automatically recalculate the FV

- Future Value Spreadsheet
- Example: You want to invest $300/yr at 6%. What will you have after 5 years?
    - Number of Years Cell C3 Enter 5

- Annual Rate (%) Cell C7 Enter 6
- Annuity Cell C9 Enter 300
- Present Value Cell C10Enter 0

- FV = $1,792.60
- What is your FV if you earn 10% instead of 6%?
  - Simply change Cell C7 (Annual Rate) to 10

- Present Value Spreadsheet
  - Click on the "PV Calculator" tab
  - Use the same as the FV calculator
  - Example: You want to have a future value of $40,000 after 10 years. How much do you need to invest today earning 7%?
    - Years = 10
    - Annual Rate = 7%
    - Annuity = 0
    - FV (Lump Sum) = 40,000
    - PV = $20,333.97

Keep in Mind

- Lump sum = only investing 1 time
- _____ = several constant investments
- If you know the FV, _____
- If you know the PV, solve for the FV

- If it helps, draw a timeline
  - This can help you figure out what to solve for!