Time Value of Money - Six Functions of a Dollar
Appraisal Training: Self-Paced Online Learning Session

Lesson 2: Future Worth of $1

Problem 1

Calculate the future value (*FV*) of each present value (*PV*) listed below using the future worth of $1 (*FW*$1) factors in AH 505:

	PV	*n* (years)	Annual Rate (%)	*FV* = *PV* × *FW*$1
1	$2,500	5	4	
2	$150,000	10	3	
3	$10	15	4	
4	$250	10	5	
5	$1,500	3	10	

Solution:
To solve, calculate the future value of each present value amount by multiplying the amount by the future worth of $1 factor found in the AH 505 annual compound interest tables for the given interest rate and term

1. *FV* = *PV* × *FW*$1
   FV = $2,500 × **1.216653** (AH 505, page 25, column 1)
   FV = $3,041.63
2. *FV* = *PV* × *FW*$1
   FV = $150,000 × **1.343916** (AH 505, page 21, column 1)
   FV = $201,587.46
3. *FV* = *PV* × *FW*$1
   FV = $10 × **1.800944** (AH 505, page 25, column 1)
   FV = $18.01
4. *FV* = *PV* × *FW*$1
   FV = $250 × **1.628895** (AH 505, page 29, column 1)
   FV = $407.22
5. *FV* = *PV* × *FW*$1
   FV = $1,500 × **1.331000** (AH 505, page 49, column 1)
   FV = $1,996.50

Problem 2

You have a choice of investing in either of two accounts:

- Account A earns an annual rate of 5% with annual compounding
- Account B earns an annual rate of 5.25% at simple interest

You plan to invest $10,000 in one of the accounts today and withdraw the funds 4 years later. In which account should you place your funds?

Solution:
The best choice is the account that will have the most money at the end of the 4 year period. To solve, calculate the future value of each alternative and select the account with the higher future value.

Account A

- *FV* = *PV* × *FW*$1 (5%, 4 yrs, annual)
  FV = $10,000 × **1.215506** (AH 505, page 29, column 1)
  FV = $12,155

Account B

- *FV* = *PV* + *FW*$1 (5.25%, 4 yrs) (simple interest)
  FV = $10,000 + ($10,000 × 5.25% × 4 yrs)
  FV = $10,000 + $2,100
  FV = $12,100

Because account A produces the higher future value, it is preferred. The annual compounding in account A more than compensates for the higher rate at simple interest in account B.

Problem 3

If you deposit $10,000 in an account that pays an annual interest rate of 7%, how much money will you have at the end of:

1. 10 years?
2. 20 years?
3. 40 years?

Solution:
To solve, calculate the future value of the deposited amount at the end of each term using the future worth of $1 factors in the AH 505 annual compound interest tables with an annual rate of 7%.

After 10 years:

- *FV* = *PV* × *FW*$1 (7%, 10 yrs, annual)
  FV = $10,000 × **1.967151** (AH 505, page 37, column 1)
  FV = $19,672

After 20 years:

- *FV* = *PV* × *FW*$1 (7%, 20 yrs, annual)
  FV = $10,000 × **3.869684** (AH 505, page 37, column 1)
  FV = $38,697

After 40 years:

- *FV* = *PV* × *FW*$1 (7%, 40 yrs, annual)
  FV = $10,000 × **14.974458** (AH 505, page 37, column 1)
  FV = $149,745

Problem 4

You deposit $10,000 today in an account that earns an annual rate of 7.5%. At the end of 5 years, how much interest on interest will the account have earned? *Hint*: The amount of interest on interest is the difference between the future value at compound interest and the future value at simple interest.

Solution:

Determine the future value at compound interest:

- *FV* = *PV* × *FW*$1 (7.5%, 5 yrs, annual)
  FV = $10,000 × **1.435629** (AH 505, page 39, column 1)
  FV = $14,356

Determine the future value at simple interest:

- *FV* = *PV* + (*PV* × 7.5% × 5 yrs)
  FV = $10,000 + ($10,000 × 7.5% × 5 yrs)
  FV = $10,000 + $3,750
  FV = $13,750

Amount of interest on interest = $14,356 - $13,750 = $606

Problem 5

You have just purchased an investment property for $400,000. You expect the value of the property to increase at an annual compound interest rate of 8% over the next 10 years. How much do you expect the property to be worth after 10 years?

Solution:
To solve, calculate the expected future value of the investment property using the future worth of $1 factor in the AH 505 annual compound interest tables for 10 years at an annual rate of 8%.

- *FV* = *PV* × *FW*$1 (8%, 10 yrs, annual)
  FV = $400,000 × **2.158925** (AH 505, page 41, column 1)
  FV = $863,570

You expect the property to be worth $863,570.

Problem 6

Assuming all cash flows (*CF*) occur at the end of each year, determine the future values of each of the following two series of cash flows:

Series	CF_1 (End Yr 1)	CF_2 (End Yr 2)	CF_3 (End Yr 3)	Annual Rate	FV
1	$5,000	$5,000	$3,000	5%	
2	$3,000	0	$3,000	4%	

Solution:
To solve, calculate the future value of the cash flow at the end of each year using the future worth of $1 factors in the AH 505 annual compound interest tables with an annual rate of 5% for series 1 cash flows and 4% for series 2, and then add the future values of each cash flow in the series. The sum is the future value of the series of cash flows.

FV of Series 1 (AH 505, page 29, column 1)

Year 1	$5,000	×	1.102500 (*FW*$1, 5%, 2 years, annual)	=	$5,512.50
Year 2	$5,000	×	1.050000 (*FW*$1, 5%, 1 year, annual)	=	$5,250.00
Year 3	$3,000	×	No Compounding	=	$3,000.00
			Total FV	=	$13,762.50

FV of Series 2 (AH 505, page 25, column 1)

Year 1	$3,000	×	1.081600 (*FW*$1, 4%, 2 years, annual)	=	$3,244.80
Year 2	0	×	1.040000 (*FW*$1, 4%, 1 year, annual)	=	0.00
Year 3	$3,000	×	No Compounding	=	$3,000.00
			Total FV	=	$6,244.80