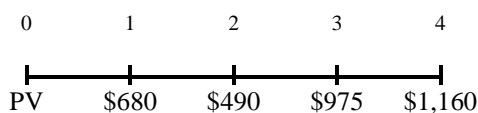


## Chapter 5 - Homework Questions and Problems Answers

**1. Present Value and Multiple Cash Flows.** Eulis Co. has identified an investment project with the following cash flows. If the discount rate is 10 percent, what is the present value of these cash flows? What is the present value at 18 percent? At 24 percent?

Year	Cash Flow
1	\$ 680
2	490
3	975
4	1,160

**Answer:** The time line is:



To solve this problem, we must find the PV of each cash flow and add them. To find the PV of a lump sum, we use:

$$PV = FV / (1 + r)^t$$

$$PV@10\% = \$680 / 1.10 + \$490 / 1.10^2 + \$975 / 1.10^3 + \$1,160 / 1.10^4 = \$2,547.97$$

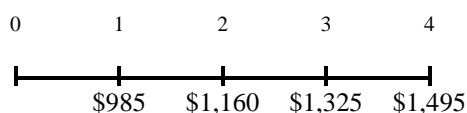
$$PV@18\% = \$680 / 1.18 + \$490 / 1.18^2 + \$975 / 1.18^3 + \$1,160 / 1.18^4 = \$2,119.91$$

$$PV@24\% = \$680 / 1.24 + \$490 / 1.24^2 + \$975 / 1.24^3 + \$1,160 / 1.24^4 = \$1,869.09$$

**3. Future Value and Multiple Cash Flows.** Booker, Inc., has identified an investment project with the following cash flows. If the discount rate is 8 percent, what is the future value of these cash flows in Year 4? What is the future value at an interest rate of 11 percent? At 24 percent?

Year	Cash Flow
1	\$ 985
2	1,160
3	1,325
4	1,495

**Answer:** The time line is:



To solve this problem, we must find the FV of each cash flow and sum. To find the FV of a lump sum, we use:

$$FV = PV(1 + r)^t$$

$$FV@8\% = \$985(1.08)^3 + \$1,160(1.08)^2 + \$1,325(1.08) + \$1,495 = \$5,519.84$$

$$FV@11\% = \$985(1.11)^3 + \$1,160(1.11)^2 + \$1,325(1.11) + \$1,495 = \$5,742.10$$

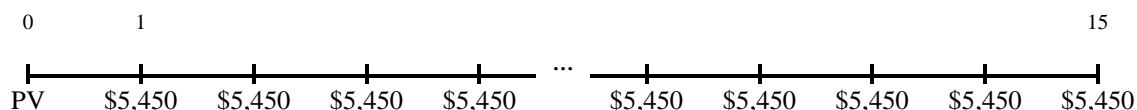
$$FV@24\% = \$985(1.24)^3 + \$1,160(1.24)^2 + \$1,325(1.24) + \$1,495 = \$6,799.64$$

Notice, since we are finding the value at Year 4, the cash flow at Year 4 is added to the FV of the other cash flows. In other words, we do not need to compound this cash flow.

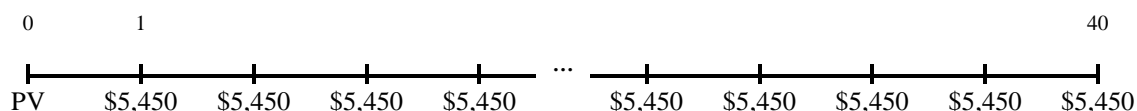
**4. Calculating Annuity Present Values. Calculating Annuity Present Values.** An investment offers \$5,450 per year for 15 years, with the first payment occurring one year from now. If the required return is 8 percent, what is the value of the investment? What would the value be if the payments occurred for 40 years? For 75 years? Forever?

**Answer:** To find the PVA, we use the equation:

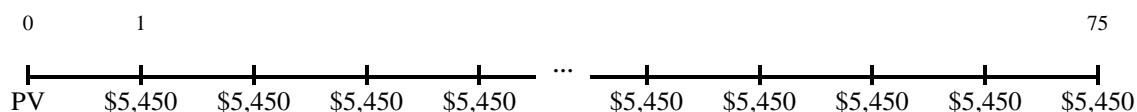
$$PVA = C\left\{\frac{1 - [1/(1 + r)^t]}{r}\right\}$$



$$PVA@15 \text{ yrs: } PVA = \$5,450\left\{\frac{1 - (1/1.08)^{15}}{.08}\right\} = \$46,649.16$$



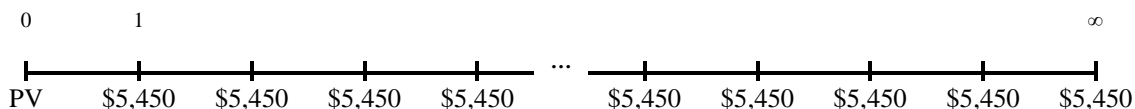
$$PVA@40 \text{ yrs: } PVA = \$5,450\left\{\frac{1 - (1/1.08)^{40}}{.08}\right\} = \$64,989.14$$



$$PVA@75 \text{ yrs: } PVA = \$5,450\left\{\frac{1 - (1/1.08)^{75}}{.08}\right\} = \$67,912.91$$

To find the PV of a perpetuity, we use the equation:

$$PV = C / r$$



$$PV = \$5,450 / .08$$

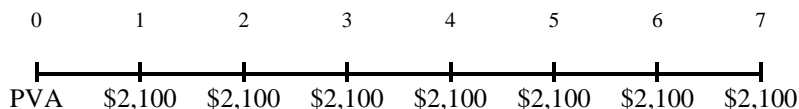
$$PV = \$68,125$$

Notice that as the length of the annuity payments increases, the present value of the annuity approaches the present value of the perpetuity. The present value of the 75-year annuity and the present value of the perpetuity imply that the value today of all perpetuity payments beyond 75 years is only \$212.09.

**6. Calculating Annuity Values.** For each of the following annuities, calculate the present value.

Present Value	Years	Interest Rate
\$ 24,500	6	11%
19,700	8	7
136,400	15	8
285,650	20	6

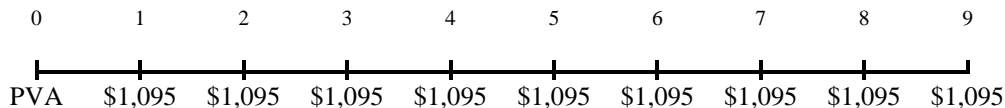
**Answer:** Here we need to find the present value of an annuity. Using the PVA equation, we find:



$$PVA = C \left( \frac{1 - [1 / (1 + r)^t]}{r} \right)$$

$$PVA = \$2,100 \left\{ \frac{1 - (1 / 1.05)^7}{.05} \right\}$$

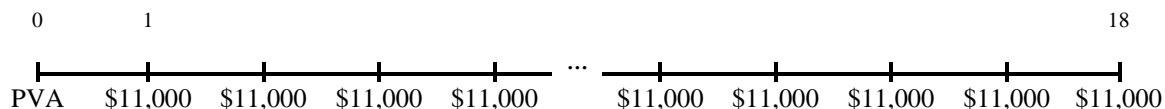
$$PVA = \$12,151.38$$



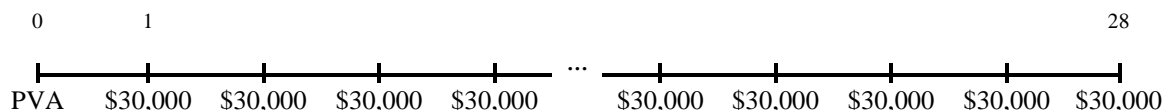
$$PVA = C \left( \frac{1 - [1 / (1 + r)^t]}{r} \right)$$

$$PVA = \$1,095 \left\{ \frac{1 - (1 / 1.10)^9}{.10} \right\}$$

$$PVA = \$6,306.13$$



$$\begin{aligned} PVA &= C\{[1 - [1 / (1 + r)^t]] / r\} \\ PVA &= \$11,000\{[1 - (1 / 1.08)^{18}] / .08\} \\ PVA &= \$103,090.76 \end{aligned}$$



$$\begin{aligned} PVA &= C\{[1 - [1 / (1 + r)^t]] / r\} \\ PVA &= \$30,000\{[1 - (1 / 1.14)^{28}] / .14\} \\ PVA &= \$208,819.87 \end{aligned}$$

**14, Calculating EAR.** First National Bank charges 10.1 percent compounded monthly on its business loans. First United Bank charges 10.3 percent compounded semiannually. As a potential borrower, which bank would you go to for a new loan?

**Answer:** For discrete compounding, to find the EAR, we use the equation:

$$EAR = [1 + (APR / m)]^m - 1$$

So, for each bank, the EAR is:

$$\text{First National: } EAR = [1 + (.101 / 12)]^{12} - 1 = .1058, \text{ or } 10.58\%$$

$$\text{First United: } EAR = [1 + (.103 / 2)]^2 - 1 = .1057, \text{ or } 10.57\%$$

For a borrower, First United would be preferred since the EAR of the loan is lower. Notice that the higher APR does not necessarily mean the higher EAR. The number of compounding periods within a year will also affect the EAR.

**15. Calculating APR.** Vandermark Credit Corp. wants to earn an effective annual return on its consumer loans of 14.2 percent per year. The bank uses daily compounding on its loans. What interest rate is the bank required by law to report to potential borrowers? Explain why this rate is misleading to an uninformed borrower.

**Answer:** The reported rate is the APR, so we need to convert the EAR to an APR as follows:

$$EAR = [1 + (APR / m)]^m - 1$$

$$APR = m[(1 + EAR)^{1/m} - 1]$$

$$APR = 365[(1.142)^{1/365} - 1]$$

$$APR = .1328, \text{ or } 13.28\%$$

This is deceptive because the borrower is actually paying annualized interest of 14.2 percent per year, not the 13.28 percent reported on the loan contract.