

## Chapter 14 (GLS) Hint for Solution Problem #6

Method I (from the calculatorsite.com): What is the annual repayment for 5-year car loan of \$20,000 at 10% interest? (If payments are only made once a year. Usually, they are made monthly, which makes the calculation a bit more complicated...but not much.)

Annual Repayment is: principal  $\times \frac{\text{rate}}{(1-(1+\text{rate})^{-5})}$

So, for our car (Kia, a Korean Auto)

$$\begin{array}{c}
 \text{interest rate} \\
 \swarrow \\
 \$20,000 \times \frac{0.10}{(1-(1+0.10)^{-5})} \\
 \swarrow \quad \searrow \\
 \text{the principal} \quad \quad \quad 5 \text{ years}
 \end{array}$$

$$\text{So, } = \$20,000 \times \frac{0.10}{1-(1.1)^{-5}}$$

$$= \$20,000 \times \frac{0.10}{1-0.6209} = \frac{0.10}{0.379}$$

$$= \$20,000 \times \frac{0.10}{0.379} \text{ or } \$20,000 \times 0.26385$$

$$= \mathbf{\$5,277 / year}$$

So, total payments will be  $5 \times \$5,277 = \$26,385.22$

Method II: (from kasasa.com)

Annual Repayment  $= \frac{\text{Amount}}{\text{Discount Factor}}$

“Amount” is simply the amount borrowed: \$20,000

(D) Discount Factor is:

$$D = [(1 + r)^n - 1] / [r (1 + r)^n]$$

In our example,  $D = [(1 + 0.10)^5 - 1] / [0.10(1 + 0.10)^5]$

$$D = [(1.1)^5 - 1] / [0.10(1.1)^5]$$

$$D = [1.61051 - 1] / [0.10 \times 1.61051]$$

$$= 0.61051 / 0.16105$$

$$D = 3.79$$

$$\therefore \text{Annual Repayment is } = \frac{20,000}{3.79} = \mathbf{\$5,277/\text{year}}$$