

**Finance I: Time Value of Money Pre-Work (SOLUTIONS)**

**Overview:**

The exponential formulas relating present value, compound interest rate, and future value are fundamental to finance, and more generally to much of the MBA curriculum. The fundamental equation can be manipulated in various ways to handle a variety of standard problems, each with its particular set of given information and unknown to compute. We step through a sequence of standard problems, seeking to understand the situation with interest applied once each year.

1. Simple Interest: Future Value. You deposit \$50,000 in the bank in an account that earns 6% interest. How much will you have at the end of the year?

$$50,000 * 1.06 = \$53,000$$

2. Simple Interest: Rate. You deposit \$25,000 in the bank, and withdraw \$27,000 one year later. What annual rate of interest did you earn?

$$\begin{aligned} 25,000 * (1 + r) &= 27,000 \\ r &= (27000/25000) - 1 \\ r &= 0.08 \end{aligned}$$

3. Future Value with Annual Compounding. You have \$50,000 in savings for retirement. If your investments earn 7% annually, how much will you accumulate in 40 years?

$$50,000 * 1.07^{40} = \$748,722.89$$

4. Present Value with Annual Compounding. Using a discount rate of 6%, how much would you pay today for \$50,000 in 20 years?

$$\begin{aligned} PV &= 50,000 / 1.06^{20} \\ &= 50000 / 3.207 \\ &= \$15,590.24 \end{aligned}$$

5. Interest Rate with Annual Compounding. A financial institution offers a “double-your-money” savings account in which you receive \$2 in fourteen years for every dollar you invest today. What annual interest rate does this account offer?

$$r = 2^{(1/14)} - 1 = 0.0508 = 5.08\%$$