

Section 2.6: Monthly Payment Calculations

Part I: The Concept of a Monthly Payment

When people borrow money to purchase a car, a house, student loans, business loans, people repay the loan in equal monthly installments called a monthly payment.

The formula to calculate the monthly payment to repay a loan is:

$$\text{MONTHLY PAYMENT (PMT)} = \frac{A \left(\frac{r}{n} \right)}{1 - \left(1 + \frac{r}{n} \right)^{-nt}} \quad (n=12)$$

Part II: Examples

1. Upon graduation from Radford, you have a \$45,000 debt. Find the monthly payment, total paid on the loan and interest paid on the loan for each option.

Option #1: A 4% interest rate and 5 years to repay the loan.

$$\text{MONTHLY PAYMENT} = \frac{\$45,000 \left(\frac{0.04}{12} \right)}{1 - \left(1 + \frac{0.04}{12} \right)^{-12 \cdot 5}} = \frac{\$150}{1 - (1.00333)^{-60}} = \frac{\$150}{1 - 0.81917} =$$

$$\text{MONTHLY PAYMENT} = \frac{\$150}{0.18083} = \$829.51$$

$$\text{TOTAL PAID ON LOAN} : \$829.51 \times 12 \times 5 = \$49,770.60 \quad \text{INTEREST} : \$49,770.60 - \$45,000 = \$4,770.60$$

Option #2: A 5% interest rate and 10 years to repay the loan.

$$\text{MONTHLY PAYMENT} = \frac{\$45,000 \left(\frac{0.05}{12} \right)}{1 - \left(1 + \frac{0.05}{12} \right)^{-12 \cdot 10}} = \frac{\$187.50}{1 - (1.004167)^{-120}} = \frac{\$187.50}{1 - 0.607137}$$

$$\text{MONTHLY PAYMENT} : \frac{\$187.50}{0.392863} = \$477.27$$

$$\text{TOTAL PAID ON LOAN} : \$477.27 \times 12 \times 10 = \$57,272.40$$

$$\text{INTEREST ON LOAN} : \$57,272.40 - \$45,000 = \$12,272.40$$