MA 15200 Lesson 40, Appendix I, Section 5.6

When an individual borrows money from a bank, he or she signs a **promissory note**, a contract that promises to repay the money loaned. In a previous lesson, we discussed a formula that could be used to repay a loan in one payment at the end of the term of the loan. This formula was $S = P(1+i)^{kt}$, where $i = \frac{r}{k}$. However, most banks require customers to repay in equal payment installments, rather than one repayment. This process is called **amortization.** To determine what each payment of a loan would be, the 'present value of an annuity' formula is solved for the principal amount (payment amount) R. This gives the following.

$$R = \frac{Pi}{1-(1+i)^{-kt}}$$

Replacing P with A, which represents the amount of the loan, gives the following formula.

Installment Payments: The periodic payment required to repay an amount A is given by $R = A\left[\frac{i}{1-(1+i)^{-kt}}\right]$, where r is the annual rate, k is the frequency of compounding, i is the periodic rate ($i = \frac{r}{k}$), and t is the term (time) of the loan.

Ex 1: Find the amount of an installment payment required to repay a loan of $15,000 repaid over 12 years, with monthly payments at a 9% annual rate.

Ex 2: Hugh is buying a $18,500 new car and financing it over the next 5 years. He is able to get a 9.3% loan. What will his monthly payments be?

Ex 3: One lending institution offers two mortgage plans. Plan A is a 15-year mortgage at 12%. Plan B is a 20-year mortgage at 11%. For each plan, find the monthly payment to repay $130,000.

Ex 4: For each plan above (A and B of problem 3), how much total would all payments equal? How much interest is paid in each plan?