

Unit 4C

Loan Payments, Credit Cards, and Mortgages

Definitions

- Loan Principal
 - The total amount of money owed at any given time
- Installment Loan
 - A loan that you pay off with equal regular payments
 - Often this is called an amortized loan

Loan Payment Formula

$$PMT = \frac{P \times \left(\frac{APR}{n}\right)}{1 - \left(1 + \frac{APR}{n}\right)^{-ny}}$$

- P = starting loan principal
- PMT = regular payment amount
- APR = annual percentage rate
- n = number of payment periods per year
- Y = loan term in years

Example 16a, page 265

$$\begin{aligned}
 PMT &= \frac{12000 \times \left(\frac{0.08}{12}\right)}{1 - \left(1 + \frac{0.08}{12}\right)^{-12 \times 10}} = \frac{12000 \times \left(\frac{0.08}{12}\right)}{1 - \left(1 + \frac{0.08}{12}\right)^{-120}} \\
 &= \frac{12000 \times \left(\frac{0.08}{12}\right)}{1 - (1.006666667)^{-120}} = \frac{12000 \times \left(\frac{0.08}{12}\right)}{1 - 0.45052346} \\
 &= \frac{12000 \times \left(\frac{0.08}{12}\right)}{0.549476539} = \frac{80}{0.549476539} \approx \$145.59
 \end{aligned}$$

Example 20a, page 265

$$\begin{aligned}
 PMT &= \frac{100000 \times \left(\frac{0.085}{12}\right)}{1 - \left(1 + \frac{0.085}{12}\right)^{-12 \times 15}} = \frac{100000 \times \left(\frac{0.085}{12}\right)}{1 - \left(1 + \frac{0.085}{12}\right)^{-180}} = \frac{100000 \times \left(\frac{0.085}{12}\right)}{1 - (1.007083333)^{-180}} \\
 &= \frac{100000 \times \left(\frac{0.085}{12}\right)}{1 - 0.280689673} = \frac{100000 \times \left(\frac{0.085}{12}\right)}{0.719310326} = \frac{708.3333333}{0.719310326} \\
 &\approx \$984.74
 \end{aligned}$$

Example 24, page 265

$$\begin{aligned}
 PMT &= \frac{100000 \times \left(\frac{0.07}{12}\right)}{1 - \left(1 + \frac{0.07}{12}\right)^{-12 \times 30}} = \frac{100000 \times \left(\frac{0.07}{12}\right)}{1 - \left(1 + \frac{0.07}{12}\right)^{-360}} = \frac{100000 \times \left(\frac{0.07}{12}\right)}{1 - (1.005833333)^{-360}} \\
 &= \frac{100000 \times \left(\frac{0.07}{12}\right)}{1 - 0.123205853} = \frac{100000 \times \left(\frac{0.07}{12}\right)}{0.876794146} = \frac{583.3333333}{0.876794146} \\
 &\approx \$665.30
 \end{aligned}$$

Total Payments = $(665.30)(12)(30) = \$239,508$
 Payments Toward Principal = \$100,000
 Payments Toward Interest = $239508 - 100000 = \$139,508$

Mortgages

- Down payment
 - Typically between 10 and 20 percent of the purchase price
- Points
 - Each point is 1% of your loan
 - You are paying higher up-front costs for a lower interest rate

Mortgages

- Fixed-rate
 - Guaranteed an rate that will not change over the life of the loan
- Adjustable-rate Mortgage (ARM)
 - Interest rate changes whenever prevailing rates change
- Prepayment penalties
- Refinance
 - Take out a new loan at a lower interest rate and use this loan to pay off your original loan

Example 42, page 266

- Choice 1

$$PMT = \frac{80000 \times \frac{0.085}{12}}{1 - \left(1 + \frac{0.085}{12}\right)^{-12 \times 30}} = \frac{80000 \times \frac{0.085}{12}}{1 - \left(1 + \frac{0.085}{12}\right)^{-360}} = \frac{80000 \times \frac{0.085}{12}}{1 - (1.007083333)^{-360}}$$
$$= \frac{80000 \times \frac{0.085}{12}}{1 - 0.0787866926} = \frac{80000 \times \frac{0.085}{12}}{0.9212133074} = \frac{566.6666667}{0.9212133074} \approx \$615.13$$

$$360 \times 615.13 = \$221,446.80$$

Example 42

- Choice 2

$$PMT = \frac{80000 \times \frac{0.075}{12}}{1 - \left(1 + \frac{0.075}{12}\right)^{-12 \times 30}} = \frac{80000 \times \frac{0.075}{12}}{1 - \left(1 + \frac{0.075}{12}\right)^{-360}} = \frac{80000 \times \frac{0.075}{12}}{1 - (1.00625)^{-360}}$$

$$= \frac{80000 \times \frac{0.075}{12}}{1 - 0.1061398293} = \frac{80000 \times \frac{0.075}{12}}{0.8938601707} = \frac{500}{0.8938601707}$$

$$\approx \$559.37$$

$$360 \times 559.37 = \$201,373.20$$

$$1200 + (0.04 \times 80000) = \$4400$$

$$\text{Total Cost} = 4400 + 201373.20 = \$205,773.20$$
