Section 4D

Loan Payments, Credit Cards, and Mortgages

Loan Basics

- **Principal** of a loan is the amount of money owed at any particular time.

- Interest is charged on the principal.

- To pay off a loan, you must gradually pay down the principal.

  Each payment should include all the current interest owed *plus* some amount that goes toward paying off the principal.

- Loans that you pay off with equal regular payments are called **installment loans** or **amortized loans**.

Loan Payment Formula (Installment Loans)

$$PMT = \frac{P * \left(\dfrac{APR}{n} \right)}{\left(1 - \left(1 + \dfrac{APR}{n} \right)^{(-nY)} \right)}$$

Where
- PMT = regular payment amount
- P = starting loan principal (amount borrowed)
- APR = annual percentage rate (as a decimal)
- n = number of payment periods per year
- Y = loan term in years

Installment Loans

- The portions of installment loan payments going toward principal and toward interest vary as the loan is paid down.

- Early in the loan term, the portion going toward interest is relatively high and the portion going toward principal is relatively low.

- As the term proceeds, the portion going toward interest gradually decreases and the portion going toward principal gradually increases.

Example 1: You have a student loan of $12,000 at a fixed APR of 8% for 10 years. Calculate the monthly payment. Determine the total amount paid over the term of the loan. Of the total amount paid, what amount is paid toward the principal and what amount is paid for interest?

- We know: P = $12000; APR = 0.08; Y = 10; n = 12

$$PMT = \frac{\$12000 * \left(\frac{0.08}{12}\right)}{\left(1 - \left(1 + \frac{0.08}{12}\right)^{(-12*10)}\right)}$$

- The monthly payment is **$145.59**
- Total amount paid is $145.59*12*10 = **$17,470.80**
- Of the $17,470.80 paid, $12,000 goes toward principal and $5,470.80 goes toward interest.

Mortgages

- **Mortgage** – an installment loan designed specifically to help you buy a home
- Mortgage interest rates are usually lower than rates on other loans because your home itself serves as a payment guarantee.
- **Foreclosure** – process where a lender can take possession of your home to sell it to recover some or all of the amount loaned to you
- **Down payment** – an amount of money paid up front to be given a mortgage(or other loan)
- **Closing costs** – fees you must pay in order to be given the loan. The may include a variety of direct costs, or fees charged as **points**, where each point is 1% of the loan amount. In most cases, lenders are required to give you a clear assessment of closing costs before you sign for the loan.

Mortgages

- **Fixed rate mortgage** – the interest rate is guaranteed for the life of the loan

- Most fixed rate mortgages have a term of either 15 or 30 years, with lower interest rates on the shorter-term loans.

- Because of the long loan term, the early payments tend to be almost entirely interest.

- You can reduce the total amount of interest paid by paying extra toward the principal in each payment.

- Consider tax implications, prepayment penalties, etc. before deciding to prepay a mortgage

- **Adjustable rate mortgage (ARM)** – a mortgage in which the interest rate you pay changes whenever prevailing rates change
- Due to the reduced long-term risk to lenders, ARMs generally have much lower initial interest rates than fixed rate mortgages.
- Making a decision between a fixed rate loan and an ARM can be one of the most important financial decisions of your life.

Example 2: A home mortgage of $200,000 has a fixed APR of 9% for 15 years. Calculate the monthly payment. Determine the total amount paid over the term of the loan. Of the total amount paid, what percentage is paid toward the principal and what percentage is paid toward the interest?

- We know: P = $200,000; APR = 0.09; Y = 15; n = 12

$$PMT = \frac{\$200,000 * \left(\dfrac{0.09}{12}\right)}{\left(1 - \left(1 + \dfrac{0.09}{12}\right)^{(-12*15)}\right)}$$

- The monthly payment is **$2028.53**
- The total amount paid is $2028.53 * 12 * 15 = **$365,135.40**
- Of the total paid, $200,000 is paid toward the principal. That is $200,000/$365,135.40=.55=**55%** of the total paid.
- Of the total paid, $165,135.40 is paid toward interest. That is $165,135.40/$365,135.40=.45=**45%** of the total paid.

Credit Cards

- Credit cards differ from installment loans because you are not required to pay off your balance in any set period of time.

- You are only required to make a minimum monthly payment that generally covers all the interest, but very little principal.

- If you only pay the minimum payment, it will take a very long time to pay off a credit card.

- Most credit cards have very high interest rates as compared to other types of loans.

Example 3: Suppose that on January 1 you have a balance of $5000 on a credit card with an APR of 20% and you want to pay off the balance in 2 years. Calculate your monthly payments. How much will you have paid since January 1? How much interest?

- We know: P = $5000; APR = 0.20; Y = 2; n = 12

$$PMT = \frac{\$5000 * \left(\frac{0.20}{12}\right)}{\left(1 - \left(1 + \frac{0.20}{12}\right)^{(-12*2)}\right)}$$

- Your monthly payments will be **$254.48**

- Over the 2 years, you will pay $254.48 * 12 * 2 = **$6107.52**

- Of the total paid, $6107.52 - $5000 = **$1107.52** is paid toward the interest.