Math 1030 #10c
Loans, Credit Cards and Mortgages
Mortgages
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A mortgage is an installment loan to finance a home.

The down payment is the amount of money you must pay up front to be given the loan.

Closing costs are fees you must pay to be given the loan.
  - direct costs
  - fees charged as points, 1% of the loan amount.

One type is a fixed rate mortgage (FRM) where you have a guaranteed interest rate for the life of the loan.

EX 1: Compare the monthly payments and total loan cost for these two loans. You borrow $150,000 for a home.

\[
P = 150000 \\
\text{r} = 12 \\
\text{PMT} = \frac{P \cdot (\frac{\text{APR}}{n})}{1 - (1 + \frac{\text{APR}}{n})^{-nY}}
\]

30-year with APR of 7.25% \[\text{APR} = 0.0725, \; Y = 30\]

\[
PMT = 150000 \cdot \frac{0.0725}{1 - (1 + 0.0725)^{-12(30)}} \\
\approx 1023.26
\]

Total payments = \[1023.26(12)(30) = 368,375.19\]

15-year with APR of 6.8% \[\text{APR} = 0.068, \; Y = 15\]

\[
PMT = 150000 \cdot \frac{0.068}{1 - (1 + 0.068)^{-12(15)}} \\
\approx 1311.53
\]

Total payments = \[1311.53(12)(15) = 239,674.66\]
EX 2: Consider these options for a $180,000 mortgage. Calculate the monthly payments and total closing costs for each.

A 30-year FRM 7.5% with $1200 direct cost and no points

\[
PMT = \frac{P \cdot \left( \frac{APR}{n} \right)}{1 - \left( 1 + \frac{APR}{n} \right)^{-ny}}
\]

\[
PMT = \frac{180000 \left( \frac{0.075}{12} \right)}{1 - \left( 1 + \frac{0.075}{12} \right)^{-12(30)}} \approx $1258.59
\]

Closing costs = $1200

Total cost = $1258.59(12)(30) + $1200 = $454,292.40

B 30-year FRM 6% with $1500 direct costs and 4 points

\[
PMT = \frac{P \cdot \left( \frac{APR}{n} \right)}{1 - \left( 1 + \frac{APR}{n} \right)^{-ny}}
\]

\[
PMT = \frac{180000 \left( \frac{0.06}{12} \right)}{1 - \left( 1 + \frac{0.06}{12} \right)^{-12(30)}} \approx $1079.19
\]

Closing costs = $1500 + 0.04(180000) = $8700

Total cost = $1079.19(12)(30) + $8700 = $397,208.40
An Adjustable Rate Mortgage (ARM) is one in which the interest rate changes whenever prevailing rates change.

\[ \text{PMT} = \frac{P \cdot \left( \frac{\text{APR}}{n} \right)}{\left[ 1 - (1 + \frac{\text{APR}}{n})^{-nY} \right]} \]

EX 3: Compare these two options for a $125,000 30-year loan. Summarize the payments for the first two years.

(A) FRM at 8.5%  
\[ \text{APR} = 0.085 \]  
\[ \text{PMT} = \frac{125000 \left( \frac{0.085}{12} \right)}{1 - \left(1 + \frac{0.085}{12}\right)^{-12(30)}} \approx \$961.14 \]

(B) ARM with first year 5.5% and second year at 10%  
\[ \text{year 1: APR} = 0.055 \]  
\[ \text{PMT}_1 = \frac{125000 \left( \frac{0.055}{12} \right)}{1 - \left(1 + \frac{0.055}{12}\right)^{-12(30)}} \approx \$709.74 \]
\[ \text{year 2: APR} = 0.10 \]  
\[ \text{PMT}_2 = \frac{123316.10 \left( \frac{0.10}{12} \right)}{1 - \left(1 + \frac{0.10}{12}\right)^{-12(29)}} \approx \$1088.24 \]

Total payments for first 2 years  
\[ = 961.14(12)(2) \]  
\[ = \$23,047.36 \]

Total paid in first 2 yrs  
\[ = 709.74(12) + 1088.24(12) \]  
\[ = \$21,575.76 \]