Math 155 - Day #11: Mortgage and Loan payments

We have studied how savings and loans grow with interest.

Now we will look at how payments on a loan effect how much is owed.

We will discuss mortgage payments in detail, but the same ideas can be used on other loans like car loans and student loans.

Example revisited: Suppose you take out a mortgage for $\$200,000$ to buy your first house. Your mortgage has a 4% interest rate compounded monthly. How much interest will you owe after 1 month?

Since the interest is compounded monthly, the interest over one month can be calculated with simple interest where $t = \frac{1}{12}$.

$I = 200000 \times (\frac{.04}{12}) = 666.67$

If no payment is made, the amount owed increases to \$200666.67

Moreover, the monthly payment must be more than \$666.67 to reduce to amount owed.

The questions that arise here are:

How much over \$666.67?

And how do we figure out how much the monthly payment should be?

Both of these questions depend on how long the loan is for.

Typical terms for mortgages are 15, 20, and 30 years.

Typical terms for car loans are 3-6 years.

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To find the monthly payment, we can use an loan payment table
The monthly payment per $1000 of the loan is based on the rate and years of loan.

	10 years	15 years	20 years	30 years
2.5%	9.43	6.66	5.29	3.95
3%	9.66	6.91	5.55	4.22
3.5%	9.89	7.15	5.80	4.49
4%	10.12	7.40	6.06	4.77
4.5%	10.36	7.65	6.33	5.07
5%	10.61	7.91	6.60	5.37
5.5%	10.85	8.17	6.88	5.68
6%	11.10	8.44	7.16	6.00
6.5%	11.35	8.71	7.46	6.32
7%	11.61	8.99	7.75	6.65
7.5%	11.87	9.27	8.06	6.99
8%	12.13	9.56	8.36	7.34

Example: What is the monthly payment on a $\$158,000$ mortgage for 30 years with a 6.5% interest rate?
The payment is $6.32 per $1000 of the loan.
So we compute: $6.32 \times 158 = 998.56$
The monthly payment is $998.56

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Example: What is the monthly payment on a 30-year mortgage of $\$200,000$ with a 4% interest rate?
Monthly payment per \$1000: \$4.77 Monthly payment:
$\$4.77 \times 200 = 954$

Example: What is the monthly payment on a 30-year mortgage of $\$200,000$ with a 7% interest rate?
Monthly payment per \$1000: \$6.65 Monthly payment:
$\$6.65 \times 200 = 1330$

Example: What is the monthly payment on a 15-year mortgage of $\$200,000$ with a 2.5% interest rate?
Monthly payment per \$1000: \$6.66 Monthly payment:
$\$6.66 \times 200 = 1332$