Loans

After completing this section, students should be able to:

- Use a formula or a spreadsheet to find the monthly (or annual) payments, given the amount of money borrowed, the interest rate, and the time period of the loan.

- Use a formula or a spreadsheet to find the largest amount of money you can afford to borrow based on the monthly (or annual) payments you can afford to make, the interest rate, and the amount of time you have to pay it back.
Before Class

This section needs a before class assignment.
Installment Loans

With an installment loan, you borrow money for a fixed period of time, called the term of the loan, and you make regular payments, usually monthly, to pay off the loan plus interest accumulated during that time.

Example. Suppose you want to buy a computer that costs $1800, on a monthly installment loan that charges an APR of 10%, compounded monthly, over the course of 3 years. How much will you need to pay each month? Make a guess for the closest answer.

A. $50
B. $55
C. $60
D. $65

Try it on a google spreadsheet.
There is a formula for the monthly payment:

\[
\text{Monthly payment} = \frac{(\text{Amount borrowed}) \cdot \frac{APR}{12} \left(1 + \frac{APR}{12}\right)^{12t}}{\left(\left(1 + \frac{APR}{12}\right)^{12t} - 1\right)}
\]

If we generalize this formula to a loan that is paid in installments \(n\) times a year, we have:
Example. For the $1800 loan with 10% APR over 3 years.

(a) Use the monthly payment formula to calculate the monthly payment needed for the $1800 loan with 10% APR over 3 years.

(b) Verify that it works on the spreadsheet.

(c) How much money will you pay altogether by the end of 3 years?

(d) How much of that money is interest?
Example. You need to borrow $8,000 so that you can attend college next fall. You get the loan at an APR of 9% to be paid off in quarterly installments over 4 years.

(a) What is your quarterly payment? (PollEv)

(b) What is the total of all payments?

(c) How much interest will be paid in all?
Example. My daughter wants to buy a car. Suppose she can afford monthly payments of $150 per month for two years. The credit union is offering a loan at an APR of 3.75%. What price car should she be shopping for? Choose the closest answer (PollEv)

A. $1500
B. $3000
C. $6000
D. $12000
Mortgages

Example. The State Employees Credit Union offers the following mortgage options on their website.

### 10-Year Term Fixed Rate Mortgage

<table>
<thead>
<tr>
<th>Mortgage Type</th>
<th>APR (APR)</th>
<th>Loan-to-Value</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.25% (3.407%)</td>
<td>90% or less</td>
<td>loan-to-value</td>
<td>Payment Example</td>
</tr>
<tr>
<td>3.75% (3.908%)</td>
<td>90.1% - 100%</td>
<td>loan-to-value</td>
<td>Payment Example</td>
</tr>
</tbody>
</table>

### 15-Year Term Fixed Rate Mortgage

<table>
<thead>
<tr>
<th>Mortgage Type</th>
<th>APR (APR)</th>
<th>Loan-to-Value</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.75% (3.860%)</td>
<td>90% or less</td>
<td>loan-to-value</td>
<td>Payment Example</td>
</tr>
<tr>
<td>4.25% (4.361%)</td>
<td>90.1% - 100%</td>
<td>loan-to-value</td>
<td>Payment Example</td>
</tr>
</tbody>
</table>

### 20-Year Term Fixed Rate Mortgage

<table>
<thead>
<tr>
<th>Mortgage Type</th>
<th>APR (APR)</th>
<th>Loan-to-Value</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.25% (4.337%)</td>
<td>90% or less</td>
<td>loan-to-value</td>
<td>Payment Example</td>
</tr>
<tr>
<td>4.75% (4.839%)</td>
<td>90.1% - 100%</td>
<td>loan-to-value</td>
<td>Payment Example</td>
</tr>
</tbody>
</table>

Suppose you take out a loan for $150,000, which is the entire purchase price of the
house. How much money will you expect to pay in total if you take out a 10 year vs 15 year vs. 20 year mortgage with monthly payments?

Why do you think the interest rate is higher for the longer term loan?
Homework

This section needs homework problems.