What Does Amortization Do:

- **A primary use for Amortization is to finance single family homes. Below is a graph showing how with Amortization, the loan amount gradually reduces over the life of the loan:**

Loan Amount

$

Time

Loan Amount
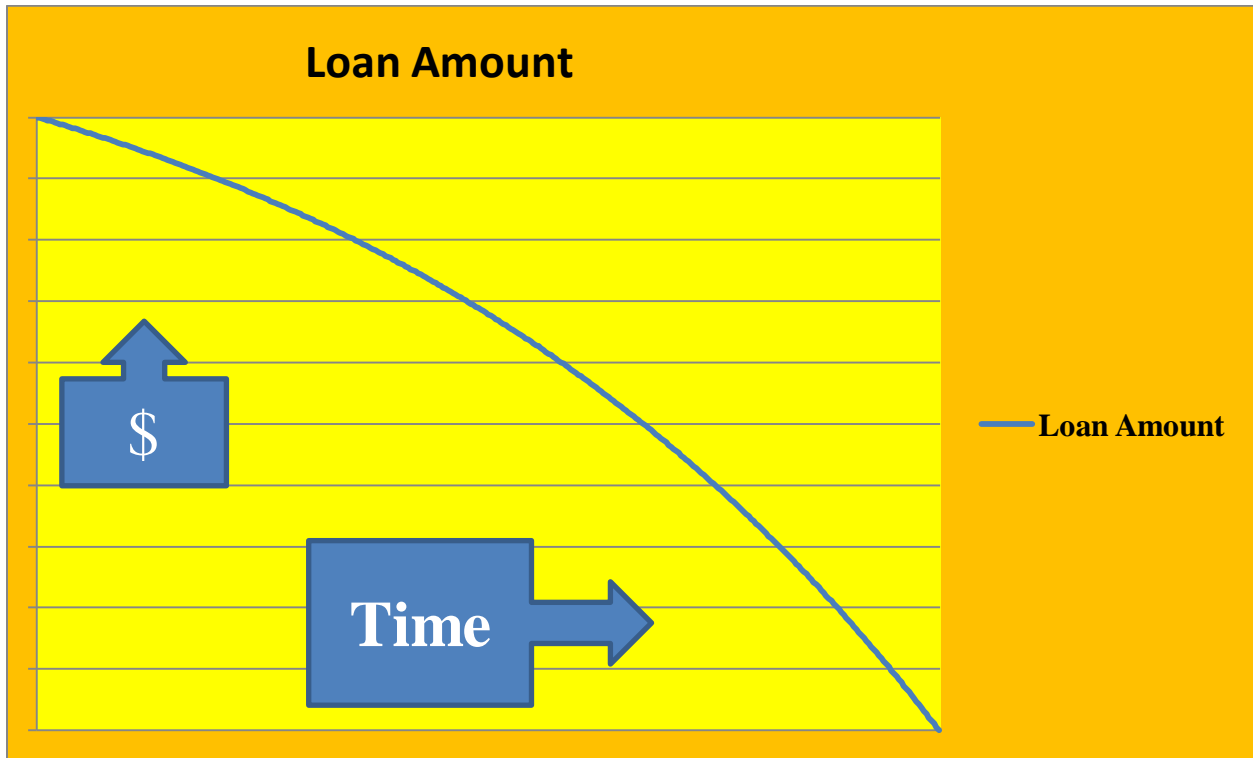
The Basic Equation is:

The following pages will display a simple fixed rate example:

The Formula to Calculate the Payment is:
(The Payment is assumed to be the monthly payment in my example)

$$Payment = Pr\left(\frac{r(1+r)^n}{(1+r)^n - 1}\right)$$

- **With the Variables set as:**
  - **Pr = Principal or Loan Balance**
  - **r = Interest Rate per Period**
  - **n = Total Number of Payments or Periods**

First I need to outline what variables I will use:

Variables:
Annual Interest Rate = 5%
Principal or Beginning Loan Amount = $100,000
Term in Months (30 Years in This Example) = 360 Months

So for our equation the variables are:
r = Annual Interest Rate ÷ 12 Months = .05/12 = .00417
Pr = $100,000
n = 360

Now I will place those figures in the equation and do the math:

$$Payment = 100{,}000 \left(\frac{.00417 \left(1 + .00417\right)^{360}}{\left(1 + .00417\right)^{360} - 1} \right)$$

My purpose with the equation is to show that there is an exact method to calculate the monthly payment that will result in the principal and interest being paid off over the set period for the loan. Almost everyone, with few exceptions, including banking professionals, are using calculators and computers so I guess that very few in the business could quickly write out the formula given above.

Here is What the Numbers Look Like in My Example:

During the First Year the loan balance does not reduce by much as you can see below:

Month	Loan Amount	Term (Months)	Annual Interest Rate	Monthly Interest Rate	Interest	Principal	Monthly Payment
1	$100,000.00	360	5.00%	0.004167	$ 416.67	$120.15	$536.82
2	$99,879.85	359	5.00%	0.004167	$ 416.17	$120.66	$536.82
3	$99,759.19	358	5.00%	0.004167	$ 415.66	$121.16	$536.82
4	$99,638.03	357	5.00%	0.004167	$ 415.16	$121.66	$536.82
5	$99,516.37	356	5.00%	0.004167	$ 414.65	$122.17	$536.82
6	$99,394.20	355	5.00%	0.004167	$ 414.14	$122.68	$536.82
7	$99,271.52	354	5.00%	0.004167	$ 413.63	$123.19	$536.82
8	$99,148.33	353	5.00%	0.004167	$ 413.12	$123.70	$536.82
9	$99,024.62	352	5.00%	0.004167	$ 412.60	$124.22	$536.82
10	$98,900.41	351	5.00%	0.004167	$ 412.09	$124.74	$536.82
11	$98,775.67	350	5.00%	0.004167	$ 411.57	$125.26	$536.82
12	$98,650.41	349	5.00%	0.004167	$ 411.04	$125.78	$536.82

What the Numbers Look Like(Continued):

In month 195 (3 months into the 16th year) you can see how in my example the Principal portion is higher than the Interest portion of the payment:

Month	Loan Amount	Term (Months)	Annual Interest Rate	Monthly Interest Rate	Interest	Principal	Monthly Payment
194	$64,498.46	167	5.00%	0.004167	$268.74	$268.08	$536.82
195	$64,230.38	166	5.00%	0.004167	$267.63	$269.20	$536.82
196	$63,961.18	165	5.00%	0.004167	$266.50	$270.32	$536.82
197	$63,690.87	164	5.00%	0.004167	$265.38	$271.44	$536.82
198	$63,419.42	163	5.00%	0.004167	$264.25	$272.57	$536.82
199	$63,146.85	162	5.00%	0.004167	$263.11	$273.71	$536.82
200	$62,873.14	161	5.00%	0.004167	$261.97	$274.85	$536.82
201	$62,598.29	160	5.00%	0.004167	$260.83	$276.00	$536.82
202	$62,322.30	159	5.00%	0.004167	$259.68	$277.15	$536.82
203	$62,045.15	158	5.00%	0.004167	$258.52	$278.30	$536.82
204	$61,766.85	157	5.00%	0.004167	$257.36	$279.46	$536.82
205	$61,487.39	156	5.00%	0.004167	$256.20	$280.62	$536.82

# What the Numbers Look Like (Continued to the end month):

During the last year, you can see how the principal loan balance comes to 0 after the 30 years of monthly payments complete:

Month	Loan Amount	Term (Months)	Annual Interest Rate	Monthly Interest Rate	Interest	Principal	Monthly Payment
349	$6,270.73	12	5.00%	0.004167	$26.13	$510.69	$536.82
350	$5,760.04	11	5.00%	0.004167	$24.00	$512.82	$536.82
351	$5,247.22	10	5.00%	0.004167	$21.86	$514.96	$536.82
352	$4,732.26	9	5.00%	0.004167	$19.72	$517.10	$536.82
353	$4,215.16	8	5.00%	0.004167	$17.56	$519.26	$536.82
354	$3,695.90	7	5.00%	0.004167	$15.40	$521.42	$536.82
355	$3,174.47	6	5.00%	0.004167	$13.23	$523.59	$536.82
356	$2,650.88	5	5.00%	0.004167	$11.05	$525.78	$536.82
357	$2,125.10	4	5.00%	0.004167	$ 8.85	$527.97	$536.82
358	$1,597.14	3	5.00%	0.004167	$ 6.65	$530.17	$536.82
359	$1,066.97	2	5.00%	0.004167	$ 4.45	$532.38	$536.82
360	$ 534.59	1	5.00%	0.004167	$ 2.23	$534.59	$536.82

Interest versus Principal:

As a review see below how the Interest and Payment portion of the payments look in a graph:
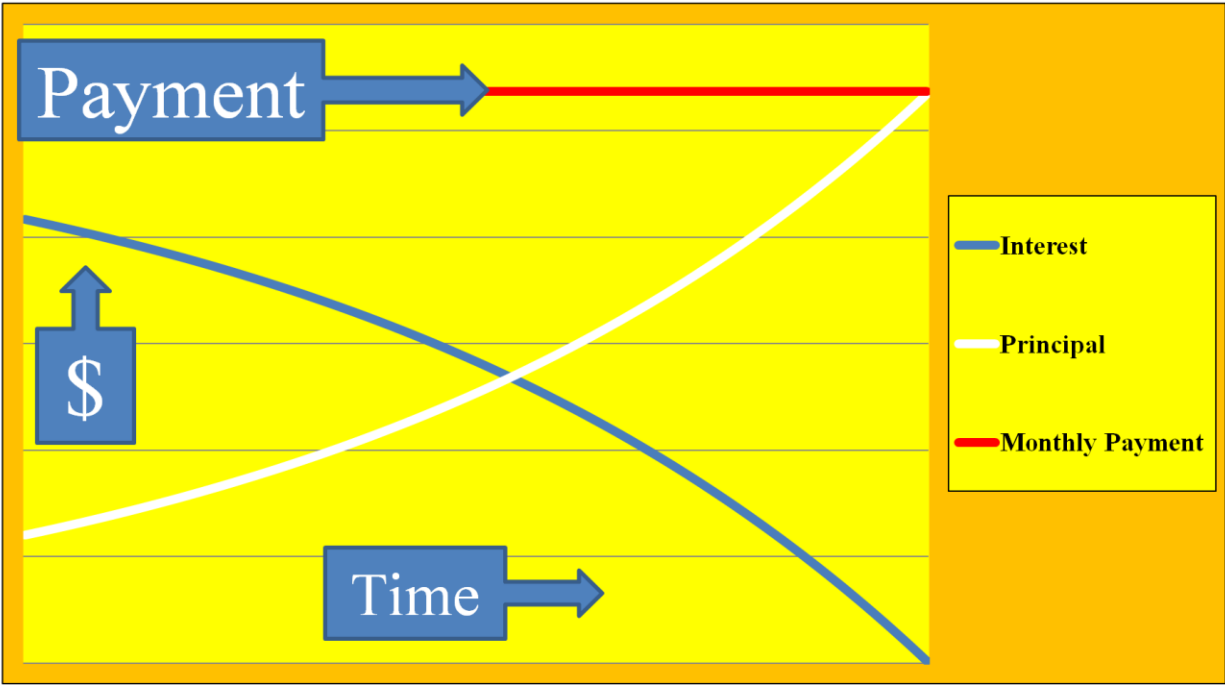
Conclusion:

Amortizing loans can be a useful tool for the long term when financing more expensive assets such as homes. In my opinion the payment should be roughly 25% of a borrowers gross income. I hope you found this helpful and I wish you a great day.

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