

**We talked to a friend who wanted to know the cost of a loan. He was told the total payback but it seemed too large, particularly compared to the amount borrowed. The lender used a computer to run the numbers. Our friend wanted to know how to calculate the cost of the loan. Here's how.**

## **Cost of Debt**

**by**

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When you borrow money, lenders are required by law to provide the total cost of the loan, total principal plus total interest. However, they are not required to tell you how it is calculated. In fact, the finance people at your bank or car dealership or wherever you borrow money may not know where the bottom line comes from. They simply enter the purchase price into their computer. The “black box” produces the paperwork complete with the monthly payment and the total payback. We'll walk you through the math. If you don't want to deal with the calculations, don't worry. We will point you to an online calculator.

Consider the cost of a mortgage. (You can follow our example to calculate the cost of other types of debt.) Assume you borrow \$250,000 for 30 years at a 4.5% interest rate. We'll walk you through the math but also show you a quick easy way to do the calculations. (The down payment is not part of the amount borrowed.)

1. The interest rate per year is .045.
2. The interest is compounded monthly, which is .045 divided by 12 months, i.e., .00375.

3. The monthly payments span 30 years, or 360 payments; 30 years times 12 months per year or a total of 360 months of payments.
4. The monthly mortgage payment is:
  - (a)  $[1 - (1 / (1.00375)^{360})] / .00375 = 197.3611590$
  - (b)  $\$250,000 / 197.3611590 = \$1,266.71$ .

You can use a computer to perform the same calculation. An internet search for *loan calculator* or *calculator* will produce a multitude of hits. We used [Bankrate](#), but the calculators are substantially the same.

We input \$250,000 in the blank for “Loan amount;” 30 in “Loan term of years;” 4.5 in “Interest rate per year;” and clicked on “calculate.”

It quickly answered:

“\$1,266.71” as the “Monthly Payment”

“\$250,000” as the “Total Principal Paid,” and

“\$206,016.78” as the “Total Interest Paid.”

We got the same monthly payment, \$1,266.71, but you now know how to do the calculation without the computer. It provides a nice confirmation process.

How did the calculator come up with “Total Interest Paid,” \$206,016.78? That is the total cost of your loan, a really important number.

Here’s how:

First, calculate total interest plus principal:

$\$1,266.71$  monthly payment x 360 months =  $\$456,016.78$ .

This is also called total payback.

Second, calculate total interest paid:

Total payback less principal equals total interest paid.

$$\$456,016.78 - \$250,000 = \$206,016.78.$$

**That is the cost of using the bank's money!"**

Even though you may have had a pretty good idea that interest cost on a mortgage would be a sizable, the magnitude is still a *WOW!* moment.

Interest as a percentage of the principal borrowed is:

$$\$206,016.78 / \$250,000 = 82\%.$$

The total interest cost is almost as much as the cost of the house!

With each payment, the portion paying down principal gets a little bit bigger and the portion going to interest cost gets a little bit smaller. Here's how it works: each payment, \$1,266.71, includes interest on the unpaid balance of the loan, which is highest during the early years. For example, the first payment's interest cost is:  $(\$250,000) (.00375) = \mathbf{\$937.50}$ .

The difference between the monthly payment and monthly interest cost goes to lower the principal amount. So, the amount that goes toward paying the principal on the first payment is:  $\$1,266.71 - \$937.50 = \mathbf{\$329.21}$ .

The second payment's interest cost is:  $(\$250,000 - \$329.21) (.00375) = \$936.27$ . The amount that goes toward paying the principal on the second payment was:  $\$1,266.71 - \$936.27 = \mathbf{\$330.44}$ .

If you sold the house during the first few years of the mortgage, you would have paid very little on the house. If you keep the house for the full 30 years, the total payback and total interest cost are \$456,016.78 and \$206,016.78, respectively.

A tax deduction can reduce the interest cost on a mortgage. However, about half of the people who have mortgages don't get an interest deduction. If you would like to calculate how

much you might save in taxes, there are a number of [online calculators](#). Even if you do get a deduction, it will not be a dollar for dollar offset. As you will see, there are many misconceptions about mortgage interest tax deductions.<sup>i</sup>

If you paid more than the monthly payment, that entire extra amount goes to reduce the principal. Paying off the loan as quickly as possible avoids a lot of the interest cost. An important, maybe the best, strategy for improving your financial future is paying off debt.

### **It can always get worse**

Credit card debt is even worse than a mortgage. Its interest rate may cost 12% or as high as 24%, depending on your credit rating. Some people never pay off their credit cards. It can become a permanent and huge interest cost.

The average U.S. household owes about \$16,000 in credit card debt, up from about \$14,500 from 2006, according to an analysis released by a personal finance company, [NerdWallet. Dec 20, 2016](#).<sup>ii</sup>

Let's see just how bad interest on an unpaid credit card balance can be.

We ran the numbers assuming the borrower kept an average running balance of \$10,000 for 25 years (300 months) at a 12% interest rate.

1. Interest rate per year: .12 (i.e., 12%).
2. Interest is compounded monthly:  $.12 / 12 = .01$  interest rate per month.
3. Number of months: 25 years (12 months) = 300 months of payments.
4. Credit card payment per month:

$$(a) \left( (1 - (1 / (1 + .01)^{300})) / .01 \right) = 94.94655125$$

$$(b) \$10,000 / 94.94655125 = \$105.32$$

The “[Loan Calculator](#)” came up with the monthly payment much quicker than we did by hand: \$105.32.

Total principal plus interest is \$31,596.72. ( $\$105.32 \times 300$ )

Total interest cost is \$21,596.72. ( $\$31,596.72 - \$10,000$ )

Total interest as a percent of credit card debt is 215%. ( $\$21,596.72 / \$10,000$ )

The interest cost is more than twice the amount borrowed!

Borrow \$10,000 and pay back \$31,597. We wonder how many people understand what’s happening to them?

It can get worse. The cost of credit card debt isn’t an either-or-proposition -- either credit card debt or no debt. Many people have mortgages, student loans, car payments, and all sorts of other types of purchases made on credit.

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<sup>i</sup> <https://www.investopedia.com/articles/mortgages-real-estate/11/calculate-the-mortgage-interest-math.asp?lgl=myfinance-layout-no-ads>

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[https://www.google.com/search?source=hp&ei=XouLWr33L8b8jwSBloKACQ&q=what+is+the+average+credit+card+debt&oq=What+is+the+average+credit+card+&gs\\_l=psy-ab.1.0.0110.4352.14874.0.17894.37.35.0.0.0.0.776.4704.0j14j2j4j6-1.21.0..2..0...1.1.64.psy-ab..16.21.4704.0..0i131k1.0.BkA0gY2FSgQ](https://www.google.com/search?source=hp&ei=XouLWr33L8b8jwSBloKACQ&q=what+is+the+average+credit+card+debt&oq=What+is+the+average+credit+card+&gs_l=psy-ab.1.0.0110.4352.14874.0.17894.37.35.0.0.0.0.776.4704.0j14j2j4j6-1.21.0..2..0...1.1.64.psy-ab..16.21.4704.0..0i131k1.0.BkA0gY2FSgQ)