The Loan Formula

Loans: car & student loans, credit card purchases, mortgages

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We did car loans, student loans, and credit card purchases earlier. We review those today and then do mortgages. Mortgages present no difficulties for those who have mastered applying the formula.

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Page 250 of the textbook provides guidance as to how to use a calculator to implement this. Remember to round your final answer to the nearest penny.

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This commits you to **Total Payments** of $36 \times \$188.02 = \$6768.72$. That's \$768.72 more than you borrowed: this is interest, namely extra money you pay which the bank profits from.

Car Loans (continued)

For the second loan conditions:

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Wait! The 5-year loan commmits you to **Total Payments** of $60 \times \$12748 = \$7648.80$. That's $1648.80 more than the $6000 you borrowed.

Less pain per month, but over 5 years you are paying back more than 25% interest (as $1648.80/6000 > 1500/6000 = 25\%$.)

Car Loans (How Much Car You Afford to Borrow?)

The other use of the Loan Formula is to find P given PMT.

You can afford monthly repayments of \$300. How much can you borrow to buy a car if you want to pay back over 4 years at an interest rate of 6.2% compounded monthly? Find your total repayments and the interest paid back as a percentage of the loan.

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By division, we find $P = \$12,724.35$. The interest is thus $\$14,400.00 - \$12,724.35 = \$1,675.65$. You can check that this is 13.17% of the amount borrowed.

Student Loans

Student Loans work just like Car Loans, but the amount borrowed is much higher and the loan term is typically 10 or more years.

You have a $30,000 loan, at 5.13%, to be paid off in 15 years. Find the monthly repayments, the total payments, and the interest paid.

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The federal student loan interest rate for undergraduates is 4.53% for 2019-20. Check that an $80,000 loan paid back over 12 years commits you to almost $104,000 in repayments.

Credit Cards

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Since we all tend to use credit cards quite frequently, the requested monthly payments on bills are very difficult to break down. But it IS smart to make those minimum payments, as otherwise additional charges or fines can be applied. Always read the "fine" print!

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Hence total payments are $36 \times \$9.55 = \$343.80$. That's $93.80 more than you borrowed: dividing by $250 reveals you have actually pay back an extra 37.52% (of what you borrowed) in interest. Ouch!

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Page 255 of our text has tips on avoiding credit card trouble.

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Many people want a slice of the action–realty company people, lawyers, property assessors, insurance companies and more. There are down payments, closing costs and other expenses. In real life it gets very complicated, see pages 256-261 for some discussion of some of those issues (all confusingly mixed in with the basics).

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Make sure you try the relevant exercises in the text, such as #15-24, 37-40, on pages 263-264.

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(Example 6 on page 257)

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Hence total payments are $360 \times \$733.76 = \$264,153.60$. That's \$164,153.60 more than the \$100,000 you borrowed: dividing by \$100,000 reveals you pay back 164% interest! (that's like giving them back over \$5 for every \$2 they lent you.)

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We find $PMT = \$927.01$, the repayment for $12 \times 15 = 180$ months.

Hence total payments are $180 \times \$927.01 = \$166,861.80$. That's \$66,861.80 more than you borrowed, and it's 66.86% interest.

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What's the catch?

Smart mortgages options

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What would you do it you were only sure you could only afford $850 a month and you had to pick one of these mortgages?

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What would you do it you were only sure you could only afford $850 a month and you had to pick one of these mortgages?

The safest choice would be the 30-year one with the lower payments. But you will be in debt for most of your working life, and it will cost you (almost) an EXTRA $100,000 in interest.

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If you go for the 15-year one, with the higher payments, you take a risk. You might pay the required $927.01 per month for a few years but if you fall short for a few months in a row, then “your” house might be reposessed by the bank.

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Is there a third option? Yes!

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The bank has to sweat more to keep recalculating what you still owe, but that's their problem and they are legally obliged to do it and to get it right.

Smart mortgages options

The REALLY SMART thing to do is to sign the paperwork for the longterm low monthly payment mortgage, which is a very serious legally binding contract, but actually pay off more every month! ("As if you were legally committed to a mortgage with higher monthly payments.")

While the interest rates just discussed were not the same, if you tried to pay about $900 a month and you succeeded most of the time (thereby "overpaying") you would in effect reduce the debt to zero in less than 20 years.

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This is an option most people don't know about.

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$$\$1200 = P \times \frac{\frac{0.065}{12}}{[1 - (1 + \frac{0.065}{12})^{-12\times 25}]}$$

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For every \$1 you borrowed you are giving over \$2 back!

A downside of mortgages (page 260 of text)

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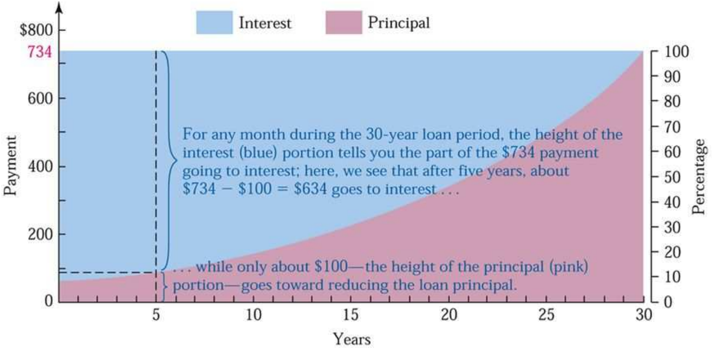
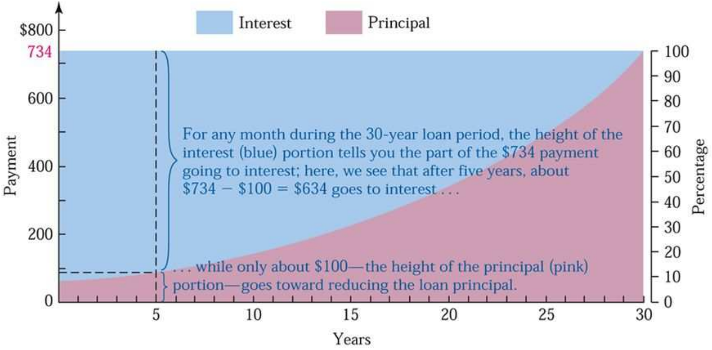
The Relationship Between Principal and Interest for a Payment



Portions of monthly payments going to principal and interest over the life of a 30-year $100,000 loan at 8%

A downside of mortgages (page 260 of text)

The Relationship Between Principal and Interest for a Payment



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Statistics: averages

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Read 6A.

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What is the average of these test scores? (Page 372)

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60, 70, 80, 90, 90, 100

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How spread out are they? (need to study standard deviation)

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