

# Technology Focus: Using Technology to Promote Equity in Financial Decision Making

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*Following are two true stories, as told by the first author. These stories illustrate how technology, together with relevant mathematics knowledge, can help all consumers make more informed financial decisions.*

## **Story 1: Financing a Car**

About 15 years ago my sister-in-law Amy was visiting from New York. She had experienced some car trouble driving down and wanted to look at new cars while in Virginia. She was interested in buying a Camry, so one night we went to a local Toyota dealership (after business hours to avoid hovering salespeople) to check out the new cars on their lot. Amy saw a well-equipped one she wanted, so the next day I went with her to negotiate a good price for that car, along with a fair price for her trade-in.

The salesman initially asked \$23,200 for the car and the general manager was willing to give her \$3,500 for her car. After negotiating, we settled on \$19,800 for the car (including the NY tax), and \$4,200 for her trade-in. Amy agreed to finance \$15,600 through Toyota. The loan officer at the dealership led us into his office, entered some numbers into a program on his computer, and announced to us that her monthly payment, for a 5-year loan, at an interest rate of 8% (the going rate at the time), would be \$333.55. Before Amy could sign the paperwork, I took out my TI-82 calculator, did my own calculations, and told the loan officer the correct payment is only \$316.31.

The loan officer was not happy, and asked to see the device I had in my hands. I said he first needed to explain the algorithm he used to determine the payment. All he was able to tell me was that he was using a proprietary Toyota program, and I replied that I programmed the TI-82 and knew the result was correct. He called a manager and a few salespeople into his office and together they argued that the Toyota program was accurate.

After another calculation I determined that they were overcharging for the car by \$950. When I confronted the salespeople with this figure they admitted that the price entered into their program included undercoating, paint sealant, and an extended warranty – all of which Amy did not order. We threatened to walk out, so they honored the original negotiated price, and “threw in” the undercoating and sealant already applied to the car. Amy was unaware of such tactics, and if I had not been there with my TI-82, she would have paid an additional \$17 per month for an extended warranty that she would not have known she purchased.

This was not an isolated incident. Indeed, a few years after the Toyota episode, a colleague went to buy a car, taking along a Casio 9850 I had given her along with a quick tutorial on how to use its financial features. She had an experience similar to Amy’s and walked out of a different dealership with a payment almost \$25 less than that originally presented to her.

## **Story 2: Refinancing a Home Loan**

Back in the early 1980s, Will, a good friend of mine who lived in a small house in a university town in the mid-west, decided to refinance his home loan. He originally borrowed \$47,500 for 30 years at an interest rate of 14%, and had a monthly mortgage payment of \$562.81.

When he went to refinance, the bank officer informed him he had paid off less than \$1,000 of his principal after about four years of paying this monthly amount. Will was stunned and called to tell me that the bank either made a mistake or was trying to cheat him. I told him the bank’s numbers were mathematically correct because for a long-term mortgage, with a rate as high as 14%, he had primarily paid interest for 4 years. Will, like many other people, did not realize how much



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interest he was paying with a 30-year mortgage. He had no sense of the relationships among the interest rate, the term of a loan, the monthly payment, and the amount of principal paid.

### Discussion

The process of borrowing money can be intimidating to some people. Many feel at the mercy of a loan officer and just accept terms and amounts at face value. A graphing calculator, or spreadsheet, with appropriate knowledge of how to use it, can be an empowering tool to help create a more equitable situation or circumstance. Figures 1 and 2 illustrate how easy it is now for someone to calculate a correct payment and a remaining mortgage balance respectively, given the proper technology tool.



Figure 1: A TI-SmartView TVM calculation for Story 1.

Even a mathematically savvy car buyer may have missed the car payment discrepancy described in Story 1 if attempting to estimate payments in his or her head, which is why technology is an important component to improving equity for all buyers. Additionally, without the aid of the Internet, one would have a difficult time negotiating a fair price for any car and trade-in.

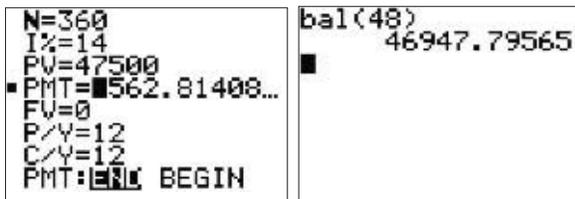


Figure 2: TI-SmartView TVM calculations showing the monthly payment and balance after 48 months for Story 2.

People who know how to use these tools can exert more control over their finances by avoiding scams and by making more informed decisions about their purchasing, saving, and retirement planning. For example, some graphs and calculations would have helped Will see that the difference in monthly payments between a 15-year and 30-year mortgage would not be as high as expected and the savings in interest paid would be substantial.

Figure 3 shows a graph of the relationship between the term of a loan and the amount of the monthly payment for a \$100,000 loan at 5%, the going rate today. These graphs show not only that the payment will be about \$537 for 360 months, or \$791 for 180 months, but also how the payment varies with the term of the loan. One can see from the shape of the graph that stretching payments out for more than 20 years does not reduce the monthly payment amount very much.

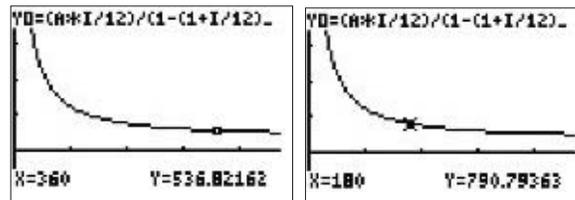


Figure 3: TI-SmartView graphs showing the relationship between loan term and monthly payment.

And, because a borrower can often get a better rate for a 15-year mortgage, the difference between a 30-year and a 15-year mortgage payment will even be less. For example, borrowing \$100,000 for 15 years at 4.5% will result in a monthly payment of about \$765. Hence, for an additional \$229 per month, one can knock off 180 payments and save over \$55,000 in interest!

The technology used here greatly reduces the mathematical and computational overhead for individuals trying to attain the information they need to make better choices. It can save consumers from

overpaying by leveling the playing field for them when meeting with loan officers who are sitting behind a computer. Access to such knowledge and tools can significantly enhance everyone's financial decision making and create more balanced relationships between consumers and sellers.

Equity requires that all students have opportunities to learn the mathematics of compound interest in high school mathematics courses and to learn how to use today's commonplace technologies to apply this important mathematical knowledge to their own finances over the course of their lives. If we want school mathematics courses to prepare our students for life in the real world we need to include the useful and simple technologies that allow them to succeed.