SECTION 1
General Mathematics

In this first section of the resource guide, we will discuss three topics that are occasionally de-emphasized or sometimes completely omitted from a typical high school math curriculum: simple and compound interest, counting with permutations and combinations, and probability of equally likely events. Each of these topics applies immediately to the world around us and therefore deserves our time and attention. By looking for the mathematics in real-life situations, we hopefully can come to see how math helps the world make more sense.

1.1 SIMPLE AND COMPOUND INTEREST

We will start with a topic that most everyone will interact with at some point in their life: money. Economics, especially banking, relies heavily on mathematics. Our discussion of the mathematics of interest will barely scratch the surface of this topic, but hopefully it is enough to give you a sense of what happens when you get a car loan or buy a house.

We will begin with the simplest of scenarios: your friend has to borrow $50 to pay his cell phone bill. Knowing that he is not great at remembering when he has borrowed things, you loan him the money provided that every month it takes him to pay you back costs him $5. Hopefully this means your friend won't forget about this, or if he does, at least you'll make a little extra money.

This situation is an example of simple interest. Simple interest is called "simple" because it is easy to calculate how much interest is owed; multiplication will do the trick. If your friend pays you nothing for six months and then pays you back, he owes you a total of $80, the original $50 plus 6 months' worth of $5 fees.

DEFINITION

A situation is described as using **simple interest** if the amount of interest charged does not change from time period to time period.

SIMPLE INTEREST FORMULA

The amount of **simple interest** charged for an initial amount of money P loaned at interest rate r for t time periods can be expressed by the formula: $Interest = P \cdot r \cdot t$. Therefore, the total amount of money owed at the end of the loan is $P + P \cdot r \cdot t$, or $\boldsymbol{P \cdot (1 + r \cdot t)}$.

In the situation we just discussed, your friend is being charged 10% interest (since 10% of $50 is $5) per month. If it takes six months for you to be paid back, your friend owes you a total of $50 + 50 \cdot (.1) \cdot 6 = 50 \cdot (1.6) =$ **$80**.