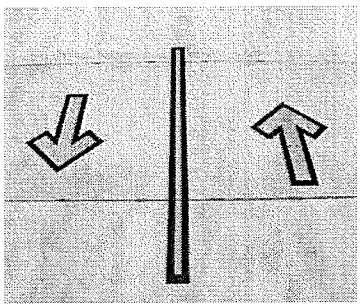
4.9 Up a Little, Down a Little

A Solidify Understanding Task



One of the most common applications of exponential growth is compound interest. For example, Mama Bigbucks puts $20,000 in a bank savings account that pays 3% interest compounded annually. "Compounded annually" means that at the end of the first year, the bank pays Mama 3% of $20,000, so they add $600 to the account. Mama leaves her original money ($20000) and the interest ($600) in the account for a year. At the end of the second year the bank will pay interest on the entire amount, $20600. Since the bank is paying interest on a previous interest amount, this is called "compound interest".

Model the amount of money in Mama Bigbucks' bank account after t years.

Use your model to find the amount of money that Mama has in her account after 20 years.

A formula that is often used for calculating the amount of money in an account that is compounded annually is:

$$A = P(1 + r)^t$$

Where:
A = amount of money in the account after t years
P = principal, the original amount of the investment
r = the annual interest rate
t = the time in years

Apply this formula to Mama's bank account and compare the result to the model that you created.

Based upon the work that you did in creating your model, explain the (1 + r) part of the formula.

Another common application of exponential functions is depreciation. When the value of something you buy goes down a certain percent each year, it is called depreciation. For example, Mama Bigbucks buys a car for $20,000 and it depreciates at a rate of 3% per year. At the end of the first year, the car loses 3% of its original value, so it is now worth $19,400.

Model the value of Mama's car after t years.

Use your model to find how many years will it take for Mama's car to be worth less than $500?

How is the situation of Mama's car similar to Mama's bank account?

What differences do you see in the two situations?

Consider your model for the value of Mama's car and develop a general formula for depreciation.