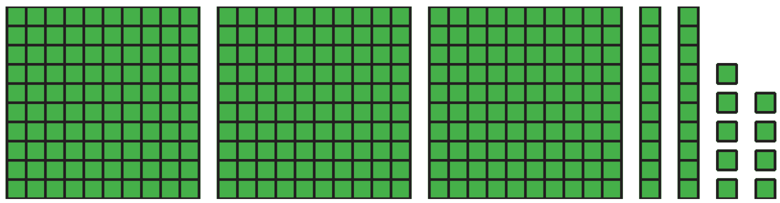
Funding the Future

Let's investigate an investment situation that can be modeled with a function.

2.1 Notice and Wonder: Writing Numbers

What do you notice? What do you wonder?



$$300 + 20 + 9$$

3 hundreds, 2 tens, 9 ones

$$3(10^2) + 2(10^1) + 9(10^0)$$

2.2 Polynomials and Integers

Consider the function p given by $p(x) = 5x^3 + 6x^2 + 4x$.

1. Evaluate the function at $x = -5$ and $x = 15$.

2. How does knowing that $5{,}000 + 600 + 40 = 5{,}640$ help you solve the equation $5x^3 + 6x^2 + 4x = 5{,}640$?

2.3 A Yearly Gift

At the end of 8th grade, Clare's aunt started investing money for her to use after graduating from high school four years later. The first deposit was $300. If r is the annual interest rate of the account, then at the end of each school year the balance in the account is multiplied by a growth factor of $x = 1 + r$.

1. After one year, the total value is $300x$. After two years, the total value is $300x \cdot x = 300x^2$. Write an expression for the total value after graduation in terms of x.

2. If Clare's aunt had invested another $500 at the end of her freshman year, what would the expression be for the total value after graduation in terms of x?

3. Suppose that $250 was invested at the end of sophomore year, and $400 at the end of junior year in addition to the original $300 and the $500 invested at the end of freshman year. Write an expression for the total value after graduation in terms of x.

4. $C(x)$ is the total amount in the account, in dollars, after four years, given a growth factor of x. If the total Clare receives after graduation is $C(x) = 1{,}580$, use a graph to find the interest rate that the account earned.

Lesson 2 Summary

A **polynomial** function of x is a function given by a sum of terms, each of which is a constant times a whole number power of x. The word "polynomial" is used to refer both to the function and to the expression defining it. Polynomial models are adaptable to a variety of situations even as they grow in complexity.

Let's say we're going to invest \$200 at an annual interest rate of r. This means at the end of a year, the balance in the account is multiplied by a growth factor of $x = 1 + r$. After the first year, the amount in the account can be expressed as $200x$, which is a polynomial. Similarly, after the second year, the amount will be $200x^2$, after three years, the amount will be $200x^3$, and so on.

If an additional \$350 is invested at the end of the first year, we can revise the polynomial. The amount of money in the account after 1 year is the same, but now the amount of money after two years is $(200x + 350)x = 200x^2 + 350x$.

If \$400 more is invested at the end of the second year and \$150 more is invested at the end of the third year, the total value of the account can then be represented by the polynomial $200x^4 + 350x^3 + 400x^2 + 150x$.

Let $D(x)$ be the amount of money in dollars in the account after four years and x be the growth factor, where $D(x) = 200x^4 + 350x^3 + 400x^2 + 150x$. A graph of $y = D(x)$ helps us visualize how the amount in the account after four years depends on different values of x.