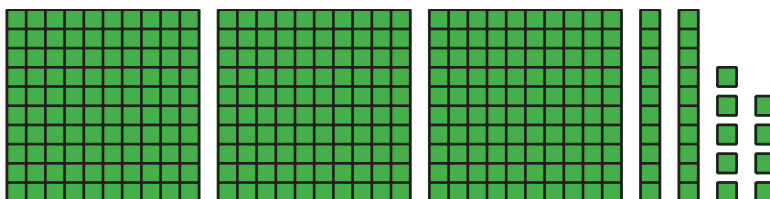


# Funding the Future

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  $x$ .

