

If you can solve nearly all of the following problems with little difficulty, then the Art of Problem Solving textbook **Introduction to Algebra** would only serve as a review for you.

1. A box containing 3 oranges, 2 apples, and one banana weighs 15 units. Another box containing 5 oranges, 7 apples, and 2 bananas weighs 44 units. A third box containing 1 orange, 3 apples, and 5 bananas weighs 26 units. How much does each fruit weigh?
2. The expression  $x^5 + y^5$  can be written as the product of  $x + y$  and another factor. Find that other factor.
3. If  $x = \frac{1 - i\sqrt{3}}{2}$ , then what is  $\frac{1}{x^2 - x}$ ?
4. Find all values of  $z$  such that  $z^4 - 4z^2 + 3 = 0$ .
5. Find the radius and the center of the circle that is the graph of the equation  $4x^2 + 4y^2 + 4x - 16y = 7$ .
6. If  $f(x) = ax^4 - bx^2 + x + 5$  and  $f(-3) = 2$ , then what is  $f(3)$ ?
7. For how many positive integers  $b$  is  $\log_b 729$  a positive integer?
8. For what real values of  $x$  is  $(1 - |x|)(1 + x)$  positive?
9. A rubber ball is dropped from a 100 ft tall building. Each time it bounces, it rises to three-quarters its previous height. So, after its first bounce it rises to 75 ft, and after its second bounce it rises to  $\frac{3}{4}$  of 75 ft, and so on forever. What is the total distance the ball travels?
10. Find all solutions to the equation  $\sqrt[3]{x^3 - x^2 - 10} = x - 1$ .

**Don't look at the next page until you've attempted all the problems!**

The answers to Do You Know Introduction to Algebra are below.

1. Oranges weigh 1 unit, apples weigh 5 units, and bananas weigh 2 units.
2.  $x^4 - x^3y + x^2y^2 - xy^3 + y^4$
3.  $-1$
4.  $\sqrt{3}$ ,  $1$ ,  $-1$ , and  $-\sqrt{3}$
5. The radius is  $\sqrt{6}$  and the center is  $(-\frac{1}{2}, 2)$ .
6.  $8$
7. There are 4 such integers:  $3, 9, 27, 729$ .
8. It is positive when  $x < -1$  or  $-1 < x < 1$ .
9.  $700$  ft
10.  $3, -3/2$