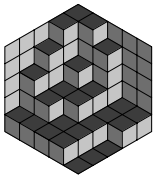


The Art of Problem Solving

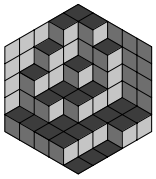
Post-Test

Introduction to Algebra

If you can solve all of the following problems *with little difficulty*, then the book **Introduction to Algebra** would largely serve as a review for you.

Answers to these problems are on the following page. **Do not use a calculator.**

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 $x = \dfrac{1 - i\sqrt{3}}{2}$, then what is $\dfrac{1}{x^2 - x}$?
4. Find all values of z such that $z^4 - 4z^2 + 3 = 0$.
5. Find the radius and 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 3/4 of 75 ft, and so on forever. What is the total distance the ball travels?
10. Find all solutions to the equation $\sqrt[3]{x^3 - x^2 - 10} = x - 1$.



The Art of Problem Solving
Post-Test
Introduction to Algebra

Answers

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, and 729.

8. It is positive when $x < -1$ or $-1 < x < 1$.

9. 700 ft

10. 3, $-3/2$