If you've mastered working with proportions, multiplying simple algebraic expressions, the basics of logarithms, simple functions and basic linear equations as illustrated in the problems below, then you are ready for the Art of Problem Solving textbook, **Intermediate Algebra**. (Answers to these problems are on the following page.)

1. **Algebraic Expressions** Simplify each of the following expressions.

    (a) $3x + 8x$

    (b) $(4y - 7) - 3(10y - 39)$

    (c) $(2x + 1)(3x + 4)$

    (d) $(x + y)^3$

2. **Linear Equations** Solve each of the following linear equations.

    (a) $x + 12 = 20$

    (b) $3x = 36$

    (c) $4y + 9 = -17$

    (d) $-14x + 47 = 8x - 84$.

3. **Factoring** Factor each of the following expressions.

    (a) $x^2 - 7x + 10$

    (b) $x^2 y + 5xy - 36y$

    (c) $x^3 - 6x^2 + 11x - 6$

    (d) $x^3 - x^2 + x - 1$

4. **Means, Medians, and Modes**

    (a) What are the mean, median, and mode of the numbers 4, 5, 7, 7, and 7?

    (b) If the sum of 10 numbers is 90, what is the mean of the 10 numbers?

    (c) Jen scored an 88 on her midterm. Out of the 14 other students in her class, 7 of them scored lower then she did. What was the median of the class midterm scores?

5. **Proportions** Evaluate each of the following problems involving proportionality.

    (a) If x and y are directly proportional and $x = 5$ when $y = 30$, what is y when x is 30?

    (b) If x and y are inversely proportional, what happens to x when y is increased by 25%?

    (c) If x and y^2 are inversely proportional and $x = 4$ when $y = 4$, what is the value of x when $y = \frac{1}{2}$?

6. **Logarithms** Express each of the following as a single number.

    (a) $\log_2 1$

    (b) $\log_3 \frac{1}{81}$

    (c) $\log_3 3^7$

7. **Quadratic Equations** Solve each of the following quadratic equations:

    (a) $x^2 - 5x + 6 = 0$

    (b) $x^2 + 2x - 24 = 0$

    (c) $6x^2 - 13x + 6 = 0$

    (d) $x^2 + 6x + 13 = 0$

    (e) $x^2 + x + 1 = 0$

8. **Functions**

    (a) If $f(x) = x^2 + 6x + 18$, for what value(s) of x does $f(x) = 9$?

    (b) If $f(x) = 2f(x-1)$ for all integers x, and $f(n) = 3$ for some integer n, find the value of $[f(n-5)][f(n+5)]$.

    (c) If $f(x) = 3x(2^x)$, how many times does the graph of $f(x)$ cross the x-axis?

    (d) If $f(x) + f(2-x) = 4$ for all x, find $f(y-2) + f(4-y)$

In addition to these kinds of problems, students should be able to construct graphs on the coordinate plane such as $y = 3x + \frac{7}{3}$, $4x + 5y = 7$, and $y = |x+2|$.

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

The answers to Are You Ready for **Intermediate Algebra** are below.

1. (a) $11x$

   (b) $-26y + 110$

   (c) $6x^2 + 11x + 4$

   (d) $x^3 + 3x^2y + 3xy^2 + y^3$

2. (a) 8

   (b) 12

   (c) $-\frac{13}{2}$

   (d) $\frac{131}{22}$

3. These factorizations are complete using real coefficients.

   (a) $(x-2)(x-5)$

   (b) $(x+9)(x-4)y$

   (c) $(x-1)(x-2)(x-3)$

   (d) $(x-1)(x^2+1)$

4. (a) Mean is 6. The median and mode are both 7.

   (b) 9

   (c) 88

5. (a) 180

   (b) x is decreased by 20%

   (c) 256

6. (a) 0

   (b) -4

   (c) 7

7. (a) 2 and 3

   (b) -6 and 4

   (c) $\frac{2}{3}$ and $\frac{3}{2}$

   (d) $-3 \pm 2i$

   (e) $-\frac{1}{2} \pm \frac{\sqrt{3}}{2}i$

8. (a) -3

   (b) 9

3

(c) 1

(d) 4