

*The Art of Problem Solving Online Classes*  
Are You Ready for  
**Algebra 2?**

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This diagnostic test consists of two parts, **Fundamentals** and **Problem Solving**. If you can solve nearly all of the **Fundamentals** problems and at least half of the **Problem Solving** problems, then you are probably ready for the Art of Problem Solving Online Class **Algebra 2**. Answers to these problems are included at the end of this document. Do not use a calculator.

**Fundamentals**

1. **Solving Linear Equations.** Solve each of the following:

(a)  $3x - 7 = 9 - x$

(b)  $\frac{7-2r}{3} = 4r$

2. **Proportion.**

(a) If  $x$  and  $y$  are directly proportional and  $x = 8$  when  $y = 20$ , then what is  $y$  when  $x = 40$ ?

(b) If  $x$  and  $y$  are inversely proportional and  $x = 8$  when  $y = 20$ , then what is  $y$  when  $x = 40$ ?

3. **Systems of Equations.**

(a) Find all values of  $r$  and  $s$  such that  $r - s = 5$  and  $3r - 5s = 9$ .

(b) Find all values of  $p$  and  $q$  such that  $3p + 7q = 1$  and  $5p = 14q + 53$ .

4. **Graphing Lines.**

(a) What is the slope of the line through  $(3, 4)$  and  $(-1, 3)$ ?

(b) What is the slope of the graph of  $3x - 4y = 7$ ?

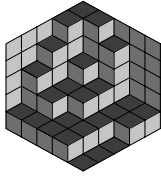
(c) Find the slope-intercept form of the equation of the line through  $(5, -2)$  and  $(-1, 6)$ .

5. **Introductory Quadratics.** Find all solutions to the following equations:

(a)  $4x^2 = 81$

(b)  $x^2 + 8x + 12 = 0$

(c)  $x^2 - 3x - 88 = 0$

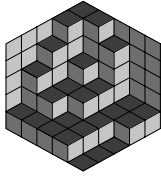


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**Problem Solving**

6. 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?
7. Find  $z$  if  $\frac{3}{1 - \frac{2}{z}} = 3z$ .
8. At a certain time, Janice notices that her digital watch reads  $a$  minutes after two o'clock. Fifteen minutes later, it reads  $b$  minutes after three o'clock. She is amused to note that  $a$  is six times the value of  $b$ . What time was it when she looked at her watch for the second time?
9. Calvin and Susie are running for class president. Of the first 80% of the ballots that are counted, Susie receives 53% of the votes and Calvin receives 47%. At least what percentage of the remaining votes must Calvin receive to catch up to Susie in the election?
10. The golden ratio is the largest number  $g$  such that  $\frac{g}{g+1} = \frac{1}{g}$ . Find  $g(g-1)$ .
11. A line passing through the points  $(2a+2, 3a^2)$  and  $(3a+4, 5a^2)$  has slope  $a+3$ . Find all possible values of  $a$ .
12. Describe all values of  $x$  that satisfy  $7 - 3x < x - 1 \leq 2x + 9$ .



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The answers to Are You Ready for Algebra 2 are below. (The answers to problem sets and challenges given in the class will include full detailed solutions as opposed to the mere answers provided below.)

1. (a)  $x = 4$ , (b)  $r = \frac{1}{2}$
2. (a) 100, (b) 4
3. (a)  $(r, s) = (8, 3)$ , (b)  $(p, q) = (5, -2)$
4. (a)  $\frac{1}{4}$ , (b)  $\frac{3}{4}$ , (c)  $y = -\frac{4}{3}x + \frac{14}{3}$
5. (a)  $x = \frac{9}{2}$ ,  $x = -\frac{9}{2}$ ; (b)  $x = -2$ ,  $x = -6$ ; (c)  $x = 11$ ,  $x = -8$
6. Oranges weigh 1 unit, apples weigh 5 units, and bananas weigh 2 units.
7. 3
8. 3:09
9. 62%
10. 1
11. -1, 6
12.  $x > 2$