**Barron’s Let’s Review Regents – Algebra I**

# Chapter 3: Quadratic Equations

## 3.1 Solving Quadratic Equations by Taking the Square Root of Both Sides of the Equation

An equation that has a variable raised to the second power is called a quadratic equation. Quadratic equations require more advanced techniques to solve. The simplest quadratic equations to solve are the ones where there is no x-term, like:   
x2 = 25 or x2 + 2 = 38.

Examples:   
x2 = 9  
x2 + 5x = 24  
x2 + 5x + 6 = 0

### One-Step Quadratic Equations

If a quadratic equation is in the form x2 = c, the exponent can be eliminated by taking the square root of both sides. There are two answers, generally, since positive times positive is a positive whereas negative times negative also equals a positive.

**Example 1**

Solve for all values of x that satisfy the equation of   
x2 = 25.

x2 = 25  
 =   
x = , x = 5 or x = -5

**Example 2**

x2 = 26  
 =   
x =

### Two-Step Quadratic Equations with Constants

**Example 3**

x2 + 5 = 54  
-5 = -5  
x2 = 49  
 = =

**Example 4**

Solve for all values of x that satisfy the equation   
x2 + 9 = 36.

x2 + 9 = 36  
-9 = -9  
x2 = 27  
 =   
x = , = +

**Example 5**

Solve for all values of x that satisfy the equation:  
(x + 1)2 = 25  
 =   
x + 1 =   
-1 = -1  
x =   
x = 4, x = -6

**Example 6**

Solve for all values of x that satisfy the equation:  
(x + 3)2 = 17  
 = 17  
x + 3 =   
-3 = -3  
x = -3   
x = -3 + or x = -3 -

**Example 7**

Solve for all values of x that satisfy the equation:  
x2 + 6x + 9 = 17

x2 + 6x + 9 = 17  
Factors: **(3,3)**, (-3,-3), (1,9), (-1, -9)  
(x + 3)2 = 17  
x + 2 =   
-2 = -2  
x = -2 + , or x = -2 -

### Two-Step Quadratic Equations with Coefficients

Solve 2x2 = 50.

**Example 8**

Solve for x in terms of a and b in the equation ax2 = b.

ax2 = b

**Example 9**

The formula for the volume of a cylinder is . Solve this equation for r in terms of V, h, and .

Since r represents the radius of the cylinder, the negative answer can be disregarded.

### Solving Square Root Equations

x = 9

x – 2 = 25  
2 = 2  
x = 27

If the square root sign is not already isolated, first isolate it with algebra.

-3 = -3  
x = 25

### Check Your Understanding of Section 3.1

1. Multiple Choice
2. Find all solutions to x2 = 36.  
   **(4) 6, -6**
3. Find all solutions to x2 = 37.  
   **(1)**
4. Find all solutions to x2 - 9 = 40.  
   **(3) 7, -7**
5. Find all solutions to (x + 2)2 = 64.  
   **(2) 6, -10**
6. Find all solutions to (x – 3)2 = 13.  
   **(3)**
7. Find all solutions to (x + 2)2 = 17.  
   **(4)**
8. Find all solutions to 3x2 = 108.  
   x2 = 36  
   (4) 6, -6
9. Find all solutions to 4x2 + 3 = 103.  
   x2 = 25,   
   **(3) 5, -5**
10. Solve for x in terms of c and d: cx2 = d  
    **(2)**
11. Solve for x in terms of g and h:  
    (x + g)2 = h  
    (1)
12. Show how you arrived at your answers.
13. Find all solutions to the equation x2 = 15, rounded to the nearest hundredth.  
    Use calculator:
14. The left-hand side of the equation   
    x2 + 10x + 25 = 64 can be factored into   
    (x + 5)2. Show how you can find the two solutions to this equation by first factoring the left hand side of the equation.  
    -5 = -5
15. If the area of the largest square in this diagram (composed of the two smaller squares and two rectangles) is 49 square units, what is the length of segment x?  
    -2 = -2  
    x = 5  
    Negative results can be disregarded because the length must be a positive number.
16. Diana solves the equation (x + 4)2 = 97 as follows:  
    (x + 4)2 = 97  
    x2 + 16 = 97  
    Wrong approach, incorrect squaring.
17. Find the solution to the equation (x + 1)3 = 8.  
    (x + 1)3 = 8  
    x + 1 = 2  
    x = 1

## 3.2 Solving Quadratic Equations by Guess and Check

There are several ways to solve a quadratic equation like x2 + 10x = 39. For some examples, when the answer is an integer, it is possible to find the answer through guess and check.

Factors: **(-3,13),** (3, -13)

x2 + 10x – 39 = 0  
(x -3)(x+13) = 0  
x = 3, -13

Guess and check is useful if the quadratic equation is a multiple choice question so there are only four things to check.

**Example 1**

Which of the four choices is a solution to the equation x2 + 5x -3 = 33?  
42 + (5)(4) – 3 = 16 + 20 – 3 = 33. Correct.  
**(3) 4**

**Math Facts**

The solutions to a quadratic equation are sometimes called the *roots* or the *zeros* of the equation.

**Example 2**

Which of the four choices is a root of the equation  
x2 – 6x + 4 = 0?

This requires a calculator.

22.391824 - 28.392 + 4 = - 2  
  
27.41674321 - 31.4166 + 4 = 0.0001

Answer:

### Check Your Understanding of Section 3.2

1. Multiple Choice

For each question, use your calculator to check which answer satisfies the quadratic equation:

1. x2 – 8x + 15 = 0  
   (3)(3) – (8)(3) + 15 = 9 – 24 + 15 = 0  
   **(1) 3**
2. x2 – 2x – 8 = 0  
   (1)(1) – (2)(1) – 8 = 1 – 2 – 8 = -9  
   (2)(2) – (2)(2) – 8 = 4 – 4 – 8 = -8  
   (3)(3) – (2)(3) – 8 = 9 – 6 – 8 = -5  
   (4)(4) – (2)(4) – 8 = 16 – 8 – 8 = 0  
     
   **(4) 4**
3. x2 + 5x – 6 = 0  
   (6)(6) + (5)(6) – 6 = 36 + 30 – 6 = 60  
   (-6)(-6) + (5)(-6) – 6 = 36 – 30 – 6 = 0  
     
   **(2) -6**
4. 2x2 + 5x – 3 = 0  
   (2)(1/4)(1/4) + (5)(1/4) – 3 = (2/16) + (5/4) – 3 = (1/8) + (10/8) – 3 = -1/8  
   (2)(1/3)(1/3) + (5)(1/3) – 3 = (2/9) + (5/3) – 3 = (2/9) + (15/9) – 3 = (17/9) – 3 = -10/9  
   (2)(1/2)(1/2) + (5)(1/2) – 3 = (2/4) + (5/2) – 3 = (1/2) + (5/2) – 3 = (6/2) – 3 = 3 – 3 = 0  
   **(3) (1/2)**
5. x2 + 7x = 30  
   (1)(1) + (7)(1) = 8 30  
   (3)(3) + (7)(3) = 9 + 21 = 30  
     
   **(2) 3**
6. x2 – 2x – 2 = 0  
   6.472 – 2 = 1.9997  
   **(4)**