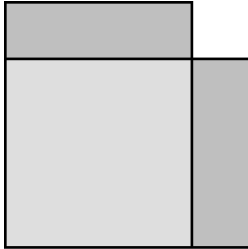


## Section 8.1

### The Square Root Property and Completing the Square

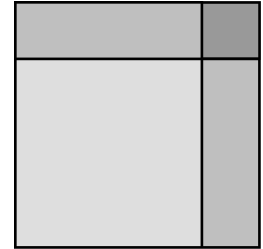
#### ***Completing the Square!!***



What is the difference between the figure on the left and the figure on the right?

The square on the right was *completed* by adding a small square to its upper right-hand corner.

In this section of the textbook, we will explore how this geometrical concept directly relates to an important algebraic procedure called “*completing the square.*”



#### **First Steps:**

- Take comprehensive notes** from your instructor’s lecture and insert your notes into this section of the *Learning Guide*. Be sure to write down all examples, definitions, and other key concepts. Additional learning resources include the *Lecture Series on DVD*, the *PowerPoints*, and Section 8.1 of your textbook which begins on page 582.
- Complete the *Concept and Vocabulary Check* on page 592 of the textbook.

#### **Guided Practice:**

- Review each of the following *Solved Problems* and complete each *Pencil Problem*.

**Objective #1:** Solve quadratic equations using the square root property.

#### ✓ ***Solved Problem #1***

**1a.** Solve:  $4x^2 = 28$

$$4x^2 = 28$$

$$\frac{4x^2}{4} = \frac{28}{4}$$

$$x^2 = 7$$

Apply the square root property.

$$x^2 = 7$$

$$\sqrt{x^2} = \pm\sqrt{7}$$

$$x = \pm\sqrt{7}$$

The solution set is  $\{\pm\sqrt{7}\}$ .

#### ✎ ***Pencil Problem #1*** ✎

**1a.** Solve:  $3x^2 = 75$

1b. Solve:  $4x^2 + 9 = 0$

$$4x^2 + 9 = 0$$

$$4x^2 = -9$$

$$x^2 = -\frac{9}{4}$$

$$x = \pm \sqrt{-\frac{9}{4}}$$

$$x = \pm \frac{\sqrt{-9}}{\sqrt{4}}$$

$$x = \pm \frac{3}{2}i$$

The solution set is  $\left\{\pm \frac{3}{2}i\right\}$ .

1b. Solve:  $25x^2 + 16 = 0$

1c. Solve:  $(x-3)^2 = 10$

$$(x-3)^2 = 10$$

$$x-3 = \sqrt{10} \quad \text{or} \quad x-3 = -\sqrt{10}$$

$$x = 3 + \sqrt{10} \quad \quad \quad x = 3 - \sqrt{10}$$

The solution set is  $\{3 \pm \sqrt{10}\}$ .

1c. Solve:  $(x+7)^2 = 9$

**Objective #2: Complete the square of a binomial.****✓ Solved Problem #2**

2. What term should be added to the binomial  $x^2 + 10x$  so that it becomes a perfect square trinomial? Write and factor the trinomial.

The coefficient of the  $x$ -term of  $x^2 + 10x$  is 10.Half of 10 is 5, and  $5^2$  is 25, which should be added to the binomial.

The result is a perfect square trinomial.

$$x^2 + 10x + 25 = (x+5)^2$$

**✎ Pencil Problem #2 ✎**

2. What term should be added to the binomial  $x^2 - 14x$  so that it becomes a perfect square trinomial? Write and factor the trinomial.

**Objective #4:** Solve problems using the square root property.**✓ Solved Problem #4**

4. You invested \$3000 in an account whose interest is compounded annually. After 2 years, the amount, or balance, in the account is \$4320. Find the annual interest rate.

$$A = P(1+r)^t$$

$$4320 = 3000(1+r)^2$$

$$1.44 = (1+r)^2$$

$$1+r = \sqrt{1.44} \quad \text{or} \quad 1+r = -\sqrt{1.44}$$

$$1+r = 1.2 \qquad 1+r = -1.2$$

$$r = 0.2 \qquad r = -2.2$$

Reject  $-2.2$  because we cannot have a negative interest rate.

The solution is  $0.2$ ; the annual interest rate is  $20\%$ .

**✎ Pencil Problem #4**

4. A supporting wire is to be attached to the top of a 50-foot antenna. If the wire must be anchored 50 feet from the base of the antenna, what length of wire is required?

**Answers for Pencil Problems (Textbook Exercise references in parentheses):**

1a.  $\{\pm 5\}$  (8.1 #1)    1b.  $\left\{\pm \frac{4}{5}i\right\}$  (8.1 #9)    1c.  $\{-10, -4\}$  (8.1 #11)

2. add 49;  $x^2 - 14x + 49 = (x-7)^2$  (8.1 #25)

3a.  $\{-8, 4\}$  (8.1 #35)    3b.  $\{-1 \pm i\}$  (8.1 #41)

4. A supporting wire of  $50\sqrt{2}$  feet, or approximately 70.7 feet, is required. (8.1 #87)

**Homework:**

- Review the Section 8.1 summary** on page 653 of the textbook.
- Insert your homework** into this section of the *Learning Guide*. Show all work neatly and check your answers. Strive to work through difficulties when possible, making note of any exercises where you need additional help. Remember, even if your instructor assigns homework through *MyMathLab*, you should still write out your work.