***Margin Exercise Answers***

**1.** $x = -8, 8$ **2.** $y = -2$ **3.** $x = \frac{1}{2}, -3$ **4.** No solution **5.** $x = \frac{3}{4}$ **6.** $x = 2$ **7.** $x = 9, 25$ **8.** $x = 8$

# 15.6 Exercises

## Concept Check

**Fill-in-the-Blank.** Complete each sentence using information found in this section.

**1.** To solve equations with radicals, first _____ one of the radicals on one side of the equation.

**2.** Next, raise both sides of the equation to the power corresponding to the _____ of the radical.

**3.** Solve the equation after all _____ have been eliminated.

**4.** When both sides of an equation are raised to a power, a/an _____ solution may be introduced.

**5.** Once all possible solutions have been found for an equation, those solutions should be checked to eliminate any _____ solutions.

**True/False.** Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

**6.** All radical equations will have two solutions.

**7.** If no true statements result when all possible solutions are checked, then there is no solution.

**8.** When solving equations with radicals, you should only have to raise both sides of the equation to a power one time.

**9.** A radical expression set equal to a negative value, such as $\sqrt{x+2} = -4$, has no real solution.

## Practice

Solve the following equations. Be sure to check your answers in the original equation.

**1.** $\sqrt{8x+1} = 5$

**2.** $\sqrt{7x+1} = 6$

**3.** $\sqrt{3x+4} = -5$

**4.** $\sqrt{4x-3} = 7$

**5.** $\sqrt{6-x} = 3$

**6.** $\sqrt{11-x} = 5$

**7.** $\sqrt{5x-6} = 8$

**8.** $\sqrt{2x-5} = -1$

**9.** $\sqrt{5x+4} = 7$

**10.** $\sqrt{3x-2} = 4$

**11.** $\sqrt{x-4} + 6 = 2$

**12.** $\sqrt{6x+4} + 2 = 10$

**13.** $\sqrt{4x+1}+4=9$

**14.** $\sqrt{2x-7}+5=3$

**15.** $\sqrt{x(x+3)}=2$

**16.** $\sqrt{x(x-5)}=6$

**17.** $\sqrt{x(2x+5)}=5$

**18.** $\sqrt{x(3x-14)}=7$

**19.** $\sqrt{x+6}=x+4$

**20.** $\sqrt{x+7}=2x-1$

**21.** $\sqrt{x-2}=x-2$

**22.** $\sqrt{x+3}=x+3$

**23.** $x-2=\sqrt{3x-6}$

**24.** $x+6=\sqrt{2x+12}$

**25.** $\sqrt{x^2-16}=3$

**26.** $\sqrt{x^2-25}=12$

**27.** $5+\sqrt{x+5}-2x=0$

**28.** $x-2-\sqrt{x+4}=0$

**29.** $2x=\sqrt{7x-3}+3$

**30.** $x-\sqrt{3x-8}=4$

**31.** $\sqrt{2x+5}=\sqrt{4x-1}$

**32.** $\sqrt{5x-1}=\sqrt{x+7}$

**33.** $\sqrt{3x+2}=\sqrt{9x-10}$

**34.** $\sqrt{2+x}=\sqrt{2x-7}$

**35.** $\sqrt{2x-1}=\sqrt{x+1}$

**36.** $\sqrt{3x+2}=\sqrt{x+4}$

**37.** $\sqrt{x+2}=\sqrt{2x-5}$

**38.** $\sqrt{2x-5}=\sqrt{3x-9}$

**39.** $\sqrt{4x-3}=\sqrt{2x+5}$

**40.** $\sqrt{4x-6}=\sqrt{3x-1}$

**41.** $\sqrt{3x+1}=1-\sqrt{x}$

**42.** $\sqrt{x}=\sqrt{x+16}-2$

**43.** $\sqrt{x+4}=\sqrt{x+11}-1$

**44.** $\sqrt{1-x}+2=\sqrt{13-x}$

**45.** $\sqrt{x+1}=\sqrt{x+6}+1$

**46.** $\sqrt{x+4}=\sqrt{x+20}-2$

**47.** $\sqrt{x+5}+\sqrt{x}=5$

**48.** $\sqrt{x}+\sqrt{x-3}=3$

**49.** $\sqrt{2x+3}=1+\sqrt{x+1}$

**50.** $\sqrt{5x-18}-4=\sqrt{5x+6}$

**51.** $\sqrt{3x+1}-\sqrt{x+4}=1$

**52.** $\sqrt{3x+4}-\sqrt{x+5}=1$

**53.** $\sqrt{5x-1}=4-\sqrt{x-1}$

**54.** $\sqrt{2x-5}-2=\sqrt{x-2}$

**55.** $\sqrt{2x-1}+\sqrt{x+3}=3$

**56.** $\sqrt{2x+3}-\sqrt{x+5}=1$

**57.** $\sqrt[3]{4+3x}=-2$

**58.** $\sqrt[3]{2+9x}=9$

**59.** $\sqrt[3]{5x+4}=4$

**60.** $\sqrt[3]{7x+1}=-5$

## Applications

Solve.

**61.** When money is invested in an account earning an annual interest rate of $r$ %, and the money is left in the account for two years, the interest rate, the principal (the initial amount invested), and the value accumulated after two years are related by the following formula.

$$(r+1)\sqrt{P} = \sqrt{A}$$

In this formula, $r$ is the annual interest rate written as a decimal, $A$ is the accumulated value, and $P$ is the principal invested.

**a.** Suppose you originally invested your money at an annual interest rate of 5%, and at the end of 2 years, your account contained \$2000. How much did you initially invest? Round your answer to the nearest cent.

**b.** Solve the formula for the annual interest rate so that you will have a formula for the interest rate in terms of the principal invested and the accumulated value.

**62.** You want to buy a used car for \$8000. You already have \$7840 saved up for the car. However, the person you are buying the car from has received several offers already. The current owner of the car says that he will hold the car for you for one week before taking another offer. At your after-school job, you make $\sqrt{1500x}+10$ dollars when you work $x$ hours. How many hours will you need to work in the next week in order to be able to buy the car? (Assume that all money from your after-school job can go straight to your car fund.) Round your answer to the nearest whole hour.

**63.** The hang time of an athlete can be represented by

$$t = 2\sqrt{\frac{2h}{g}},$$

where $t$ is the hang time of the athlete in seconds, $h$ is the height of the jump in feet, and $g$ is the acceleration due to gravity. (The gravity constant $g$ can be estimated by using 32 ft/sec$^2$.)

**a.** If Michael Jordan had a vertical jump of 48 inches, how long would he be in the air?

**b.** A volleyball player has a hang time of 0.866 seconds. How high is this player's vertical leap? Round your answer to the nearest foot.

**64.** A company claims their new line of dishware is indestructible, so product testers are dropping dinner plates from varying distances to determine the damage that happens on impact with the ground. The equation $v = \sqrt{19.8h}$ is used to calculate the velocity $v$ of the dinner plate in meters per second when it is dropped from a certain height $h$ in meters. Round all answers to the nearest hundredth.

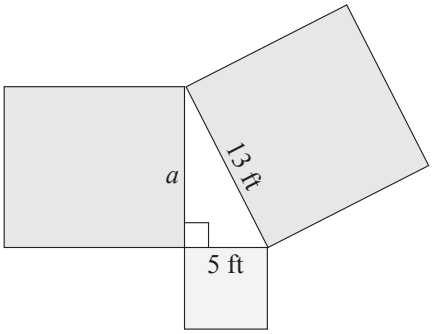
**a.** From what height was the dinner plate dropped if its velocity on impact was 10 m/s?

**b.** From what height was the dinner plate dropped if its velocity on impact was 25 m/s?

**c.** From what height was the dinner plate dropped its velocity on impact was 50 m/s?

**65.** Giovanna drops a stone from the highest point of a bridge into the river below. When Giovanna dropped the stone, her arm was stretched out 2 m above the bridge. The equation $t = \dfrac{\sqrt{10(d+2)}}{7}$ is used to find the time $t$ it takes for a stone to drop a distance of $d + 2$ meters. If it takes the stone 2.5 seconds to hit the water, what is the height of the bridge to the nearest hundredth?

**66.** A landscaper is designing a pond in the shape of a right triangle that has a square flower patch along each edge. She knows two of the flower patches will have side lengths of 5 ft and 13 ft and that the remaining flower patch must have a side length $a$ that satisfies the equation $13 = \sqrt{a^2 + 5^2}$. What is the side length of the remaining flower patch?




**67.** A farmer fell asleep under a tree in his apple orchard while thinking about pie. While he was sleeping, a squirrel knocked an apple off of a branch of the tree. The function $f(d) = \sqrt{\dfrac{2d}{9.8}}$ can be used to find the amount of time in seconds that it takes for the apple to drop a certain distance $d$, where $d$ is in meters. Round your answers to the nearest hundredth.

**a.** If the apple was connected to a branch that was 2 meters above the farmer's head, how long would it take before the apple hit the top of the farmer's head?

**b.** If the squirrel knocked a second apple off of a branch that was 5 meters above the farmer's head, how long would it take before the apple hit the top of the farmer's head?

**c.** Suppose the second apple missed the farmer's head and landed on the ground instead. If the farmer's head was 0.8 meters above the ground, how long did it take for the apple to hit the ground?

**68.** A person's Body Mass Index (BMI) is determined by the formula $B = \dfrac{703w}{h^2}$, where $B$ is the BMI, $w$ is the person's weight in pounds, and $h$ is the person's height in inches. Having a BMI between 18.5 and 24.9 is considered optimal. A BMI between 25 and 29.9 is considered overweight and a BMI over 30 is considered obese. A BMI below 18.5 is considered underweight.

**a.** Solve the BMI formula for the variable $h$.

**b.** How tall is a person who has a BMI of 20 and a weight of 120 pounds? Round to the nearest inch.

**c.** To be in the optimal BMI range with a weight of 200 pounds, what range in height should a person be? Round to the nearest inch. (**Hint:** Calculate the heights for the endpoints of the BMI range given.)

**d.** How tall is a person whose BMI is 30 and who weighs 150 pounds? Round to the nearest inch.