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10.3 Solving Radical Equations

For use with Exploration 10.3

Essential Question How can you solve an equation that contains square roots?

1 EXPLORATION: Analyzing a Free-Falling Object

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. The table shows the time t (in seconds) that it takes a free-falling object (with no air resistance) to fall d feet.

d (feet)	t (seconds)
0	0.00
32	1.41
64	2.00
96	2.45
128	2.83
160	3.16
192	3.46
224	3.74
256	4.00
288	4.24
320	4.47

a. Use the data in the table to sketch the graph of t as a function of d. Use the coordinate plane below.

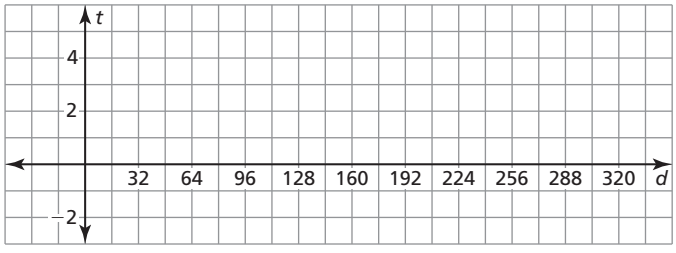
b. Use your graph to estimate the time it takes the object to fall 240 feet.

c. The relationship between d and t is given by the function

$$r = \sqrt{\frac{d}{16}}.$$

Use this function to check you estimate in part (b).

d. It takes 5 seconds for the object to hit the ground. How far did it fall? Explain your reasoning.



2 EXPLORATION: Solving a Square Root Equation

Work with a partner. The speed s (in feet per second) of the free-falling object in Exploration 1 is given by the function

$$s = \sqrt{64d}.$$

Find the distance the object has fallen when it reaches each speed.

a. $s = 8$ ft/sec **b.** $s = 16$ ft/sec **c.** $s = 24$ ft/sec

Communicate Your Answer

3. How can you solve an equation that contains square roots?

4. Use your answer to Question 3 to solve each equation.

a. $5 = \sqrt{x + 20}$ **b.** $4 = \sqrt{x - 18}$

c. $\sqrt{x} + 2 = 3$ **d.** $-3 = -2\sqrt{x}$

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10.3 Notetaking with Vocabulary

For use after Lesson 10.3

In your own words, write the meaning of each vocabulary term.

radical equation

Core Concepts

Squaring Each Side of an Equation

Words If two expressions are equal, then their squares are also equal.

Algebra If $a = b$, then $a^2 = b^2$.

Notes:

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10.3 Notetaking with Vocabulary (continued)

Extra Practice

In Exercises 1–21, solve the equation. Check your solution(s).

1. $\sqrt{x} = 4$

2. $8 = \sqrt{n} - 3$

3. $3\sqrt{a} - 15 = -6$

4. $\sqrt{s - 3} + 7 = 11$

5. $6\sqrt{t - 2} = 12$

6. $3\sqrt{3x - 6} + 2 = 20$

7. $\sqrt{d} = \sqrt{5d - 8}$

8. $\sqrt{3c - 2} = \sqrt{4c - 6}$

9. $\sqrt{4b - 4} = \sqrt{2b + 4}$

10. $\sqrt{z - 12} = \sqrt{\frac{z}{3} - 3}$

11. $\sqrt{\frac{2v}{3} + 10} = \sqrt{4v - 10}$

12. $\sqrt{3w + 1} - \sqrt{6w} = 0$

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10.3 Notetaking with Vocabulary (continued)

13. $5 = \sqrt[3]{x}$

14. $-3 = \sqrt[3]{x + 2}$

15. $\sqrt[3]{7m - 3} = \sqrt[3]{m + 9}$

16. $k + 6 = \sqrt{2k + 15}$

17. $\sqrt{-1 - 2b} = b$

18. $\sqrt{3p + 19} = p - 3$

19. $r - 1 = \sqrt{r + 5}$

20. $\sqrt{2x - 1} + 6 = 3$

21. $k - 1 = \sqrt{5k - 9}$

22. The period P (in seconds) of a pendulum is given by the function $P = 2\pi\sqrt{\frac{L}{32}}$, where L is the pendulum length (in feet). A pendulum has a period of 16 seconds. Is this pendulum 16 times as long as a pendulum with a period of 4 seconds? Explain your reasoning.