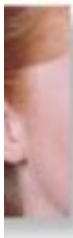


## Communicate

1. Explain why a common logarithmic function is appropriate to use for the decibel scale of sound intensities.
2. Describe the steps you would take to solve  $6^x = 39$  for  $x$ .
3. Explain how to evaluate  $\log_4 29$  by using a calculator.

## Guided Skills Practice

**S**



4. **PHYSICS** Suppose that a soft whisper is about 75 times as loud as the threshold of hearing,  $I_0$ . Find the relative intensity,  $R$ , of this whisper in decibels. (**EXAMPLE 1**)
5. **PHYSICS** The relative intensity,  $R$ , of a loud siren is about 130 decibels. Compare the intensity of this siren with the threshold of hearing,  $I_0$ . (**EXAMPLE 2**)

**Solve each exponential equation for  $x$ . Round your answers to the nearest hundredth. (EXAMPLE 3)**

6.  $8^x = 4$
7.  $4^x = 72$

**Evaluate each logarithmic expression. Round your answers to the nearest hundredth. (EXAMPLE 4)**

8.  $\log_2 46$
9.  $\log_5 2$

## Practice and Apply

**Solve each equation. Round your answers to the nearest hundredth.**

- |                      |                    |                      |
|----------------------|--------------------|----------------------|
| 10. $4^x = 17$       | 11. $2^x = 49$     | 12. $7^x = 908$      |
| 13. $8^x = 240$      | 14. $3.5^x = 28$   | 15. $7.6^x = 64$     |
| 16. $25^x = 0.04$    | 17. $3^x = 0.26$   | 18. $2^{-x} = 0.045$ |
| 19. $7^{-x} = 0.022$ | 20. $3^x = 0.45$   | 21. $5^x = 1.29$     |
| 22. $2^{x+1} = 30$   | 23. $3^{x-6} = 81$ | 24. $11 - 6^x = 3$   |
| 25. $67 - 2^x = 39$  | 26. $8 + 3^x = 10$ | 27. $1 + 5^x = 360$  |

Evaluate each logarithmic expression to the nearest hundredth.

- |                          |                           |                      |
|--------------------------|---------------------------|----------------------|
| 28. $\log_4 92$          | 29. $\log_6 87$           | 30. $\log_6 18$      |
| 31. $\log_3 15$          | 32. $\log_6 3$            | 33. $\log_5 2$       |
| 34. $\log_9 4$           | 35. $\log_8 3$            | 36. $\log_4 0.37$    |
| 37. $\log_9 1.43$        | 38. $\log_3 9$            | 39. $\log_3 8$       |
| 40. $\log_8 \frac{1}{4}$ | 41. $\log_7 \frac{1}{50}$ | 42. $8 - \log_2 64$  |
| 43. $1 - \log_5 21$      | 44. $9 + \log_3 27$       | 45. $4 + \log_5 125$ |

E

46. Prove that  $\log_{(b^n)} x = \frac{1}{n} \log_b x$  is true.

NS

47. **PHYSICS** The sound of a leaf blower is about  $10^{10.5}$  times the intensity of the threshold of hearing,  $I_0$ . Find the relative intensity,  $R$ , of this leaf blower in decibels.
48. **PHYSICS** The sound of a conversation is about 350,000 times the intensity of the threshold of hearing,  $I_0$ . Find the relative intensity,  $R$ , of this conversation in decibels.
49. **PHYSICS** Suppose that the relative intensity,  $R$ , of a rock band is about 115 decibels. Compare the intensity of this band with that of the threshold of hearing,  $I_0$ .
50. **PHYSICS** The relative intensity,  $R$ , of an automobile engine is about 55 decibels. Compare the intensity of this engine with that of the threshold of hearing,  $I_0$ .
51. **PHYSICS** Suppose that background music is adjusted to an intensity that is 1000 times as loud as the threshold of hearing. What is the relative intensity of the music in decibels?
52. **PHYSICS** Suppose that a burglar alarm has a rating of 120 decibels. Compare the intensity of this decibel rating with that of the threshold of hearing,  $I_0$ .
53. **PHYSICS** Simon Robinson set the world record for the loudest scream by producing a scream of 128 decibels at a distance of 8 feet and 2 inches. Compare the intensity of this decibel rating with that of the threshold of hearing,  $I_0$ . [Source: *The Guinness Book of World Records*, 1997]
54. **PHYSICS** A small jet engine produces a sound whose intensity is one billion times as loud as the threshold of hearing. What is the relative intensity of the engine's sound in decibels?

