Example 1

Find each of the values below and then justify your answer by writing the equivalent exponential form.

a. $\log_5 25 = ?$ b. $\log_7 ? = 3$ c. $\log_2 \left(\frac{1}{8}\right) = ?$

A logarithm is really just an exponent, so an expression like the one in part (a), $\log_5 25$, is asking "What exponent can I raise the base 5 to, to get 25?" We can translate this question into an equation: $5^? = 25$. By phrasing it this way, the answer is more apparent: 2. This is true because $5^2 = 25$.

Part (b) can be rephrased as $7^3 = ?$. The answer is 343.

Part (c) asks "2 to what exponent gives $\frac{1}{8}$?" or $2^? = \frac{1}{8}$. The answer is -3 because $2^{-3} = \frac{1}{2^3} = \frac{1}{8}$.

3. $x = \log_5 30$
4. $4^x = 80$
5. $\left(\frac{1}{2}\right)^x = 64$
6. $x^3 = 343$
7. $5^x = \frac{1}{125}$
8. $\log_x 32 = y$
9. $11^3 = x$
10. $-4 = \log_x \left(\frac{1}{16}\right)$

3. $5^x = 30$
4. $\log_4 80 = x$
5. $\log_{1/2} 64 = x$
6. $\log_x 343 = 3$
7. $\log_5 \left(\frac{1}{125}\right) = x$
8. $x^y = 32$
9. $\log_{11} x = 3$
10. $x^{-4} = \frac{1}{16}$

13. $9 = \log x$

14. $81 = 9^x$

15. $\left(\frac{1}{3}\right)^x = 243$

16. $6^x = 7776$

17. $7^x = \frac{1}{49}$

18. $\log_2 32 = x$

19. $\log_{11} x = 3$

20. $\log_5 \left(\frac{1}{125}\right) = x$

13. $x = 1{,}000{,}000{,}000$

14. $x = 2$

15. $x = -5$

16. $x = 5$

17. $x = -2$

18. $x = 5$

19. $x = 1{,}331$

20. $x = -3$

y

y