

Homework 6.4

1. $8^2 = 64$ 2. $2^3 = 8$ 3. $5^3 = 125$ 4. $3^6 = 729$
 $\log_8 64 = 2$ $\log_2 8 = 3$ $\log_5 125 = 3$ $\log_3 729 = 6$

5. $\frac{\log 243}{\log 3} = 5$ 6. $\frac{\log 625}{\log 5} = 4$ 7. $\frac{\log 729}{\log 9} = 3$ 8. $\frac{\log 256}{\log 4} = 4$

9. $\log_8 64 = x \Rightarrow 8^x = 64 \Rightarrow 8^x = 8^2 \Rightarrow x = 2$

10. $\log_5 3 + \log_5 6 = \log_5 (3 \times 6) = \log_5 18$

11. $\log_2 32 - \log_2 8 = \log_2 \frac{32}{8} = \log_2 4$

12. $\frac{1}{2} \log_4 25 + \log_4 2 = \log_4 25^{\frac{1}{2}} + \log_4 2 = \log_4 (5 \times 2) = \log_4 10$

13. $\log_4 \frac{m}{n} = \log_4 m - \log_4 n$

14. $\log_5 (x \sqrt[3]{y}) = \log_5 x y^{\frac{1}{3}} = \log_5 x + \frac{1}{3} \log_5 y$

15. $\log_3 \frac{x^4}{y^2} = \log_3 x^4 - \log_3 y^2 = 4 \log_3 x - 2 \log_3 y$

18. $\sqrt[3]{y^2} = 4$

$$y^2 = 4^3$$

$$y^2 = 64$$

$$y = \pm 8$$

19. $2 - 4^x = -62$

$$-4^x = -64$$

$$4^x = 64$$

$$4^x = 4^3$$

$$x = 3$$

20. $\log x + \log 2 = 5$

$$\log 2x = 5$$

$$10^5 = 2x$$

$$100000 = 2x$$

$$x = 50000$$

$$21. \log_3(x+1) = 4$$

$$3^4 = x+1$$

$$81 = x+1$$

$$80 = x$$

$$22. \log 4x = -1$$

$$10^{-1} = 4x$$

$$0.1 = 4x$$

$$x = 0.025$$

$$23. \log 4 - \log x = -2$$

$$\log \frac{4}{x} = -2$$

$$10^{-2} = \frac{4}{x}$$

$$x = 400$$

$$24. 4 + 5^x = 29$$

$$5^x = 25$$

$$5^x = 5^2$$

$$x = 2$$

$$25. \log(2x) = \log 10$$

$$2x = 10$$

$$x = 5$$

$$26. 4^x = 16$$

$$4^x = 4^2$$

$$x = 2$$

$$27. 9^{y-3} = 8$$

$$\frac{(y-3) \log 9}{\log 9} = \frac{\log 8}{\log 9}$$

$$y-3 = 0.9464$$

$$y = 3.9464$$

$$28. \log \frac{1}{3} x = 2$$

$$100 = \frac{1}{3} x$$

$$x = 300$$

$$29. 2 = \log_4(x+1)$$

$$\log_4(x+1) = 2$$

$$4^2 = x+1$$

$$16 = x+1$$

$$x = 15$$

$$30. N = \text{species} = 2700$$

$$A = \text{area} = 500 \text{ km}^2$$

$k = \text{parameter}$

$$N = k \log A$$

$$2700 = k \log 500$$

$$k = 1000.38$$

$$N = 1000.38 \log(250)$$

$$N \approx 2399 \text{ species!}$$

Half the initial area

Homework 6.4: Solving Logarithms Quiz Review

Math 3

Write each equation in logarithmic form.

1. $64 = 8^2$

$\log_8 64 = 2$

2. $8 = 2^3$

$\log_2 8 = 3$

3. $125 = 5^3$

$\log_5 125 = 3$

4. $729 = 3^6$

$\log_3 729 = 6$

Evaluate each logarithm.

5. $\log_3 243$

5

6. $\log_5 625$

4

7. $\log_9 729$

3

8. $\log_4 256$

4

9. Reasoning Find the value of $\log_8 64$ without using a calculator. Justify your answer.

$x = 2$

Write each expression as a single logarithm.

10. $\log_5 3 + \log_5 6$

$\log_5 18$

11. $\log_2 32 - \log_2 8$

$\log_2 4$

12. $\frac{1}{2} \log_4 25 + \log_4 2$

$\log_4 10$

Expand each logarithm.

13. $\log_4 \frac{m}{n}$

$\log_4 m - \log_4 n$

14. $\log_5 (x \cdot \sqrt[3]{y})$

$\log_5 x + \frac{1}{3} \log_5 y$

15. $\log_3 \frac{x^4}{y^2}$

$4 \log_3 x - 2 \log_3 y$

Solve each equation.

18. $\sqrt[3]{y^2} = 4$

$x = \pm 8$

19. $2 - 4^x = -62$

$x = 3$

20. $\log x + \log 2 = 5$

$x = 50000$

21. $\log_3 (x + 1) = 4$

$x = 80$

22. $\log 4x = -1$

$x = 0.025$

23. $\log 4 - \log x = -2$

$x = 400$

24. $4 + 5^x = 29$

$x = 2$

25. $\log(2x) = \log(10)$

$x = 5$

26. $4^x = 16$

$x = 2$

27. $9^{y-3} = 8$

$x = 3.9464$

28. $\log \frac{1}{3} x = 2$

$x = 300$

29. $2 = \log_4 (x + 1)$

$x = 15$

30. You can use the equation $N = k \log A$ to estimate the number of species N that live in a region of area A . The parameter k is determined by the conditions in the region. In a rain forest, 2700 species live in 500 km². How many species would remain if half of the forest area were destroyed by logging and farming?

$N \approx 2399$ species

Homework 6.4: Solving Logarithms Quiz Review

Math 3

Write each equation in logarithmic form.

1. $10^4 = 81$

$\log_{10} 81 = 4$

2. $2^5 = 32$

$\log_2 32 = 5$

3. $10^2 = 100$

$\log_{10} 100 = 2$

4. $10^3 = 1000$

$\log_{10} 1000 = 3$

5. $\log_2 32 = 5$

$2^5 = 32$

6. $\log_2 64 = 6$

$2^6 = 64$

7. $\log_2 16 = 4$

$2^4 = 16$

8. $\log_2 8 = 3$

$2^3 = 8$

9. Rounding first the value of log 84 without using a calculator. Justify your answer.

$\log 84 \approx 1.924$

Write each expression as a single logarithm.

10. $\log_2 3 + \log_2 6$

$\log_2 18$

11. $\log_2 32 - \log_2 8$

$\log_2 4$

12. $\log_2 10 + \log_2 5$

$\log_2 50$

Expand each logarithm.

13. $\log_2 \frac{w}{v}$

$\log_2 w - \log_2 v$

14. $\log_2 (x+2)$

$\log_2 (x+2)$

15. $\log_2 21$

$\log_2 3 + \log_2 7$

Solve each equation.

16. $10^x = 4$

$x = \log_{10} 4$

17. $2^x - 3 = -63$

$x = -5$

18. $10^x + \log_2 x = 2$

$x = 1$

19. $\log_2 (x+1) = 4$

$x = 15$

20. $\log_2 (x-1)$

$x = 3$

21. $10^x - \log_2 x = 42$

$x = 2$

22. $10^x + 3x = 39$

$x = 1$

23. $\log_2 (x+1) = \log_2 (10)$

$x = 9$

24. $x = 10$

$x = 10$

25. $x = 8$

$x = 8$

26. $\log_2 \frac{1}{2}$

$x = -1$

27. $\log_2 (x+1)$

$x = 3$

28. The number of bacteria in a culture is given by $N = 1000(1.05)^t$, where t is time in hours. The number of bacteria is 1000 at $t = 0$. How long will it take for the number of bacteria to reach 100,000? (Round to the nearest hour.)

$t \approx 40$ hours