

1. Which expression is equivalent to $\log_5 30$?

- A. $\log 6$
- B. $\log 30 - \log 5$
- C. $\frac{\log 5}{\log 30}$
- D. $\frac{\log_2 30}{\log_2 5}$

2. Simplify: $(\log_x y)(\log_y x)$

- A. 0
- B. 1
- C. $xy^{(x+y)}$
- D. $\log_{xy} (x + y)$

3. Evaluate: $\log_7 15$ (Accurate to 2 decimal places.)

- A. 0.17
- B. 0.33
- C. 1.18
- D. 1.39

4. A radioactive material decays according to the formula $A = A_0 10^{-kt}$, where A is the final amount, A_0 is the initial amount and t is time in years. Find k , if 500 grams of this material decays to 450 grams in 10 years. (Accurate to 4 decimal places.)

- A. -16.9897
- B. -0.9000
- C. 0.0046
- D. 1.1065

5. Which expression is equivalent to $\frac{\log_n p}{\log_n m}$?

- A. $\frac{p}{m}$
- B. $\log_m p$
- C. $\log_p m$
- D. $\log p - \log m$

6. Solve for x : $\log(4x+3) - \log x = \log 10$

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{7}{3}$

D. $\frac{13}{3}$

7. Solve: $\log_3 x + \log_3(x+2) = 1$

A. $-3, 1$

B. 0.5

C. 0.12

D. 1

8. Evaluate: $\log_4 135$ (Accurate to 2 decimal places.)

A. 0.53

B. 1.53

C. 2.13

D. 3.54

9. If $\log_9 5 = x$ and $\log_{27} 2 = y$, express $\log_3 100$ in terms of x and y .

A. $2(9^x + 27^y)$

B. $9x + 27y$

C. $24xy$

D. $4x + 6y$

10. Solve: $\log 4x + \log x = \log 100$

A. $\frac{2}{5}$

B. $\frac{5}{2}$

C. 5

D. 20

11. Simplify: $\frac{1}{\log_a x} + \frac{1}{\log_b x}$

A. $-\log_{ab} x$

B. $-\log_x ab$

C. $\log_{ab} x$

D. $\log_x ab$

12. Solve: $\log_6 x + \log_6(x - 5) = 2$

- A. 3.5
- B. 8.5
- C. 9
- D. 20.5

13. Solve for x : $(\log_2 3)(\log_x 5)(\log_5 2) = 9$

- A. $3^{\frac{1}{9}}$
- B. $9^{\frac{1}{3}}$
- C. 2
- D. 3

14. Solve: $\log_2 x = \log_4 x^2$

- A. 1
- B. 2
- C. 1, 2, 4
- D. all positive real numbers

15. Solve: $\frac{1}{\log_2 x} + \frac{1}{\log_8 x} = 2$

- A. 2
- B. 4
- C. 8
- D. 16

16. A city has a population of 15 000 and the population decreases by 8% per year. How many years will it take for the population to become 5 000? (accurate to 1 decimal place) **(3 marks)**

17. Solve for x : $\log_5(2x + 1) = 1 - \log_5(x + 2)$ **(3 marks)**

18. Solve: $\log(10 - 3x) - 2 \log x = 0$ **(3 marks)**

19. Solve: $\log(x + 11) + \log x = \log(x + 1) + \log 6$ **(3 marks)**

20. Solve: $\log_4(7 - 3x) + \log_4(x + 4) = 2$ **(3 marks)**

21. Solve for x : $\log_2(3x + 2) + \log_2(x - 1) = 1$ **(3 marks)**

22. Suppose you invest \$10 at 10.2% per annum compounded annually. How many years would it take for your investment to grow to \$15 000? (Accurate to at least 1 decimal place.) **(3 marks)**

23. Solve: $\log_4(x - 3) + \log_4(2x - 4) = 1$ **(3 marks)**

24. Solve: $\log_2(x + 7) + \log_2(x + 5) = 3$ **(3 marks)**

25. A river system currently has 4 million fish. Each year the population declines by 5%. After how many years will the population fall below 700 000 fish? (Accurate to the nearest year.) **(2 marks)**

26. Solve for x : $2 \log(4-x) - \log 3 = \log(10-x)$ (3 marks)
27. Solve: $\log(x+4) = 1 - \log 2x$ (3 marks)
28. A colony of ants has a population of 250 000. It is growing at a rate of 3.7% per annum. How long will it take for the population to reach 1 000 000? (Accurate to the nearest year.) (3 marks)
29. Solve for x : $\log(3x-5) + \log(2x-1) = 1$ (3 marks)
30. Solve for x : $500 = 2.5(7.04)^{\frac{x}{3}}$ (Accurate to at least 2 decimal places.) (3 marks)
31. The population of a city is increasing at a rate of 6.5% each year. If the present population is 12 000, how long will it take for the population to reach 32 000? (Accurate to at least 1 decimal place.) (3 marks)

KEY

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| 1. D | 8. D | 15. B | 22. 75.3 | 29. 2.5 |
| 2. B | 9. D | 16. 13.2 | 23. 4 | 30. 8.14 |
| 3. D | 10. C | 17. 0.5 | 24. -3 | 31. 15.6 |
| 4. C | 11. D | 18. 2 | 25. 34 | |
| 5. B | 12. C | 19. 1 | 26. -2 | |
| 6. A | 13. A | 20. -3, 4/3 | 27. 1 | |
| 7. D | 14. D | 21. 4/3 | 28. 39 | |