ILLAWARRA TUTORING

In this worksheet you will master the laws of logarithms to simplify and manipulate logarithmic expressions effectively. Work through each question carefully, showing all your workings.

Easy Questions

1. Write the expression $\log(2 \cdot 3)$ as a sum of two logarithms.
2. Express $\log\left(\frac{15}{3}\right)$ as a difference of two logarithms.
3. Simplify $\log\left(2^4\right)$ by using the power law.
4. Write $\log(a \cdot b^2)$ as a sum of logarithms.
5. Simplify $\log\left(\sqrt{x}\right)$ and write your answer in terms of $\log(x)$.

Intermediate Questions

6. Express $\log a + \log b - \log c$ as a single logarithm.
7. Simplify $2\log x + \frac{1}{2}\log y$ into a single logarithm.
8. Write the expression $\log\left(\frac{x^3}{y^2}\right)$ as a combination of logarithms.
9. Simplify $\frac{1}{3}\log\left(8x^3\right)$ to an equivalent expression.
10. Simplify $\log\left(m^4\right) - \frac{1}{2}\log m$.
11. Given that $\log x + \log y = 3$, write the equation in the form $\log(xy) = $.
12. Express $\log a + \frac{1}{2}\log b - 2\log c$ as a single logarithm.
13. Expand $\log\left(\frac{p^3 q}{r^2}\right)$ completely.
14. Write $\frac{1}{4}\log\left(s^8 t^2\right)$ as a sum of logarithms.
15. Express $\log(50)$ in terms of $\log 2$ and $\log 5$, given that $50 = 2 \cdot 5^2$.

16. Simplify $3\log k - \log\left(k^2\right)$.

17. Expand $\log\left(\sqrt{\dfrac{a^3b}{c}}\right)$ completely.

18. Express $\dfrac{1}{2}\log x - \log y + \dfrac{3}{2}\log z$ as a single logarithm.

19. Write $2\log(2x) - 3\log(3y)$ as a single logarithm.

20. Expand $\log\left(\dfrac{a^3b^2}{c^4}\right)$ completely.

Hard Questions

21. Write $\log\left(\sqrt{\dfrac{p^5q^3}{r^2}}\right)$ as a combination of logarithms.

22. Simplify $\log a - 2\Big[\log a - \log b\Big]$ and express your answer as a single logarithm.

23. Rewrite $3\Big[\log m + \log n\Big] - \dfrac{1}{2}\Big[2\log m - 4\log p\Big]$ as a single logarithm.

24. Write $\log\left(\dfrac{2x^3\sqrt{y}}{z^2}\right)$ as a sum and difference of logarithms.

25. Express $\dfrac{1}{3}\Big[3\log(2a) - \log(b^2)\Big]$ as a single logarithm.

26. Simplify $\log\left(\dfrac{x^2}{y^3}\right) + \log\left(\dfrac{y}{xz^2}\right)$ into a single logarithm.

27. Expand completely $\log\left(\dfrac{(a^2b)^{3/2}}{c\sqrt{d}}\right)$.

28. Combine $2\log(3x) + \dfrac{1}{2}\log(y^2) - \log(6x^2)$ into a single logarithm.

29. Combine $\dfrac{1}{2}\Big[\log(4a) + \log(9b)\Big] - \log(6)$ into one logarithm.

30. Express $\dfrac{1}{2}\log\left(\dfrac{x^6}{y^4}\right) - \log\left(\dfrac{x}{y}\right)$ as a single simplified logarithm.