

**Expand or condense the logarithm**

1.  $\log_3 \frac{\sqrt{x}}{27z^4}$

2.  $\log \pi + 2 \log w - \log 2$

3.  $2 \log_2 (2x) - 3 \log_2 y - \log_2 z$

4.  $2(\log 2x - \log y) - (\log 3 + 2 \log 5)$

5.  $\log_4 \sqrt{\frac{a^3 \sqrt{c}}{b}}$

6.  $3 \log a + \frac{1}{3} \log (b+1) - \log 7$

7.  $5 \log_4 2 + 2 \log_4 5$

8.  $\log \frac{a^2 \sqrt[3]{b}}{4c^5}$

---

$$9. \frac{1}{6}\log 8 - \frac{1}{4}\log 9 + \frac{1}{2}\log 24$$

$$10. \log_4 \frac{4a^5}{3b^3}$$

---

$$11. \ln y - 2(\ln x + \ln x)$$

$$12. \log \frac{(x+2)y^2}{z^7}$$

---

$$13. \frac{1}{4}\log_5 81 - \left(2\log_5 6 - \frac{1}{2}\log_5 4\right)$$

$$14. 2(\log_6 15 - \log_6 5) + \frac{1}{2}\log_6 \frac{1}{25}$$

---

$$15. \log_3 \left( \frac{4(x-5)^2}{x^4(x-1)^3} \right)$$

$$16. \frac{1}{2}\log_7 (81y^{12}) - \log_7 (3) + \log_7 (2y^2)$$

---