

$$1) 27^{\log_{81} 256}$$

$$\begin{aligned} & \log_{81} 256 \\ &= \frac{\log 256}{\log 81} \\ &= \frac{\log 4}{\log 3} \end{aligned}$$

$$\begin{aligned} & 27^{\frac{\log 4}{\log 3}} \\ &= 27^{\frac{\log 4}{\log 3}} \times 27^{\frac{\log 2}{\log 3}} \\ &= 8 \cdot 8 \\ &= 64 \end{aligned}$$

$$2) \frac{\log_3 125 + \log_9 729}{\log_3 15}$$

$$\begin{aligned} &= \frac{\frac{\log 125}{\log 3} + 3}{\frac{\log 15}{\log 3}} \end{aligned}$$

$$\begin{aligned} &= \frac{\frac{\log 125}{\log 3}}{\frac{\log 15}{\log 3}} + \frac{3}{\frac{\log 15}{\log 3}} \end{aligned}$$

$$= \frac{\log 125}{\log 3} \cdot \frac{\log 3}{\log 15} + 3 \cdot \frac{\log 3}{\log 15}$$

$$= \log_{15} 125 + 3 \log_{15} 3$$

$$= \log_{15} 125 + \log_{15} 27$$

$$= 3$$

$$3) \quad m = p^{x^y}$$

$$\log_p m = x^y$$

$$\log_x (\log_p m) = y$$