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Question 1. Find the value of P if

$$\left(\frac{2}{5}\right)^3 \times \left(\frac{2}{5}\right)^{-6} = \left(\frac{2}{5}\right)^{2P-1}$$

Solution:

$$\left(\frac{2}{5}\right)^3 \times \left(\frac{2}{5}\right)^{-6} = \left(\frac{2}{5}\right)^{2P-1}$$

$$\Rightarrow \quad \left(\frac{2}{5}\right)^{3-6} = \left(\frac{2}{5}\right)^{2P-1}$$

$$\Rightarrow \quad \left(\frac{2}{5}\right)^{-3} = \left(\frac{2}{5}\right)^{2P-1}$$

Equating the powers of the same base

$$2P - 1 = -3$$
$$2P = -3 + 1$$
$$2P = -2$$
$$\therefore \quad P = -1$$

Question 12.

If $\left(\frac{x}{y}\right) = \left(\frac{3}{2}\right)^{-2} \div \left(\frac{3}{7}\right)^0$, find the value of $\left(\frac{x}{y}\right)^{-3}$.

Solution:

$$\left(\frac{x}{y}\right) = \left(\frac{3^{-2}}{2^{-2}}\right) \div 1 \qquad\qquad \left[\because \left(\frac{a}{b}\right)^0 = 1\right]$$

$$= \frac{2^2}{3^2} = \frac{4}{9}$$

$$\therefore \quad \left(\frac{x}{y}\right)^{-3} = \left(\frac{4}{9}\right)^{-3}$$

$$= \frac{4^{-3}}{9^{-3}} = \frac{9^3}{4^3}$$

$$= \frac{729}{64}$$

Question 13.
Find the value of x if

1. $$\left(\frac{125}{27}\right) \times \left(\frac{125}{27}\right)^x = \left(\frac{5}{3}\right)^{18}$$

2. $(81)^{-4} \div (729)^{2-x} = 9^{4x}$

Simplify: $\dfrac{(x^{m+n})^2 \times (x^{n+p})^2 \times (x^{p+m})^2}{(x^m \cdot x^n \cdot x^p)^3}$