

WS 6.5B Solving Exponential Equations

Solve each equation.

1) $6^{2x+2} = 6^2$

$$\begin{array}{r} 2x+2 = 2 \\ -2 \quad -2 \\ \hline 2x = 0 \\ \frac{2x}{2} = \frac{0}{2} \end{array}$$

$$\boxed{x = 0}$$

2) $4^{-3b-3} = 4^{-2b}$

$$\begin{array}{r} -3b-3 = -2b \\ +3b \quad +3b \\ \hline -3 = b \end{array}$$

$$\boxed{-3 = b}$$

3) $2^{2k-1} = 16$

$$2^{2k-1} = 2^4$$

$$\begin{array}{r} 2k-1 = 4 \\ +1 \quad +1 \\ \hline 2k = 5 \end{array}$$

$$\frac{2k}{2} = \frac{5}{2}$$

$$\boxed{k = \frac{5}{2}}$$

4) $3^{2-2x} = 3^{3x-3}$

$$\begin{array}{r} 2-2x = 3x-3 \\ +2x \quad +2x \\ \hline 2 = 5x-3 \end{array}$$

$$\begin{array}{r} 2 = 5x-3 \\ +3 \quad +3 \\ \hline 5 = 5x \end{array}$$

$$\frac{5}{5} = \frac{5x}{5}$$

$$\boxed{1 = x}$$

5) $36^{-a} = 6^3$

$$(6^2)^{-a} = 6^3$$

$$\begin{array}{r} -2a = 3 \\ -2 \quad -2 \\ \hline a = -\frac{3}{2} \end{array}$$

$$\boxed{a = -\frac{3}{2}}$$

6) $25^{3r+2} = 125$

$$(5^2)^{3r+2} = 5^3$$

$$2(3r+2) = 3$$

$$\begin{array}{r} 6r+4 = 3 \\ -4 \quad -4 \\ \hline 6r = -1 \end{array}$$

$$\frac{6r}{6} = \frac{-1}{6}$$

$$\boxed{r = -\frac{1}{6}}$$

$$7) 125^{3n-3} = 625^{2n}$$

$$(5^3)^{3n-3} = (5^4)^{2n}$$

$$3(3n-3) = 4(2n)$$

$$\begin{array}{r} 9n - 9 = 8n \\ -9n \quad -9n \end{array}$$

$$\frac{-9}{-1} = \frac{-9n}{-1}$$

$$\boxed{9 = n}$$

$$9) 1000000^{-2m-1} = 100000$$

$$(10^6)^{-2m-1} = 10^5$$

$$6(-2m-1) = 5$$

$$\begin{array}{r} -12m - 6 = 5 \\ +6 \quad +6 \end{array}$$

$$\frac{-12m}{-12} = \frac{11}{-12}$$

$$\boxed{m = -\frac{11}{12}}$$

$$11) 3^{3p} = 3^{-3p-1}$$

$$\begin{array}{r} 3p = -3p-1 \\ +3p \quad +3p \end{array}$$

$$\frac{6p}{6} = \frac{-1}{6}$$

$$\boxed{p = -\frac{1}{6}}$$

$$8) 25^{-2x} = 625^x$$

$$25^{-2x} = (25^2)^x$$

$$-2x = 2x$$

$$\begin{array}{r} -2x = 2x \\ +2x \quad +2x \end{array}$$

$$\frac{0}{4} = \frac{4x}{4}$$

$$\boxed{0 = x}$$

$$10) 9^k = 27$$

$$(3^2)^k = 3^3$$

$$\frac{2k}{2} = \frac{3}{2}$$

$$\boxed{k = \frac{3}{2}}$$

$$12) 2^{3n} = 64$$

$$2^{-3n} = 2^6$$

$$\frac{-3n}{-3} = \frac{6}{-3}$$

$$\boxed{n = -2}$$

$$13) 8^{a-2} = 32^{a-2}$$

$$(2^3)^{a-2} = (2^5)^{a-2}$$

$$3(a-2) = 5(a-2)$$

$$\begin{array}{r} 3a - 6 = 5a - 10 \\ -5a \quad -5a \end{array}$$

$$\frac{-2a - 6}{+6} = \frac{-10}{+6}$$

$$-2a = -4$$

$$\boxed{a = 2}$$

$$14) 9^{2m} = 81$$

$$9^{2m} = 9^2$$

$$\frac{2m}{2} = \frac{2}{2}$$

$$\boxed{m = 1}$$