

Solving exponential equations that do not require the use of logarithms WS

Solve each equation by first rewriting each side using a common base.

1) $\left(\frac{1}{64}\right)^{v+1} = 16$

$$(4^{-3})^{v+1} = 4^2$$

$$-3v-3 = 2$$

$$-3v = 5$$

$$v = -\frac{5}{3}$$

2) $\left(\frac{1}{243}\right)^{n+1} = 27$

$$(3^{-5})^{n+1} = 3^3$$

$$-5n-5 = 3$$

$$-5n = 8$$

$$n = -\frac{8}{5}$$

3) $64^{-3v} = \frac{1}{16}$

$$(4^3)^{-3v} = 4^{-2}$$

$$-9v = -2$$

$$v = \frac{2}{9}$$

4) $16^{-2v} = 8$

$$(2^4)^{-2v} = 2^3$$

$$-8v = 3$$

$$v = -\frac{3}{8}$$

5) $\left(\frac{1}{6}\right)^{2n} = 216$

$$(6^{-1})^{2n} = 6^3$$

$$-2n = 3$$

$$n = -\frac{3}{2}$$

6) $16^{3m+1} = 4^{3m}$

$$(4^2)^{3m+1} = 4^{3m}$$

$$6m+2 = 3m$$

$$3m = -2$$

$$m = -\frac{2}{3}$$

7) $25^{-3m-3} = 125^{-m-1}$

$$(5^2)^{-3m-3} = (5^3)^{-m-1}$$

$$-6m-6 = -3m-3$$

$$-3m = 3$$

$$m = -1$$

8) $25^{3v} = 625^{3v}$

$$(5^2)^{3v} = (5^4)^{3v}$$

$$6v = 12v$$

$$-6v = 0$$

$$v = 0$$

9) $243^{-3r-2} = \frac{1}{27}$

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

$$-15r-10 = -3$$

$$-15r = 7$$

$$r = -\frac{7}{15}$$

10) $32^{2b} = 2^4$

$$(2^5)^{2b} = 2^4$$

$$10b = 4$$

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

Solving Exp. Eqs. w/o logs

11) $9^{-2n} = \frac{1}{27}$

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

$$-4n = -3$$

$$\boxed{n = \frac{3}{4}}$$

12) $243^{1-2n} = 81^{3n+2}$

$$(3^5)^{1-2n} = (3^4)^{3n+2}$$

$$5-10n = 12n+8$$

$$-22n = 3$$

$$\boxed{n = -\frac{3}{22}}$$

13) $25^{-3m} = 125^{3m+3}$

$$(5^2)^{-3m} = (5^3)^{3m+3}$$

$$-6m = 9m+9$$

$$-15m = 9$$

$$\boxed{m = -\frac{3}{5}}$$

14) $4^{2m-2} = 64$

$$(2^2)^{2m-2} = 2^6$$

$$4m-4 = 6$$

$$4m = 10$$

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

15) $\left(\frac{1}{4}\right)^{-k} = 16$

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

$$\boxed{k = 2}$$

16) $16^{-2p-3} = 4$

$$(4^2)^{-2p-3} = 4^1$$

$$-4p-6 = 1$$

$$-4p = 7$$

$$\boxed{p = -\frac{7}{4}}$$

17) $27^{v-1} = 9$

$$(3^3)^{v-1} = 3^2$$

$$3v-3 = 2$$

$$3v = 5$$

$$\boxed{v = \frac{5}{3}}$$

18) $36^{-2k} = 216^{-2k+3}$

$$(6^2)^{-2k} = (6^3)^{-2k+3}$$

$$-4k = -6k+9$$

$$2k = 9$$

$$\boxed{k = \frac{9}{2}}$$

19) $9^{a+1} = 243$

$$(3^2)^{a+1} = 3^5$$

$$2a+2 = 5$$

$$2a = 3$$

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

20) $27^{-v} = \frac{1}{3}$

$$(3^3)^{-v} = 3^{-1}$$

$$-3v = -1$$

$$\boxed{v = \frac{1}{3}}$$