R.6 Exponents

1. $8^{-2} = \dfrac{1}{8^2} = \dfrac{1}{64}$

2. $3^{-4} = \dfrac{1}{3^4} = \dfrac{1}{81}$

3. $5^0 = 1$, by definition.

4. $(-12)^0 = 1$, by definition.

5. $-(-3)^{-2} = -\dfrac{1}{(-3)^2} = -\dfrac{1}{9}$

6. $-(-3^{-2}) = -\left(-\dfrac{1}{3^2}\right) = -\left(-\dfrac{1}{9}\right) = \dfrac{1}{9}$

7. $\left(\dfrac{2}{7}\right)^{-2} = \dfrac{1}{\left(\frac{2}{7}\right)^2} = \dfrac{1}{\frac{4}{49}} = \dfrac{49}{4}$

8. $\left(\dfrac{4}{3}\right)^{-3} = \dfrac{1}{\left(\frac{4}{3}\right)^3} = \dfrac{1}{\frac{64}{27}} = \dfrac{27}{64}$

9. $\dfrac{3^{-4}}{3^2} = 3^{(-4)-2} = 3^{-4-2} = 3^{-6} = \dfrac{1}{3^6}$

10. $\dfrac{8^9 \cdot 8^{-7}}{8^{-3}} = 8^{9+(-7)-(-3)} = 8^{9-7+3} = 8^5$

11. $\dfrac{10^8 \cdot 10^{-10}}{10^4 \cdot 10^2}$

$= \dfrac{10^{8+(-10)}}{10^{4+2}} = \dfrac{10^{-2}}{10^6}$

$= 10^{-2-6} = 10^{-8}$

$= \dfrac{1}{10^8}$

12. $\left(\dfrac{5^{-6} \cdot 5^3}{5^{-2}}\right)^{-1} = (5^{-6+3-(-2)})^{-1}$

$= (5^{-6+3+2})^{-1} = (5^{-1})^{-1}$

$= 5^{(-1)(-1)} = 5^1 = 5$

13. $\dfrac{x^4 \cdot x^3}{x^5} = \dfrac{x^{4+3}}{x^5} = \dfrac{x^7}{x^5} = x^{7-5} = x^2$

14. $\dfrac{y^9 y^7}{y^{13}} = y^{9+7-13} = y^3$

15. $\dfrac{(4k^{-1})^2}{2k^{-5}} = \dfrac{4^2 k^{-2}}{2k^{-5}} = \dfrac{16k^{-2-(-5)}}{2}$

$= 8k^{-2+5} = 8k^3$

$= 2^3 k^3$

16. $\dfrac{(3z^2)^{-1}}{z^5} = \dfrac{3^{-1}(z^2)^{-1}}{z^5} = \dfrac{3^{-1}z^{2(-1)}}{z^5}$

$= \dfrac{3^{-1}z^{-2}}{z^5} = 3^{-1}a^{-2-5}$

$= 3^{-1}z^{-7} = \dfrac{1}{3} \cdot \dfrac{1}{z^7} = \dfrac{1}{3z^7}$

17. $\dfrac{2^{-1}x^3y^{-3}}{xy^{-2}} = 2^{-1}x^{3-1}y^{-3-(-2)}$

$= 2^{-1}x^2y^{-3+2} = 2^{-1}x^2y^{-1}$

$= \dfrac{1}{2}x^2 \cdot \dfrac{1}{y} = \dfrac{x^2}{2y}$

18. $\dfrac{5^{-2}m^2y^{-2}}{5^2m^{-1}y^{-2}} = \dfrac{5^{-2}}{5^2} \cdot \dfrac{m^2}{m^{-1}} \cdot \dfrac{y^{-2}}{y^{-2}}$

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

$= 5^{-2-2}m^{2+1}y^{-2+2}$

$= 5^{-4}m^3y^0 = \dfrac{1}{5^4} \cdot m^3 \cdot 1$

$= \dfrac{m^3}{5^4}$

19. $\left(\dfrac{a^{-1}}{b^2}\right)^{-3} = \dfrac{(a^{-1})^{-3}}{(b^2)^{-3}} = \dfrac{a^{(-1)(-3)}}{b^{2(-3)}}$

$= \dfrac{a^3}{b^{-6}} = a^3b^6$