pp. 304-305, #1-27 odd, #31, #32, #43-46 all, #54

1. $(-7)^0 = 1$

3. $5^{-4} = \frac{1}{5^4} = \frac{1}{625}$

5. $\frac{2^{-6}}{4^0} = \frac{1}{1 \cdot 2^6} = \frac{1}{64}$

7. $\frac{-3^{-3}}{6^{-2}} = -\frac{6^2}{3^3} = -\frac{36}{27} = -\frac{4}{3}$

9. $x^{-7} = \frac{1}{x^7}$

11. $9x^0y^{-3} = \frac{9 \cdot 1}{y^3} = \frac{9}{y^3}$

13. $\frac{2^{-2}m^{-3}}{n^0} = \frac{1}{1 \cdot 2^2m^3} = \frac{1}{4m^3}$

15. $\frac{4^{-3}a^0}{b^{-7}} = \frac{1 \cdot b^7}{4^3} = \frac{b^7}{64}$

17. $\frac{2^2y^{-6}}{8^{-1}z^0x^{-7}} = \frac{2^2 \cdot 8^1 \cdot x^7}{1 \cdot y^6} = \frac{4 \cdot 8 \cdot x^7}{y^6} = \frac{32x^7}{y^6}$

19. $\dfrac{5^6}{5^2} = 5^{6-2}$

$= 5^4$

$= 625$

21. $(-9)^2 \cdot (-9)^2 = (-9)^{2+2}$

$= (-9)^4$

$= 6561$

23. $(p^6)^4 = p^{6 \cdot 4}$

$= p^{24}$

25. $6^{-10} \cdot 6^5 = 6^{-10+5}$

$= 6^{-5}$

$= \dfrac{1}{6^5}$

$= \dfrac{1}{7776}$

27. $\dfrac{x^5}{x^4} \cdot x = x^{5-4} \cdot x$

$= x^1 \cdot x^1$

$= x^{1+1}$

$= x^2$

31. The Product of Powers Property should be used because powers with the same base are being multiplied. So, the product should have a base of 2, not $2 \cdot 2$.

$2^4 \cdot 2^5 = 2^{4+5} = 2^9$

32. In the second step, the Quotient of Powers Property should be used because powers with the same base are being divided. The exponents should be subtracted, not divided.

$$\frac{x^5 \cdot x^3}{x^4} = \frac{x^{5+3}}{x^4} = \frac{x^8}{x^4} = x^{8-4} = x^4$$

43. $$\left(\frac{2x^{-2}y^3}{3x\,y^{-4}}\right)^4 = \left(\frac{2 \cdot y^3 \cdot y^4}{3 \cdot x^1 \cdot x^2}\right)^4 = \left(\frac{2 \cdot y^{3+4}}{3 \cdot x^{1+2}}\right)^4 = \left(\frac{2y^7}{3x^3}\right)^4$$

$$= \frac{(2y^7)^4}{(3x^3)^4} = \frac{2^4(y^7)^4}{3^4(x^3)^4} = \frac{16y^{7 \cdot 4}}{81x^{3 \cdot 4}} = \frac{16y^{28}}{81x^{12}}$$

44. $$\left(\frac{4s^5t^{-7}}{-2s^{-2}t^4}\right)^3 = \left(\frac{4 \cdot s^5 \cdot s^2}{-2 \cdot t^4 \cdot t^7}\right)^3 = \left(\frac{-2 \cdot s^{5+2}}{t^{4+7}}\right)^3 = \left(\frac{-2s^7}{t^{11}}\right)^3$$

$$= \frac{(-2s^7)^3}{(t^{11})^3} = \frac{(-2)^3(s^7)^3}{t^{11 \cdot 3}} = \frac{-8s^{7 \cdot 3}}{t^{33}} = \frac{-8s^{21}}{t^{33}}$$

45. $\left(\frac{3m^{-5}n^2}{4m^{-2}n^0}\right)^2 \cdot \left(\frac{mn^4}{9n}\right)^2 = \left(\frac{3 \cdot \cancel{m^2} \cdot n^2}{4 \cdot \underset{m^3}{\cancel{m^5}} \cdot 1}\right)^2 \cdot \left(\frac{mn^3}{9}\right)^2$

$$= \left(\frac{3n^2}{4m^3}\right)^2 \cdot \left(\frac{mn^3}{3^2}\right)^2$$

$$= \frac{(3n^2)^2}{(4m^3)^2} \cdot \frac{(mn^3)^2}{(3^2)^2}$$

$$= \frac{3^2 \cdot n^{2\cdot 2} \cdot m^2 \cdot n^{3\cdot 2}}{4^2 \cdot m^{3\cdot 2} \cdot 3^{2\cdot 2}}$$

$$= \frac{\cancel{3^2} \cdot n^4 \cdot \cancel{m^2} \cdot n^6}{4^2 \cdot \underset{m^4}{\cancel{m^6}} \cdot \underset{3^2}{\cancel{3^4}}}$$

$$= \frac{n^{4+6}}{4^2 \cdot m^4 \cdot 3^2}$$

$$= \frac{n^{10}}{16 \cdot 9 \cdot m^4}$$

$$= \frac{n^{10}}{144m^4}$$

46. $\left(\dfrac{3x^3y^0}{x^{-2}}\right)^4 \cdot \left(\dfrac{y^2\,x^{-4}}{5xy^{-8}}\right)^3 = (3 \cdot x^3 \cdot x^2 \cdot 1)^4 \cdot \left(\dfrac{y^2 \cdot y^8}{5 \cdot x^1 \cdot x^4}\right)^3$

$$= (3 \cdot x^{3+2})^4 \cdot \left(\frac{y^{2+8}}{5 \cdot x^{1+4}}\right)^3$$

$$= (3x^5)^4 \cdot \left(\frac{y^{10}}{5x^5}\right)^3$$

$$= 3^4 \cdot x^{5 \cdot 4} \cdot \frac{y^{10 \cdot 3}}{(5x^5)^3}$$

$$= \frac{81 \cdot x^{20} \cdot y^{30}}{5^3\, x^{5 \cdot 3}}$$

$$= \frac{81 \cdot \overset{x^5}{\cancel{x^{20}}} \cdot y^{30}}{125\cancel{x^{15}}}$$

$$= \frac{81x^5y^{30}}{125}$$

54. Because $9 = 3^2$ and $27 = 3^3$, $\dfrac{3^{10} \cdot 27^9}{9^{12}}$ can be rewritten as

$$\frac{3^{10} \cdot 27^9}{9^{12}} = \frac{3^{10} \cdot (3^3)^9}{(3^2)^{12}}$$

$$= \frac{3^{10} \cdot 3^{3 \cdot 9}}{3^{2 \cdot 12}}$$

$$= \frac{3^{10} \cdot 3^{27}}{3^{24}}$$

$$= \frac{3^{10+27}}{3^{24}}$$

$$= \frac{3^{37}}{3^{24}}$$

$$= 3^{27-24}$$

$$= 3^{13}.$$