

Properties of Exponents

Simplify. Your answer should contain only positive exponents.

1) $\underline{2m^2} \cdot \underline{2m^3}$

$$4m^5$$

2) $\underline{m^4} \cdot \underline{2m^{-3}}$

$$2m^1$$

3) $\underline{4r^{-3}} \cdot \underline{2r^2}$

$$8r^{-1} = \frac{8}{r^1}$$

4) $\underline{4n^4} \cdot \underline{2n^{-3}}$

$$8n^1$$

5) $\underline{2k^4} \cdot \underline{4k}$

$$8k^5$$

6) $\underline{2x^3y^{-3}} \cdot \underline{2x^{-1}y^3}$

$$4x^2y^0 = 4x^2$$

7) $\underline{2y^2} \cdot \underline{3x}$

$$6xy^2$$

8) $\underline{4v^3} \cdot \underline{vu^2}$

$$4v^4u^2$$

9) $\underline{4a^3b^2} \cdot \underline{3a^{-4}b^{-3}}$

$$12a^{-1}b^{-1} = \frac{12}{a^1b^1}$$

10) $\underline{x^2y^{-4}} \cdot \underline{x^3y^2}$

$$x^5y^{-2} = \frac{x^5}{y^2}$$

11) $(x^2)^0$

$$x^0 = 1$$

12) $(2x^2)^{-4}$

$$2^{-4}x^{-8} = \frac{1}{2^4x^8} = \frac{1}{16x^8}$$

13) $(4r^0)^4$

$$4^4r^0 = 256$$

14) $(4a^3)^2$

$$4^2a^6 = 16a^6$$

15) $(3k^4)^4$

$$3^4k^{16} = 81k^{16}$$

16) $(4xy)^{-1}$

$$4^{-1}x^{-1}y^{-1} = \frac{1}{4^1x^1y^1}$$

$$17) (2b^4)^{-1}$$

$$2^{-1}b^{-4} = \boxed{\frac{1}{2b^4}}$$

$$18) (x^2y^{-1})^2$$

$$x^4y^{-2} = \boxed{\frac{x^4}{y^2}}$$

$$19) (2x^4y^{-3})^{-1}$$

$$2^{-1}x^{-4}y^3 = \boxed{\frac{y^3}{2x^4}}$$

$$20) (3m)^{-2}$$

$$3^{-2}m^{-2} = \frac{1}{3^2m^2} = \boxed{\frac{1}{9m^2}}$$

$$21) \frac{r^2}{2r^5}$$

$$\boxed{\frac{1}{2r^3}}$$

$$22) \frac{x^{-1}}{4x^6}$$

$$\boxed{\frac{1}{4x^7}}$$

$$23) \frac{3n^4}{8n^3}$$

$$\frac{n^1}{1} = \boxed{n}$$

$$24) \frac{m^4}{2m^4}$$

$$\boxed{\frac{1}{2}}$$

$$25) \frac{3m^{-4}}{m^3}$$

$$\boxed{\frac{3}{m^7}}$$

$$26) \frac{2x^4y^{-4}z^{-3}}{3x^2y^{-3}z^4}$$

$$\boxed{\frac{2x^2}{3y^1z^7}}$$

$$27) \frac{4x^0y^{-2}z^3}{4x}$$

$$\boxed{\frac{z^3}{xy^2}}$$

$$28) \frac{2h^3j^{-3}k^4}{3jk}$$

$$\boxed{\frac{2h^3k^3}{3j^4}}$$

$$29) \frac{4m^4n^3p^3}{3m^2n^2p^4}$$

$$\boxed{\frac{4m^2n}{3p}}$$

$$30) \frac{3x^3y^{-1}z^{-1}}{x^{-4}y^0z^0}$$

$$\boxed{\frac{3x^7}{y^1z^1}}$$

Rational Exponents

$$13. 49^{\frac{1}{2}} = \sqrt{49} = 7$$

$$14. 8^{\frac{2}{3}} = (\sqrt[3]{8})^2 = 4$$

$$15. 16^{\frac{3}{4}} = (\sqrt[4]{16})^3 = 8$$

$$16. 27^{\frac{4}{3}} = (\sqrt[3]{27})^4 = 81$$

$$17. 7^{1/3} = \sqrt[3]{7}$$

$$18. 5^{2/3} = (\sqrt[3]{5})^2$$

$$19. (-27)^{2/3} = (\sqrt[3]{-27})^2 = 9$$

$$20. (-32)^{3/5} = (\sqrt[5]{-32})^3 = -8$$

$$21. (-1000)^{2/3} = (\sqrt[3]{-1000})^2 = 100$$

$$22. -36^{3/2} = -(\sqrt{36})^3 = -216$$

↑
Negative stays out!

$$23. (-1)^{1/3} = \sqrt[3]{-1} = -1$$

$$24. 4^{5/2} = (\sqrt{4})^5 = 32$$

$$25. \sqrt[5]{11^2} = 11^{2/5}$$

$$26. \sqrt[4]{x^3} = x^{3/4}$$

$$27. \sqrt[8]{y^2} = y^{2/8} = y^{1/4}$$

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$$28. \sqrt[5]{7} = 7^{1/5}$$

$$29. \sqrt[3]{9^6} = 9^{6/3} = 9^2 = 81$$

$$30. (\sqrt[4]{2})^2 = 2^{2/4} = 2^{1/2}$$

$$31. \sqrt{4^3} = 4^{3/2} = 8$$

$$32. (\sqrt{y})^5 = y^{5/2}$$

$$33. \sqrt[4]{7^8} = 7^{8/4} = 7^2 = 49$$

$$34. (\sqrt[6]{z})^2 = z^{2/6} = z^{1/3}$$

$$35. \sqrt[6]{m^4} = m^{4/6} = m^{2/3}$$

$$36. -\sqrt{19^7} = -19^{7/2}$$

$$37. 8^{1/2} \cdot 8^{3/2} = 8^{4/2} = 8^2 = 64$$

$$38. n^{1/3} \cdot n^{5/3} = n^{6/3} = n^2$$

$$39. 16^{1/4} \cdot 16^{1/4} \cdot 16^{3/4} = 16^{5/4} = 32$$

$$40. x^{1/2} \cdot x^3 = x^{7/2}$$

$$41. (5^{1/2})^6 = 5^{6/2} = 5^3 = 125$$

$$42. (7^{3/2})^{2/3} = 7^{6/6} = 7$$

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$$43. \frac{49^{1/4}}{49^{3/4}} = \frac{1}{49^{1/2}} = \frac{1}{\sqrt{49}} = \frac{1}{7}$$

$$44. \frac{25^{5/4}}{25^{1/4}} = 25^{4/4} = 25$$

$$45. 8^{-1/3} = (\sqrt[3]{8})^{-1} = 2^{-1} = \frac{1}{2}$$

$$46. \left(\frac{1}{25}\right)^{-1/2} = \frac{1^{-1/2}}{25^{-1/2}} = \frac{(\sqrt{1})^{-1}}{(\sqrt{25})^{-1}} = \frac{1^{-1}}{5^{-1}} = \frac{5}{1} = 5$$

$$47. (x^3 z^9)^{2/3} = x^{6/3} z^{18/3} = x^2 z^6$$

$$48. (x^{1/2} y^2)^4 \sqrt[3]{y^3} = x^{4/2} y^8 y^{3/3} = x^2 y^8 y = x^2 y^9$$

$$49. (m^4 n^2)^{1/2} \sqrt{m^2 n^2} \\ m^{4/2} n^{2/2} (m^2 n^2)^{1/2} = m^2 n m^{2/2} n^{2/2} = m^3 n^2 \\ \quad \quad \quad \downarrow \quad \downarrow \\ \quad \quad \quad m \quad n$$

$$50. \frac{7^{1/2}}{\sqrt{7}} = \frac{7^{1/2}}{7^{1/2}} = 1$$

$$51. (y^{2/3}) \sqrt[3]{y^9} = y^{2/3} y^{9/3} = y^{2/3} y^3 = y^{11/3}$$

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$$52. \frac{z^{1/3}}{\sqrt[3]{z^2}} = \frac{z^{1/3}}{z^{2/3}} = \frac{1}{z^{1/3}}$$