

Answers to Rational Exponents Worksheet

I. 1. 2 2. 9 3. $\frac{1}{5}$ 4. 8 5. 343 6. $\frac{1}{4}$
 7. $\frac{1}{16}$ 8. $\frac{5}{3}$ 9. 27 10. 5 11. $\frac{1}{13}$

II. 12. $x\sqrt{x}$ 13. $y\sqrt{2y}$ 14. $\sqrt{2n}$ 15. $\frac{\sqrt{2}}{2x^2}$
 16. $\sqrt[4]{5}$ 17. $\sqrt{2}$ 18. $\frac{\sqrt{2}}{2}$ 19. $2\sqrt{2}$
 20. $\frac{\sqrt[3]{18}}{3}$ 21. $\frac{4}{25}$ 22. $\frac{4}{9}$ 23. $\sqrt{3}$

III. 24. 4 25. $2\sqrt[3]{2}$ 26. 3 27. $\sqrt[3]{5}$
 28. $\sqrt[3]{5}$ 29. 2 30. $\sqrt[3]{49}$ 31. $\sqrt[4]{3}$
 32. $\sqrt[3]{5}$ 33. 2

IV. 34. $x^{\frac{1}{2}}(1+x)$ 35. $x^{\frac{3}{5}}(1-x^{\frac{1}{5}})$ 36. $x^{\frac{1}{7}}(1+x^{\frac{1}{7}}+x^{\frac{2}{7}})$
 37. $2x^{\frac{3}{2}}(1+2x)$ 38. $-3x^{\frac{3}{8}}(x^{\frac{1}{4}}+3)$ 39. $x^{-4}(x+2)$

40. $5x^{-6}(x-2)$ 41. $3x^{-10}(x^5-2)$

42. $(x^{\frac{1}{24}}+2)(x^{\frac{1}{12}}-2x^{\frac{1}{24}}+4)(x^{\frac{1}{24}}-2)(x^{\frac{1}{12}}+2x^{\frac{1}{24}}+4)$

43. $(4x^{\frac{1}{18}}-5y^{\frac{1}{32}})(4x^{\frac{1}{18}}+5y^{\frac{1}{32}})$

44. $(x^{\frac{1}{18}}+3)(x^{\frac{1}{9}}-3x^{\frac{1}{18}}+9)$

45. prime

46. $(x^2+2)^{\frac{-3}{2}}(x^3+3x-2)$

47. $(2x+3)^{\frac{-5}{3}}\left[3x+4+(5x+1)(2x+3)^{\frac{1}{3}}\right]$

48. $x(x^3+3)^{\frac{-4}{5}}\left[1-x(x^3+3)^{\frac{1}{5}}\right]$

49. $(x^2-3)^{\frac{-3}{2}}(x+1)(x^2+x-3)$

50. $(5-x^2)^{\frac{-5}{4}}\left[(x+3)(5-x^2)^{\frac{1}{2}}+x\right]$

$$\textcircled{1} 8^{\frac{1}{3}} \Rightarrow \sqrt[3]{8} = \boxed{2}$$

$$\textcircled{2} 3^2 = 9$$

$$\textcircled{3} 5$$

$$\textcircled{4} 2^{4(\frac{3}{4})} \Rightarrow 2^3 = 8$$

$$\textcircled{5} 49^{\frac{3}{2}} \Rightarrow 7^3 = \boxed{343}$$

$$\textcircled{6} (2^5)^{-\frac{2}{5}} \Rightarrow 2^{-2} = \boxed{\frac{1}{4}}$$

$$\textcircled{7} 4^{-3(\frac{2}{3})} \Rightarrow 4^{-2} = \boxed{\frac{1}{16}}$$

$$\textcircled{8} \left(\frac{3^3}{5^3}\right)^{-\frac{1}{3}} = \boxed{\frac{5}{3}}$$

$$\textcircled{9} (3^{-4})^{-\frac{3}{4}} \Rightarrow 3^3 = \boxed{27}$$

$$\textcircled{10} 25^{\frac{1}{2}} = \boxed{5}$$

$$\textcircled{11} \boxed{\frac{1}{13}}$$

$$\textcircled{12} x^{\frac{6}{4}} \Rightarrow x^{\frac{3}{2}} = \boxed{x\sqrt{x}} \quad \textcircled{13} 2^{\frac{3}{6}} y^{\frac{9}{6}} = 2^{\frac{1}{2}} y^{\frac{3}{2}} \rightarrow \boxed{y\sqrt{2y}}$$

$$\textcircled{14} (2^{\frac{1}{4}} n^{\frac{2}{4}})^{\frac{2}{4}} = 2^{\frac{1}{2}} n^{\frac{1}{2}} \rightarrow \boxed{\sqrt{2n}} \quad \textcircled{15} \sqrt[4]{8^{-1} x^{-12}} \rightarrow 8^{-\frac{1}{6}} x^{-\frac{12}{6}} \rightarrow 2^{3(-\frac{1}{6})} x^2 \rightarrow 2^{-\frac{1}{2}} x^2$$
$$\rightarrow \frac{x^2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \boxed{\frac{\sqrt{2}}{2x^2}}$$

$$\textcircled{16} (5^3)^{\frac{1}{12}} \rightarrow 5^{\frac{1}{4}} \rightarrow \boxed{\sqrt[4]{5}}$$

$$\textcircled{17} 2^{\frac{4}{8}} = 2^{\frac{1}{2}} \rightarrow \boxed{\sqrt{2}}$$

$$\textcircled{18} 2^{-\frac{5}{10}} \rightarrow 2^{-\frac{1}{2}} \rightarrow \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \boxed{\frac{\sqrt{2}}{2}}$$

$$\textcircled{19} \left((2^6)^{\frac{1}{2}}\right)^{\frac{1}{2}} \Rightarrow 2^{\frac{3}{2}} = \boxed{2\sqrt{2}}$$

$$\textcircled{20} \frac{2^{\frac{3}{9}}}{3^{\frac{2}{9}}} \rightarrow \frac{2^{\frac{1}{3}}}{3^{\frac{2}{3}}} \rightarrow \frac{\sqrt[3]{2}}{\sqrt[3]{3}} \cdot \frac{\sqrt[3]{9}}{\sqrt[3]{9}} = \boxed{\frac{\sqrt[3]{18}}{3}}$$

$$\textcircled{21} \frac{(2^2)^{\frac{2}{3}}}{(5^3)^{\frac{2}{3}}} = \boxed{\frac{4}{25}}$$

$$\textcircled{22} \left(\frac{81}{16}\right)^{-\frac{2}{4}} \rightarrow \left(\frac{16}{81}\right)^{\frac{1}{2}} \rightarrow \left(\frac{4^2}{9^2}\right)^{\frac{1}{2}} = \boxed{\frac{4}{9}}$$

$$\textcircled{23} 9^{\frac{1}{4}} \rightarrow 3^{2(\frac{1}{4})} \rightarrow 3^{\frac{1}{2}} = \boxed{\sqrt{3}}$$

$$\textcircled{24} (2^4)^{\frac{1}{6}} \cdot (2^4)^{\frac{1}{3}} \rightarrow 2^{\frac{2}{3} + \frac{4}{3}} \rightarrow 2^2 = \boxed{4}$$

$$\textcircled{29} \left((2^3)^{\frac{1}{2}}\right)^{\frac{1}{2}} \cdot 2^{\frac{1}{4}}$$
$$2^{\frac{3}{4} + \frac{1}{4}} = \boxed{2}$$

$$\textcircled{25} 2^{\frac{1}{2}} \cdot (2^5)^{\frac{1}{6}} \rightarrow 2^{\frac{3}{6} + \frac{5}{6}} \rightarrow 2^{\frac{8}{6}} \rightarrow 2^{\frac{4}{3}} = \boxed{2\sqrt[3]{2}}$$

$$\textcircled{26} (3^2)^{\frac{1}{8}} (3^3)^{\frac{3}{4}} \rightarrow 3^{\frac{1}{4}} \cdot 3^{\frac{9}{4}} \rightarrow \boxed{3}$$

$$\textcircled{30} (7 \cdot 7^{\frac{1}{3}})^{\frac{1}{2}}$$
$$(7^{\frac{4}{3}})^{\frac{1}{2}} \rightarrow 7^{\frac{2}{3}} = \boxed{\sqrt[3]{49}}$$

$$\textcircled{27} 5^{\frac{1}{2}} (5^3)^{\frac{1}{2}} \rightarrow 5^{\frac{4}{2}} \rightarrow 5^2 = \boxed{25}$$

$$\textcircled{28} \left((5^2)^{\frac{1}{3}}\right)^{\frac{1}{2}} \rightarrow 5^{\frac{1}{3}} = \boxed{\sqrt[3]{5}}$$

For WS: Rational Exponents

KEY

$$\textcircled{29} \quad (8^{\frac{1}{2}})^{\frac{1}{2}} \cdot 2^{\frac{1}{4}}$$

$$2^{\frac{3}{4} + \frac{1}{4}}$$

$$\boxed{2}$$

$$\textcircled{30} \quad 7^{\frac{1}{2}} \cdot 7^{\frac{1}{3}(\frac{1}{2})}$$

$$7^{\frac{3}{6} + \frac{1}{6}}$$

$$7^{\frac{2}{3}}$$

$$\sqrt[3]{7^2}$$

$$\textcircled{31} \quad 3^{\frac{1}{4}(\frac{1}{2})} \cdot 3^{2(\frac{1}{4})(\frac{1}{3})}$$

$$3^{\frac{1}{2} + \frac{1}{6}}$$

$$3^{\frac{2}{3}} \rightarrow \boxed{\sqrt[3]{4}}$$

$$\textcircled{32} \quad (5^{\frac{1}{6}} \cdot 5^{\frac{1}{2}})^{\frac{1}{2}}$$

$$5^{\frac{2}{6} + \frac{1}{2}}$$

$$5^{\frac{1}{3}}$$

$$\sqrt[3]{5}$$

$$\textcircled{33} \quad (8^{\frac{1}{4}})^{\frac{1}{3}} \cdot 8^{\frac{1}{2}(\frac{1}{2})}$$

$$8^{\frac{1}{12} + \frac{1}{4}}$$

$$8^{\frac{1}{3}} \rightarrow \boxed{2}$$

FACTOR

$$\textcircled{34} \quad x^{\frac{1}{2}}(1+x)$$

$$\textcircled{35} \quad x^{\frac{3}{5}} - x^{\frac{4}{5}}$$

$$x^{\frac{3}{5}}(1 - x^{\frac{1}{5}})$$

$$\textcircled{36} \quad x^{\frac{1}{7}}(1 + x^{\frac{1}{7}} + x^{\frac{2}{7}})$$

$$\textcircled{37} \quad 2x^{\frac{3}{2}}(1+2x)$$

$$\textcircled{38} \quad -3x^{\frac{3}{4}}(x^{\frac{1}{4}} + 3)$$

$$\textcircled{39} \quad x^{-4}(x+2)$$

$$\textcircled{40} \quad 5x^{-6}(x-2)$$

$$\textcircled{41} \quad 3x^{-10}(x^5-2)$$

$$\textcircled{42} \quad x^{\frac{1}{4}} - 64$$

$$(x^{\frac{1}{8}} - 8)(x^{\frac{1}{8}} + 8)$$

$$(x^{\frac{3}{24}} - 2^3)$$

$$(x-y)(x^2 + xy + y^2) = x^3 - y^3$$

$$(x+y)(x^2 - xy + y^2) = x^3 + y^3$$

$$(x^{\frac{1}{24}} - 2)(x^{\frac{2}{24}} + 2x^{\frac{1}{24}} + 4)(x^{\frac{1}{24}} + 2)(x^{\frac{2}{24}} - 2x^{\frac{1}{24}} + 4)$$

$$x^{\frac{3}{24}} + 2x^{\frac{2}{24}} + 4x^{\frac{1}{24}}$$

$$- 2x^{\frac{3}{24}} - 4x^{\frac{2}{24}} - 8$$

$$x^{\frac{3}{24}} - 2x^{\frac{2}{24}} + 4x^{\frac{1}{24}}$$

$$2x^{\frac{2}{24}} - 4x^{\frac{1}{24}} + 8$$

$$(43) 16x^{\frac{1}{4}} - 25y^{\frac{1}{16}}$$

$$\frac{1}{9} = \frac{3}{27} = \frac{6}{54}$$

$$\frac{1}{16} = \frac{2}{32}$$

$$\left(4x^{\frac{3}{54}} - 5y^{\frac{1}{32}}\right)\left(4x^{\frac{3}{54}} + 5y^{\frac{1}{32}}\right)$$

$$(44) x^{\frac{1}{6}} + 27 \rightarrow x^{\frac{3}{18}} + 3^3$$

$$\frac{1}{6} = \frac{2}{12} = \frac{3}{18}$$

$$\left(x^{\frac{1}{18}} + 3\right)\left(x^{\frac{2}{18}} - 3x^{\frac{1}{18}} + 9\right)$$

$$(45) x^{\frac{1}{4}} + 4x^{\frac{1}{2}} + 4 \rightarrow \left(x^{\frac{1}{8}} + 2\right)\left(x^{\frac{1}{8}} + 2\right) \text{ doesn't work (prime)}$$

$$(46) (x^2 + 2)^{-\frac{3}{2}} \left((x-2) + (x^2+2)x \right)$$

$$\downarrow (x-2 + x^3 + 2x) \rightarrow (x^2 + 2)^{-\frac{3}{2}} (x^3 + 3x - 2) \checkmark$$

$$(47) (2x+3)^{-\frac{5}{3}} \left((3x+4) + (5x+1)(2x+3)^{\frac{1}{3}} \right)$$

$$(48) x(x^3+3)^{-\frac{4}{5}} \left(1 - x(x^3+3)^{\frac{1}{5}} \right)$$

$$(49) (x^2-3)^{-\frac{3}{2}} \left((x+2)(x^2-3) + (x+3) \right)$$

$$(x^2-3)^{-\frac{3}{2}} (x^3 + 2x^2 - 3x - 6 + x + 3)$$

$$(x^2-3)^{-\frac{3}{2}} (x^3 + 2x^2 - 2x - 3) \rightarrow P(-1) = 0$$

$$\begin{array}{r|rrrr} -1 & 1 & 2 & -2 & -3 \\ & & -1 & -1 & 0 \\ \hline & 1 & 1 & -3 & 0 \end{array}$$

$$\boxed{(x^2-3)^{-\frac{3}{2}} (x+1)(x^2+x-3)}$$