$2^2 = 2 \cdot 2 = 4$ $2^{-2} = \frac{1}{2^2} = \frac{1}{4}$

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

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

$a^2 \cdot a^{-5} = a^{-3} = \frac{1}{a^3}$

i) $5^{-2} = \frac{1}{25}$ iii) $2^{-3} = \frac{1}{2^3} = \frac{1}{8} = 0.125$

ii) $7^{-2} = \frac{1}{49}$ iv) 4^{-3} $\frac{1}{64}$

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

$\left(\frac{1}{4}\right)^{-2} = \frac{4^2}{1} = \frac{16}{1} = 16$

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$\frac{6^{-2}}{1} = \frac{1}{36}$ $\frac{6}{1} \times \frac{6}{1} = \frac{36}{1}$ $\frac{6^2}{1^2} = \frac{36}{1}$

$\left(\frac{1}{6}\right)^{-2} = \frac{6^2}{1} = \frac{36}{1} = 36$

$\left(\frac{a}{b}\right)^2 = \frac{a^2}{b^2}$ or $\frac{a}{b} \times \frac{a}{b} = \frac{a^2}{b^2}$

$\left(\frac{a}{b}\right)^{-2} = \frac{b}{a} \times \frac{b}{a} = \frac{b^2}{a^2}$

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$x^{-3} \cdot x^4 = x^{-3+4} = x^1$

$a^{-4} \cdot a^{-1} = a^{-4+-1} = a^{-5}$

9 e) $\frac{x^{-5}}{x^2} = x^{-5-+2} = x^{-7}$

g) $\frac{b^{-8}}{b^{-3}} = b^{-8+3} = b^{-5} = \frac{1}{b^5}$

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11 d) $\left(\frac{3}{2} m^{-2} n^{-3}\right)^{-4}$

$\left(\frac{3}{2}\right)^{-4} \left(m^{-2} n^{-3}\right)^{-4}$

$\left(\frac{2}{3}\right)^4 \left(m^{+8} n^{+12}\right)$

$\frac{2^4}{3^4}\left(m^8 n^{12}\right) = \frac{16 m^8 n^{12}}{81}$

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b) $(2a^{-2}b^3)^{-2}$

$= 2^{-2} a^{+4} b^{-4}$

$= \frac{1}{2^2} \frac{a^4}{b^4} = \frac{a^4}{4b^4}$

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$(4m^2n^3)^{-3} = 4^{-3}m^{-6}n^{-9}$

$= \frac{1}{64m^6n^9}$

$= 4^3m^6n^9\left(\frac{64m^6n^9}{1}\right)^{-1}$

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

$4p^4 \cdot 4p^{-2} = 16p^2$

$\frac{2m^{-1}}{m^3} = 2m^{-1-+3} = 2m^{-4} = \frac{2}{m^4}$

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$\left(\frac{2x^3y}{6xy^4}\right)^{-2}$ $\left(\frac{6x^1y^4}{2x^3y^1}\right)^2$

$\left(3x^{-2}y^3\right)^2 = \frac{9x^{-4}y^6}{1}$

$= \frac{9y^6}{x^4}$

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Rational Exponents

$\sqrt{9} = 3$ $\sqrt{4} = 2$ $\sqrt{81} = 9$

$\sqrt[3]{27} = 3$ $\sqrt[3]{8} = 2$ $\sqrt[3]{64} = 4$

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$\sqrt{9}$ OR $9^{\frac{1}{2}}$ Exponents

$\sqrt[3]{27}$ OR $27^{\frac{1}{3}}$

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$9^{\frac{2}{2}}$ ① top

Top / inside Bottom / outside

$\sqrt[2]{9^1}$

$9^{\frac{2}{3}} = \sqrt[3]{9^2}$

$27^{\frac{2}{3}} = \sqrt[3]{27^2}$

$27^{\frac{1}{3}} = \sqrt[3]{27^1}$

$= \sqrt[3]{27}$

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Write in radical form

$x^{\frac{1}{4}}$ $m^{-\frac{4}{3}}$

Write using exponents

$\sqrt{3^5}$ $\left(\sqrt[4]{x}\right)^3$

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