

Rules of Indices

$$1. x^p \times x^q = x^{p+q}$$

$$2. x^p \div x^q = x^{p-q}$$

$$3. (x^p)^q = x^{p \times q}$$

$$4. x^1 = x$$

$$5. x^0 = 1$$

$$6. x^{-p} = \frac{1}{x^p}$$

$$7. x^{\frac{1}{p}} = \sqrt[p]{x}$$

$$8. x^{p/q} = \left(\sqrt[q]{x}\right)^p$$

or $\sqrt[q]{x^p}$

We define

$$y^2 = y \times y$$

$$y^3 = y \times y \times y$$

⋮

$$y^8 = y \times y \times y \times y \times y \times y \times y \times y$$

Examples

$$1. x^7 \times x^3 = x^{7+3} = x^{10}$$

$$2. x^8 \div x^4 = x^{8-4} = x^4$$

$$3. (x^4)^3 = x^{4 \times 3} = x^{12}$$

$$4. 7^1 = 7$$

$$5. 5^0 = 1$$

$$6. 4^{-2} = \frac{1}{4^2} = \frac{1}{16}$$

$$7. 36^{\frac{1}{2}} = \sqrt{36} = 6$$

$$8. 8^{2/3} = \left(\sqrt[3]{8}\right)^2 = 2^2 = 4$$

Cubes $2^3 = 8$ $3^3 = 27$ $4^3 = 64$ $5^3 = 125$ $6^3 = 216$

$$9. 25^{3/2} = (\sqrt{25})^3 = 5^3 = 125$$

$$10. 49^{-1/2} = \frac{1}{49^{1/2}} = \frac{1}{\sqrt{49}} = \frac{1}{7}$$

$$11. 2x^2 \times 3x^3 \\ = 2 \times x^2 \times 3 \times x^3 \\ = 6x^5$$

$$12. 10x^{10} \div 2x^2 \\ = \frac{10x^{10}}{2x^2} = 5x^8$$

$$13. (2x^2)^3 \\ = 2x^2 \times 2x^2 \times 2x^2 \\ = 8x^6$$

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a, b, c of Q1 to 7

Part e of every question

$$1e \quad 5^{-2} \times 5^{-3} = 5^{-2+(-3)} = 5^{-2-3} = 5^{-5}$$

$$2e \quad 6^{-3} \div 6^{-5} = 6^{-3-(-5)} = 6^{-3+5} = 6^2$$

$$3e \quad a^3 \div a = a^{3-1} = a^2$$

$$4e \quad (4^{-2})^{-3} = 4^{-2 \times -3} = 4^6$$

$$5e \quad -4a^3 \times -2a^5 = 8a^{3+5} = 8a^8$$

$$6e \quad 24a^5 \div 6a^{-2} = 4a^{5-(-2)} = 4a^7$$

$$7e \quad 24a^{-3}b^4 \div 3a^2b^{-3} = \frac{24a^{-3}b^4}{3a^2b^{-3}} = 8a^{-3-2}b^{4-(-3)}$$

$$= \underline{8a^{-5}b^7}$$

$$\text{or } \frac{8b^7}{a^5}$$