Practice Questions on Indices (Exponents)

Level: From Basic to Advanced

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1. Multiplying with the Same Base

Question: Simplify: $2^3 \times 2^4$

Solution:

$$2^3 \times 2^4 = 2^{3+4} = 2^7 = \boxed{128}$$

Rule Applied: $a^m \times a^n = a^{m+n}$

2. Dividing with the Same Base

Question: Simplify: $\frac{5^6}{5^2}$

Solution:

$$\frac{5^6}{5^2} = 5^{6-2} = 5^4 = \boxed{625}$$

Rule Applied: $\frac{a^m}{a^n} = a^{m-n}$

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3. Power of a Power

Question: Simplify: $(3^2)^3$

Solution:

$$(3^2)^3 = 3^{2\times3} = 3^6 = \boxed{729}$$

Rule Applied: $(a^m)^n = a^{mn}$

4. Negative Exponents

Question: Evaluate: 4^{-2}

Solution:

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

Rule Applied: $a^{-n} = \frac{1}{a^n}$

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5. Zero Exponent Rule

Question: Simplify: $7^0 + 5^0$

Solution:

$$7^0 + 5^0 = 1 + 1 = \boxed{2}$$

Rule Applied: $a^0 = 1$, for $a \neq 0$

6. Fractional Exponents

Question: Evaluate: $8^{\frac{1}{3}}$

Solution:

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

Rule Applied: $a^{\frac{1}{n}} = \sqrt[n]{a}$

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7. Different Bases with Same Powers

Question: Simplify: $2^3 \times 3^3$

Solution:

$$2^3 \times 3^3 = (2 \times 3)^3 = 6^3 = \boxed{216}$$

Rule Applied: $a^n \times b^n = (ab)^n$

8. Scientific Notation

Question: Express 0.00045 in scientific notation.

Solution:

$$0.00045 = 4.5 \times 10^{-4} = \boxed{4.5 \times 10^{-4}}$$

Note: Count decimal places shifted right for negative exponent.

9. Solving Exponential Equations

Question: Solve for x: $2^x = 16$

Solution:

$$2^x = 16 \Rightarrow 2^x = 2^4 \Rightarrow x = \boxed{4}$$

Strategy: Express both sides with the same base.

10. Combined Exponential Operations

Question: Simplify: $\frac{2^4 \times 3^2}{6^2}$

Solution:

$$\frac{16 \times 9}{36} = \frac{144}{36} = \boxed{4}$$

Alternate Method:

$6^2 = (2 \times 3)^2 = 2^2 \times 3^2,$ so simplify directl

Key Laws of Indices

1. $a^m \times a^n = a^{m+n}$
2. $\frac{a^m}{a^n} = a^{m-n}$
3. $(a^m)^n = a^{mn}$
4. $a^{-n} = \frac{1}{a^n}$
5. $a^0 = 1$
6. $a^{\frac{1}{n}} = \sqrt[n]{a}$