Fractional Exponents and Radicals: Convert, Evaluate, Simplify

Conversion diagram: radical index/power to fractional exponent

Text diagram only; no arbitrary XY.

Radical form: the nth root of a^m.

Fractional exponent form: a^(m/n).

Index n -> denominator n.

Power m -> numerator m.

Example: the fifth root of x^3 = x^(3/5).

Example: y^(4/7) = the seventh root of y^4.

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Order-of-evaluation flow for a^(m/n)

Text flow only; no arbitrary XY.

Start: a^(m/n).

Step 1: take the nth root of a.

Step 2: raise the result to the mth power.

Negative exponent branch: a^(-m/n) = 1 / a^(m/n); evaluate the positive exponent, then take the reciprocal.

Example: 16^(3/4): fourth root of 16 is 2; 2^3 = 8.

Example: 9^(-1/2): positive exponent gives 3; reciprocal gives 1/3.

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Rubric

Concise rubric key.

Criterion	Description
Conversion accuracy	The index and power are placed correctly in the fractional exponent form.
Evaluation accuracy	The numeric result is correct and the order of root and power is valid.
Simplification accuracy	Exponents are combined only for like bases and perfect power factors are extracted correctly.
Domain awareness	Even roots of negative bases are identified as non-real, and odd roots of negative bases are handled correctly.
Check method	The student provides a valid arithmetic or substitution check that supports the result.