

Fraction operations

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Purpose

Calculate exactly with fractions using all four operations and explain why each method works.

Vocabulary

Common denominator: shared unit for addition or subtraction. Reciprocal: number that multiplies with a non-zero number to make 1. Exact answer: no rounding. Cancellation: dividing factors by a common factor.

Why the method works

Addition and subtraction count equal units: $\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$. Multiplication can mean a fraction of a fraction: half of three quarters is three eighths. Division asks how many groups fit: $\frac{3}{4} \div \frac{1}{4} = 3$.

Method and checking

For + or -, rename with a common denominator. For $\times$, multiply numerators and denominators; cancel common factors if useful. For $\div$ by a non-zero fraction, multiply by its reciprocal because that makes the divisor 1. Convert mixed numbers first; simplify and check size.

Common errors and next attempt

If denominators are added, return to equal-sized parts. If division is reversed, ask how many quarters fit in three quarters. If mixed numbers are multiplied as separate parts, convert first. Recheck $\frac{1}{3} + \frac{1}{6} = \frac{1}{2}$ and $\frac{2}{3} \div \frac{1}{3} = 2$.