

Fraction Rules

<p>Negative Fractions</p> <ol style="list-style-type: none"> 1. $-\frac{a}{b}$ is the same as $\frac{-a}{b}$ and $\frac{a}{-b}$ 2. $\frac{-a}{-b}$ simplifies to $\frac{a}{b}$ 3. $-\frac{a}{b}$ is NOT the same as $\frac{-a}{-b}$ 	<p>Examples</p> $\frac{5}{-3} = \frac{-5}{3} = -\frac{5}{3}$ $\frac{-7}{-8} = \frac{7}{8}$ $-\frac{4}{11} \neq \frac{-4}{-11}$
<p>Cancellation ($a \neq 0, b \neq 0, c \neq 0$)</p> <ol style="list-style-type: none"> 1. $\frac{a}{a}$ cancels to 1 2. $\frac{ab}{ac}$ cancels to $\frac{b}{c}$ 3. $\frac{a}{b} \cdot \frac{b}{c}$ cancels to $\frac{a}{c}$ 4. $\frac{a}{b} \cdot \frac{c}{a}$ cancels to $\frac{c}{b}$ 5. $a \cdot \frac{b}{a}$ cancels to b 6. $\frac{b}{a} \cdot a$ cancels to b 	<p>Examples</p> $\frac{6}{6} = 1$ $\frac{12}{28} = \frac{3 \cdot 4}{7 \cdot 4} = \frac{3}{7}$ $\frac{-10}{9} \cdot \frac{9}{13} = \frac{-10}{13} = -\frac{10}{13}$ $\frac{6}{11} \cdot \frac{5}{6} = \frac{5}{11}$ $4 \cdot \frac{7}{4} = 7$ $\frac{2}{-3} (-3) = 2$
<p>Addition (Needs a common denominator)</p> <ol style="list-style-type: none"> 1. $\frac{a}{b} + \frac{c}{b} = \frac{a+c}{b}$ 2. $a + \frac{b}{c} = \frac{ac}{c} + \frac{b}{c} = \frac{ac+b}{c}$ 3. $\frac{a}{b} + \frac{c}{d} = \frac{ad}{bd} + \frac{bc}{bd} = \frac{ad+bc}{bd}$ 	<p>Examples</p> $\frac{3}{4} + \frac{5}{4} = \frac{8}{4} = 2$ $6 + \frac{8}{5} = \frac{30}{5} + \frac{8}{5} = \frac{38}{5}$ $\frac{6}{7} + \frac{3}{4} = \frac{24}{28} + \frac{21}{28} = \frac{45}{28}$

Subtraction**(Needs a common denominator)**

$$1. \frac{a}{b} - \frac{c}{b} = \frac{a-c}{b}$$

$$2. a - \frac{b}{c} = \frac{ac}{c} - \frac{b}{c} = \frac{ac-b}{c}$$

$$3. \frac{a}{b} - c = \frac{a}{b} - \frac{bc}{b} = \frac{a-bc}{b}$$

$$4. \frac{a}{b} - \frac{c}{d} = \frac{ad}{bd} - \frac{bc}{bd} = \frac{ad-bc}{bd}$$

Examples

$$\frac{2}{3} - \frac{5}{3} = \frac{-3}{3} = -1$$

$$1 - \frac{9}{4} = \frac{4}{4} - \frac{9}{4} = -\frac{5}{4}$$

$$\frac{15}{7} - 2 = \frac{15}{7} - \frac{14}{7} = \frac{1}{7}$$

$$\frac{2}{3} - \frac{1}{2} = \frac{4}{6} - \frac{3}{6} = \frac{1}{6}$$

Multiplication**(Doesn't need a common denominator)**

$$1. \frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$$

$$2. a \cdot \frac{b}{c} = \frac{a}{1} \cdot \frac{b}{c} = \frac{ab}{c}$$

$$3. \frac{a}{b} \cdot c = \frac{a}{b} \cdot \frac{c}{1} = \frac{ac}{b}$$

Examples

$$\frac{5}{-3} \cdot \frac{7}{11} = -\frac{35}{33}$$

$$6 \cdot \frac{2}{7} = \frac{12}{7}$$

$$\frac{9}{5} \cdot (-3) = -\frac{27}{5}$$

Division**(Doesn't need a common denominator)**

$$1. \frac{\frac{a}{c}}{\frac{b}{d}} = \frac{a}{b} \cdot \frac{d}{c} = \frac{ad}{bc}$$

$$2. \frac{\frac{a}{c}}{b} = \frac{\frac{a}{c}}{\frac{b}{1}} = \frac{a}{b} \cdot \frac{1}{c} = \frac{a}{bc}$$

$$3. \frac{a}{\frac{b}{c}} = \frac{a}{\frac{b}{c}} = \frac{a}{1} \cdot \frac{c}{b} = \frac{ac}{b}$$

Examples

$$\frac{\frac{3}{10}}{\frac{4}{7}} = \frac{3}{10} \cdot \frac{7}{4} = \frac{21}{40}$$

$$\frac{\frac{2}{3}}{6} = \frac{\frac{2}{3}}{\frac{6}{1}} = \frac{2}{3} \cdot \frac{1}{6} = \frac{2}{18} = \frac{1}{9}$$

$$\frac{2}{\frac{7}{4}} = \frac{2}{\frac{7}{4}} = \frac{2}{1} \cdot \frac{4}{7} = \frac{8}{7}$$

Mixed Numbers

$$1. a \frac{b}{c} = \frac{c \cdot a + b}{c}$$

2. To change an improper fraction to a mixed number. First divide the bottom into the top. Then the answer is the whole number, and the new fraction is the remainder over the bottom of the fraction.

Examples

$$3 \frac{1}{2} = \frac{3 \cdot 2 + 1}{2} = \frac{7}{2}$$

$$\frac{27}{4} = 27 \div 4 = 6 \text{ remainder } 1 = 6 \frac{1}{4}$$