

Adding Fractions

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Case 1: Let's start with *proper fractions* with a **common denominator**. Examples:

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

$$\frac{2}{10} + \frac{3}{10} = \frac{5}{10}$$

When the denominators are the same, add the numerators and leave the denominator the same.

Case 2: *Proper fractions* with **different denominators**. Examples:

$$\frac{1}{2} + \frac{1}{3}$$

$$= \left(\frac{1}{2}\right) \left(\frac{3}{3}\right) + \left(\frac{1}{3}\right) \left(\frac{2}{2}\right)$$

$$= \frac{3}{6} + \frac{2}{6}$$

$$= \frac{5}{6}$$

Another example:

$$\frac{3}{4} + \frac{1}{3} = \left(\frac{3}{4}\right) \left(\frac{3}{3}\right) + \left(\frac{1}{3}\right) \left(\frac{4}{4}\right) = \frac{9}{12} + \frac{4}{12} = \frac{13}{12}$$

$$\frac{1}{5} + \frac{7}{15} = \left(\frac{1}{5}\right) \left(\frac{1}{5}\right) \left(\frac{3}{3}\right) + \frac{7}{15} = \frac{3}{15} + \frac{7}{15} = \frac{10}{15}$$

Rewrite all the fractions so that they are all over a common denominator. Then add as you would have in Case 1.

Case 3 *Improper fractions* over a **common denominator**. Examples:

$$\frac{13}{3} + \frac{4}{3} = \frac{17}{3}$$

$$\frac{6}{5} + \frac{9}{5} = \frac{15}{5}$$

Same procedure as when adding proper fractions with a common denominator, Case 1, add the numerators and keep the denominator the same.

Case 4 *Improper fractions* with **different denominators**. Examples:

$$\frac{10}{3} + \frac{5}{2} = \left(\frac{10}{3}\right) \left(\frac{2}{2}\right) + \left(\frac{5}{2}\right) \left(\frac{3}{3}\right) = \frac{20}{6} + \frac{15}{6} = \frac{35}{6}$$

$$\frac{7}{4} + \frac{5}{3} = \left(\frac{7}{4}\right) \left(\frac{3}{3}\right) + \left(\frac{5}{3}\right) \left(\frac{4}{4}\right) = \frac{21}{12} + \frac{20}{12} = \frac{41}{12}$$

$$\frac{7}{5} + \frac{16}{15} = \left(\frac{7}{5}\right) \left(\frac{3}{3}\right) + \frac{16}{15} = \frac{21}{15} + \frac{16}{15} = \frac{37}{15}$$

Same procedure as for proper fractions with different denominators, rewrite all fractions over a common denominator then add numerators as in Case 1.

Case 5 *Mixed fractions* Examples:

$$\begin{aligned} & 3\frac{1}{2} + 4\frac{2}{3} && \text{Change each mixed fraction into an improper fraction} \\ = & \frac{7}{2} + \frac{14}{3} \\ = & \left(\frac{7}{2}\right) \left(\frac{3}{3}\right) + \left(\frac{14}{3}\right) \left(\frac{2}{2}\right), && \text{Rewrite fractions over a common denominator} \\ = & \frac{21}{6} + \frac{28}{6}, && \text{Add as in Case 2.} \\ = & \frac{49}{6}, && \text{Rewrite as a mixed fraction.} \\ = & 8\frac{1}{6} \end{aligned}$$

1. Add the following fractions.

a) $\frac{3}{7} + \frac{2}{7} =$

b) $\frac{2}{8} + \frac{5}{8} =$

c) $\frac{4}{10} + \frac{7}{10} =$

d) $\frac{1}{3} + \frac{1}{3} =$

e) $\frac{1}{9} + \frac{6}{9} =$

f) $\frac{6}{11} + \frac{3}{11} =$

g) $\frac{15}{20} + \frac{2}{20} =$

h) $\frac{11}{17} + \frac{3}{17} =$

i) $\frac{21}{30} + \frac{4}{30} =$

j) $\frac{1}{2} + \frac{3}{5} =$

k) $\frac{2}{3} + \frac{1}{2} =$

l) $\frac{1}{4} + \frac{2}{5} =$

m) $\frac{1}{5} + \frac{4}{15} =$

n) $\frac{5}{6} + \frac{7}{30} =$

o) $\frac{5}{7} + \frac{1}{14} =$

p) $\frac{3}{8} + \frac{2}{5} =$

q) $\frac{4}{9} + \frac{2}{27} =$

r) $\frac{5}{10} + \frac{7}{20} =$

2. More exercises.

a) $\frac{5}{2} + \frac{6}{2} =$

b) $\frac{11}{8} + \frac{13}{8} =$

c) $\frac{7}{3} + \frac{4}{3} =$

d) $\frac{10}{9} + \frac{12}{9} =$

e) $\frac{9}{4} + \frac{5}{4} =$

f) $\frac{15}{10} + \frac{21}{10} =$

g) $\frac{8}{5} + \frac{10}{5} =$

h) $\frac{13}{6} + \frac{7}{6} =$

i) $\frac{17}{11} + \frac{10}{11} =$

j) $\frac{12}{7} + \frac{8}{7} =$

k) $\frac{9}{5} + \frac{7}{4} =$

l) $\frac{11}{10} + \frac{9}{5} =$

m) $\frac{12}{9} + \frac{4}{3} =$

n) $\frac{11}{8} + \frac{3}{2} =$

o) $\frac{8}{7} + \frac{29}{28} =$

p) $\frac{7}{6} + \frac{8}{5} =$

q) $\frac{6}{3} + \frac{21}{20} =$

r) $\frac{7}{4} + \frac{8}{3} =$

s) $\frac{7}{3} + \frac{5}{2} =$

t) $\frac{3}{2} + \frac{9}{5} =$

3. More addition of fractions.

a) $3\frac{1}{2} + 6\frac{1}{2} =$

b) $7\frac{3}{12} + 1\frac{5}{12} =$

c) $4\frac{1}{3} + 3\frac{2}{3} =$

d) $5\frac{3}{10} + 7\frac{5}{10} =$

e) $3\frac{1}{4} + 2\frac{3}{4} =$

f) $6\frac{2}{9} + 9\frac{5}{9} =$

g) $9\frac{1}{5} + 4\frac{3}{5} =$

h) $2\frac{4}{8} + 10\frac{3}{8} =$

i) $8\frac{1}{6} + 5\frac{2}{6} =$

j) $1\frac{1}{7} + 8\frac{4}{7} =$

k) $2\frac{2}{3} + 7\frac{1}{4} =$

l) $3\frac{2}{3} + 6\frac{1}{2} =$

m) $5\frac{3}{4} + 4\frac{1}{2} =$

n) $4\frac{4}{8} + 5\frac{3}{5} =$

o) $6\frac{5}{6} + 3\frac{4}{5} =$

p) $7\frac{5}{10} + 2\frac{3}{5} =$

q) $9\frac{4}{9} + 1\frac{6}{7} =$

r) $1\frac{2}{6} + 6\frac{6}{9} =$

s) $2\frac{1}{2} + 5\frac{2}{7} =$

t) $3\frac{1}{8} + 4\frac{7}{10} =$