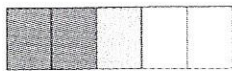## Add and Subtract Fractions

Fractions can be added or subtracted only if they have the same **denominator**.

For example, $\dfrac{2}{5} + \dfrac{1}{5} = \dfrac{3}{5}$

To add or subtract fractions with different denominators, the first step is to find the **lowest common denominator** (LCD).

Example 1: Add Fractions

Find each sum.

a) $\dfrac{3}{4} + \dfrac{1}{2}$

b) $\dfrac{3}{8} + \dfrac{1}{6}$

Solution

a) The LCD for $\dfrac{3}{4}$ and $\dfrac{1}{2}$ is 4.

$$\dfrac{3}{4} + \dfrac{1}{2} = \dfrac{3}{4} + \dfrac{1 \times 2}{2 \times 2}$$
$$= \dfrac{3}{4} + \dfrac{2}{4}$$
$$= \dfrac{5}{4}$$
$$= 1\dfrac{1}{4}$$

b) The LCD for $\dfrac{3}{8}$ and $\dfrac{1}{6}$ is 24.

$$\dfrac{3}{8} + \dfrac{1}{6} = \dfrac{3 \times 3}{8 \times 3} + \dfrac{1 \times 4}{6 \times 4}$$
$$= \dfrac{9}{24} + \dfrac{4}{24}$$
$$= \dfrac{13}{24}$$

Example 2: Subtract Fractions

Find each difference.

a) $\dfrac{3}{4} - \dfrac{1}{3}$

b) $3\dfrac{2}{5} - 2\dfrac{1}{4}$

Solution

a) The LCD of $\dfrac{3}{4}$ and $\dfrac{1}{3}$ is 12.

$$\dfrac{3}{4} - \dfrac{1}{3} = \dfrac{3 \times 3}{4 \times 3} - \dfrac{1 \times 4}{3 \times 4}$$
$$= \dfrac{9}{12} - \dfrac{4}{12}$$
$$= \dfrac{5}{12}$$

b) First, convert the mixed numbers to improper fractions. Then, use the LCD of 20, and subtract.

$$3\dfrac{2}{5} - 2\dfrac{1}{4} = \dfrac{17}{5} - \dfrac{9}{4}$$
$$= \dfrac{17 \times 4}{5 \times 4} - \dfrac{9 \times 5}{4 \times 5}$$
$$= \dfrac{68}{20} - \dfrac{45}{20}$$
$$= \dfrac{23}{20} \text{ or } 1\dfrac{3}{20}$$

3. Multiply.

   a) $\dfrac{1}{3} \times 2\dfrac{2}{5}$

   b) $1\dfrac{1}{6} \times \dfrac{3}{7}$

   c) $4\dfrac{1}{5} \times 2\dfrac{2}{3}$

   d) $1\dfrac{3}{4} \times 2\dfrac{3}{14}$

4. Divide.

   a) $\dfrac{4}{7} \div \dfrac{1}{2}$

   b) $\dfrac{4}{9} \div \dfrac{2}{3}$

   c) $\dfrac{5}{12} \div \dfrac{3}{10}$

   d) $\dfrac{2}{3} \div \dfrac{7}{15}$

5. Divide.

   a) $1\dfrac{1}{4} \div \dfrac{4}{5}$

   b) $2\dfrac{7}{8} \div \dfrac{3}{4}$

   c) $3\dfrac{1}{5} \div 2\dfrac{2}{3}$

   d) $1\dfrac{2}{9} \div 7\dfrac{1}{3}$

6. A jar of jelly beans is $\dfrac{2}{3}$ full. $\dfrac{3}{8}$ of these jelly beans are orange. What fraction of the full jar are the orange jelly beans?

ANSWERS:

Multiply and Divide Fractions, pages 5 and 6

1. a) $\dfrac{18}{35}$ b) $\dfrac{1}{4}$

2. a) $\dfrac{5}{22}$ b) $\dfrac{3}{35}$

3. a) $\dfrac{4}{5}$ b) $\dfrac{1}{2}$ c) $11\dfrac{1}{5}$ d) $3\dfrac{7}{8}$

4. a) $1\dfrac{1}{7}$ b) $\dfrac{2}{3}$ c) $1\dfrac{7}{18}$ d) $1\dfrac{3}{7}$

5. a) $1\dfrac{9}{16}$ b) $3\dfrac{5}{6}$ c) $1\dfrac{1}{5}$ d) $\dfrac{1}{6}$

6. $\dfrac{1}{4}$

7. 6

Multiply and Divide Fractions

To multiply fractions, divide the numerator and the denominator by any common factors. Any mixed numbers should first be converted to improper fractions. To divide by a fraction, multiply by its **reciprocal**.

Example 1: Multiply Fractions

Multiply.

a) $\dfrac{8}{9} \times \dfrac{3}{4}$

b) $1\dfrac{2}{3} \times 1\dfrac{1}{4}$

Solution

a) $\dfrac{8}{9} \times \dfrac{3}{4} = \dfrac{\overset{2}{\cancel{8}}}{\underset{3}{\cancel{9}}} \times \dfrac{\overset{1}{\cancel{3}}}{\underset{1}{\cancel{4}}}$

$\quad = \dfrac{2}{3} \times \dfrac{1}{1}$

$\quad = \dfrac{2}{3}$

b) $1\dfrac{2}{3} \times 1\dfrac{1}{4} = \dfrac{5}{3} \times \dfrac{5}{4}$

$\quad = \dfrac{25}{12}$

$\quad = 2\dfrac{1}{12}$

Example 2: Divide Fractions

Divide.

a) $\dfrac{2}{5} \div \dfrac{4}{9}$

b) $3\dfrac{1}{2} \div \dfrac{6}{7}$

Solution

a) $\dfrac{2}{5} \div \dfrac{4}{9} = \dfrac{\overset{1}{\cancel{2}}}{5} \times \dfrac{9}{\underset{2}{\cancel{4}}}$

$\quad = \dfrac{1}{5} \times \dfrac{9}{2}$

$\quad = \dfrac{9}{10}$

b) $3\dfrac{1}{2} \div \dfrac{6}{7} = \dfrac{7}{2} \div \dfrac{6}{7}$

$\quad = \dfrac{7}{2} \times \dfrac{7}{6}$

$\quad = \dfrac{49}{12}$

$\quad = 4\dfrac{1}{12}$

Practise

*Express your answers in **lowest terms**.*

1. Multiply.

   a) $\dfrac{3}{5} \times \dfrac{6}{7}$

   b) $\dfrac{1}{3} \times \dfrac{3}{4}$

2. Multiply.

   a) $\dfrac{5}{8} \times \dfrac{4}{11}$

   b) $\dfrac{2}{7} \times \dfrac{3}{10}$

Practise

1. Find each sum or difference. Express your answers in **lowest terms**.

   a) $\dfrac{4}{9} + \dfrac{8}{9}$

   b) $\dfrac{3}{8} + \dfrac{7}{8}$

   c) $\dfrac{3}{4} - \dfrac{1}{4}$

   d) $\dfrac{9}{10} - \dfrac{3}{10}$

2. Find each sum.

   a) $\dfrac{5}{6} + \dfrac{1}{3}$

   b) $\dfrac{3}{10} + \dfrac{2}{5}$

   c) $\dfrac{5}{12} + \dfrac{1}{6}$

3. Find each sum.

   a) $\dfrac{2}{3} + \dfrac{3}{5}$

   b) $\dfrac{5}{6} + \dfrac{3}{7}$

   c) $\dfrac{2}{9} + \dfrac{5}{12}$

4. Find each difference.

   a) $\dfrac{7}{8} - \dfrac{1}{3}$

   b) $\dfrac{8}{9} - \dfrac{1}{6}$

   c) $\dfrac{5}{6} - \dfrac{5}{8}$

5. Find each difference.

   a) $3\dfrac{2}{7} - 2\dfrac{1}{2}$

   b) $1\dfrac{5}{9} - \dfrac{3}{5}$

   c) $2\dfrac{2}{5} - 1\dfrac{1}{3}$

ANSWERS:

Add and Subtract Fractions, pages 3 and 4

1. a) $1\dfrac{1}{3}$ b) $1\dfrac{1}{4}$ c) $\dfrac{1}{2}$ d) $\dfrac{3}{5}$

2. a) $1\dfrac{1}{6}$ b) $\dfrac{7}{10}$ c) $\dfrac{7}{12}$

3. a) $1\dfrac{4}{15}$ b) $1\dfrac{11}{42}$ c) $\dfrac{23}{36}$

4. a) $\dfrac{13}{24}$ b) $\dfrac{13}{18}$ c) $\dfrac{5}{24}$

5. a) $\dfrac{11}{14}$ b) $\dfrac{43}{45}$ c) $1\dfrac{1}{15}$

6. a) $7\dfrac{1}{12}$ h b) $1\dfrac{1}{12}$ h