Adding and Subtracting Unlike Fractions

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Lecture Notes

Notes

- Fractions that have the *different denominators* are called **unlike fractions,** because the denominators are *unalike.*
- When adding and subtracting fractions with *different denominators*, we first need to transform one, or both, denominators so that they match.
    - We must find the **Lowest Common Denominator (LCD)**. The LCD represents the lowest number possible that both denominators divide into.
    - To add or subtract fractions, we need the *same unit fraction*.
    - We must make the fraction(s) bigger so that the denominators match.
    - We are "bumping up" the fraction(s), changing their size, to make their denominators become the same number.
    - We multiply the denominator by some number that results in the LCD.
        - However, we must multiply **both** numerator and denominator by that *same number*.
        - Multiplying by that *same number* ensures we maintain the same *ratio* of the fraction.
        - A **ratio** shows the relative size of two values: **numerator** with respect to **denominator**.
- Adding and subtracting fractions with *different denominators* involves a 4-step process.
    - A fraction having unlike denominators is the typical problem you will get.
- If you understand how to *add* fractions, you will have no problem with how to *subtract* fractions.
    - The only difference between the two is the actual addition step, or subtraction step.
    - All other steps are the same for both types of problems.

Add and Subtract Fractions with Unlike Denominators

- **Step 1:** Find the LCD.
- **Step 2:** Find equivalent fraction(s).
    - Multiply denominator(s) by some number that results in the LCD.
    - To maintain the same *ratio*, multiply the numerator by that **same number** (***n***) as the denominator.
        - Ex: $\frac{n \cdot 2}{n \cdot 5}$
- **Step 3:** Add or subtract numerators. Keep denominators the same.
- **Step 4:** Reduce, if possible.
- *Caution:* You **cannot "reduce up front"** while in *addition or subtraction mode*. You must wait until the end to reduce.

Example:

$$\frac{6}{12} - \frac{2}{9} \Rightarrow \frac{\mathbf{3}}{\mathbf{3}} \cdot \frac{6}{12} - \frac{\mathbf{4}}{\mathbf{4}} \cdot \frac{2}{9} \Rightarrow \frac{18}{36} - \frac{8}{36} \Rightarrow \frac{10}{36} \Rightarrow$$

$$\Rightarrow \frac{5}{18}$$

- **Step 1:** Find the LCD: **36**.
- **Step 2:** Find equivalent fraction(s): From $\frac{6}{12} - \frac{2}{9}$ to $\frac{18}{36} - \frac{8}{36}$
- **Step 3:** Subtract numerators: $\frac{10}{36}$
- **Step 4:** Reduce: $\frac{5}{18}$

Notes

- In *Step 2* when we multiply the denominator(s) by some number that results in the LCD:
  - That *same* number is used up-and-down (numerator and denominator).
    - This is to maintain the same *ratio* of the fraction.
  - But a *different* number is used side-to-side (left fraction and right fraction).
    - This is because the denominators of the two fractions are themselves *different*.
    - If the denominators were the same, there would be no need for *Step 2* (or *Step 1*).

Add the fractions.

$\frac{3}{4} + \frac{1}{8}$

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

(Type a simplified fraction.)

- **Step 1:** Find the LCD: **8**.
- **Step 2:** Find equivalent fraction(s): From $\frac{3}{4} + \frac{1}{8}$ to $\frac{6}{8} + \frac{1}{8}$
- **Step 3:** Add numerators: $\frac{7}{8}$
- **Step 4:** Cannot reduce: $\frac{7}{8}$

Add.

$\frac{7}{11} + \frac{7}{22}$

$\frac{7}{11} + \frac{7}{22} = \frac{21}{22}$

(Simplify your answer. Type a whole number or a simplified fraction.)

Add.

$\frac{1}{2}+\frac{1}{7}$

$\frac{1}{2}+\frac{1}{7}=\frac{9}{14}$

(Type a whole number or a simplified fraction.)

Add and simplify.

$\frac{1}{8}+\frac{5}{6}$

$\frac{1}{8}+\frac{5}{6}=\frac{23}{24}$

(Type a simplified fraction.)

- **Step 1:** Find the LCD: **24**.
- **Step 2:** Find equivalent fraction(s): From $\frac{1}{8}+\frac{5}{6}$ to $\frac{3}{24}+\frac{20}{24}$
- **Step 3:** Add numerators: $\frac{23}{24}$
- **Step 4:** Cannot reduce: $\frac{23}{24}$

$\frac{1}{7}+\frac{1}{4}$

$\frac{1}{7}+\frac{1}{4}=\frac{11}{28}$

(Type a whole number or a simplified fraction.)

Subtract and simplify.

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

$\frac{4}{5}-\frac{1}{4}=\frac{11}{20}$

(Type a whole number or a simplified fraction.)

Subtract the following fractions. Simplify the answer.

$\frac{5}{12}-\frac{2}{9}$

$\frac{5}{12}-\frac{2}{9}=\frac{7}{36}$

(Simplify your answer. Type a whole number or a fraction.)

- **Step 1:** Find the LCD: **36**.
- **Step 2:** Find equivalent fraction(s): From $\frac{5}{12}-\frac{2}{9}$ to $\frac{15}{36}-\frac{8}{36}$
- **Step 3:** Subtract numerators: $\frac{7}{36}$
- **Step 4:** Cannot reduce: $\frac{7}{36}$

Subtract and simplify. $\frac{4}{5}-\frac{7}{15}$	$\frac{4}{5}-\frac{7}{15}=\frac{1}{3}$ (Type a simplified fraction.)

- **Step 1:** Find the LCD: **15**.
- **Step 2:** Find equivalent fraction(s): From $\frac{4}{5}-\frac{7}{15}$ to $\frac{12}{15}-\frac{7}{15}$
- **Step 3:** Subtract numerators: $\frac{5}{15}$
- **Step 4:** Reduce: $\frac{1}{3}$

Subtract and simplify. $\frac{7}{9}-\frac{1}{27}$	$\frac{7}{9}-\frac{1}{27}=\frac{20}{27}$ (Type a simplified fraction.)

Subtract and simplify. $\frac{3}{4}-\frac{5}{12}$	$\frac{3}{4}-\frac{5}{12}=\frac{1}{3}$ (Type a simplified fraction.)

MAT 050 Problems

Note

- The fractions are bigger in MAT 050, but the same 4-step process is used.

Add and simplify. $\frac{2}{27}+\frac{1}{6}$	$\frac{2}{27}+\frac{1}{6}=\frac{13}{54}$ (Type a whole number or a simplified fraction.)

Add and simplify. $\frac{1}{125}+\frac{3}{10}$	$\frac{1}{125}+\frac{3}{10}=\frac{77}{250}$ (Type a whole number or a simplified fraction.)

Subtract and simplify. $\frac{7}{15}-\frac{1}{9}$	$\frac{7}{15}-\frac{1}{9}=\frac{16}{45}$ (Type a whole number or a simplified fraction.)

Subtract and simplify. $\frac{13}{15}-\frac{21}{25}$	$\frac{13}{15}-\frac{21}{25}=\frac{2}{75}$ (Type a whole number or a simplified fraction.)