Subtraction of fractions

Key Concepts:

- Subtraction of fractions depends on whether the denominators are the same or different.
- Always subtract numerators and keep the common denominator, or make denominators the same before subtracting.

Case 1: Like Fractions (Same Denominator)

When the denominators are the same, subtract the numerators directly.

Formula:

If $\frac{a}{b}$ and $\frac{c}{b}$ are like fractions,	
then $\frac{a}{b} - \frac{c}{b} = \frac{a-c}{b}$	
Example 1:	Example 2:
Subtract: $\frac{5}{9} - \frac{2}{9}$	Subtract: $\frac{7}{12} - \frac{3}{12}$
Solution:	Solution:
$\frac{5-2}{9} = \frac{3}{9} = \frac{1}{3}$	$\frac{7-3}{12} = \frac{4}{12} = \frac{1}{3}$

Case 2: Unlike Fractions (Different Denominators)

Steps:

- Find the LCM of the denominators.
- Convert each fraction to an equivalent fraction with the LCM as denominator.
- Subtract the numerators.

Example 1:

Subtract: $\frac{5}{6} - \frac{1}{4}$

Solution:

LCM of 6 and 4 = 12

$$\frac{5}{6} = \frac{10}{12}, \frac{1}{4} = \frac{3}{12}$$
Now, $\frac{10}{12} - \frac{3}{12} = \frac{10 - 3}{12} = \frac{7}{12}$

Example 2:

Subtract:
$$\frac{3}{5} - \frac{1}{10}$$

Solution:

LCM of 5 and 10 = 10

$$\frac{3}{5} = \frac{6}{10}, \frac{1}{10} = \frac{1}{10}$$
Now, $\frac{6}{10} - \frac{1}{10} = \frac{5}{10} = \frac{1}{2}$

Properties of Subtraction of Fractions:

Closure Property: The difference of two fractions is also a fraction (if minuend ≥ subtrahend).

Example: $\frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$

• Not Commutative: $\frac{a}{b} - \frac{c}{d} \neq \frac{c}{d} - \frac{a}{b}$ (changing the order changes the result)

Example: $\frac{2}{5} - \frac{1}{3} \neq \frac{1}{3} - \frac{2}{5}$

• Not Associative: $\left(\frac{a}{b} - \frac{c}{d}\right) - \frac{e}{f} \neq \frac{a}{b} - \left(\frac{c}{d} - \frac{e}{f}\right)$