

FRACTIONS

Adding and Subtracting fractions or "Combining Fractions" requires the denominators to be the same.

Level 1: Combine fractions when the denominators match.

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

➤ FRACTION RULE: When denominators are the same combine the numerators.

Level 2: Find the LCD before combining.

➤ LCD: least common denominator or sometimes called the least common multiple of the denominators of two or more fractions.

Example: Combine fractions: $\frac{3}{5} - \frac{1}{4}$

Find the LCD: What is the lowest number that 4 and 5 divide into evenly? 20 is the answer because it is a multiple of 4 and 5.

➤ FRACTION RULE: Remember anything you do to the top of a fraction you must do to the bottom of a fraction.

$$\frac{3}{5} \cdot \frac{?}{?} \quad \text{Multiply top and bottom by 4} \Rightarrow \frac{3 \cdot 4}{5 \cdot 4} = \frac{12}{20}$$

$$\frac{1}{4} \cdot \frac{?}{?} \quad \text{Multiply top and bottom by 5} \Rightarrow \frac{1 \cdot 5}{4 \cdot 5} = \frac{5}{20}$$

KEEP THE DENOMINATOR and combine the numerators.

$$\frac{12}{20} - \frac{5}{20} = \frac{7}{20}$$

➤ FRACTION RULE: Any fraction that can be reduced should be reduced.

NOTE: Sometimes you will see a mixed number in a problem, change it to an improper fraction first.

$$3\frac{1}{4} \Rightarrow \text{Becomes} \Rightarrow \frac{13}{4}$$

Level 3: Use multiple factors to CREATE the LCD. In the last example we got the LCD by multiplying 4 and 5 to get 20. This does not always work.

Example: Combine $\frac{7}{30} - \frac{8}{45}$

If you multiply these two numbers you will get 1350, this number is too large. Instead factor each denominator into prime factors.

$$30 \text{ factors to } (2)(3)(5) \quad \text{and} \quad 45 \text{ factors to } (3)(3)(5)$$

If you have any factors that repeat write them once with an exponent.

$$\text{So, } 45 = (3^2)(5)$$

Write one of each factor and use the one with the higher power. For example: 3 and 3^2 match so we only take 3^2 . Also, 5 and 5 match but we only take one 5.

$$\text{LCD: } (2)(3^2)(5) = 90$$

Now we do the same thing, build up each fraction so it matches 90.

$$\frac{7}{30} \cdot \frac{?}{?} \quad \text{Build up the fraction then multiply} \quad \frac{7}{30} \cdot \frac{3}{3} = \frac{21}{90}$$

$$\frac{8}{45} \cdot \frac{?}{?} \quad \text{Build up the fraction then multiply} \quad \frac{8}{45} \cdot \frac{2}{2} = \frac{16}{90}$$

$$\frac{21}{90} - \frac{16}{90} = \frac{21-16}{90} = \frac{5}{90} \quad \Leftarrow \text{ Check if the fraction can be reduced}$$

Yes it can so the final answer is: $\frac{1}{18}$