ADDITION AND SUBTRACTION BETWEEN FRACTIONS

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The addition or subtraction between **fractions with like denominators** is performed using the following algorithm:

$$\frac{a}{d} \pm \frac{b}{d} \pm \frac{c}{d} \ldots = \frac{a \pm b \pm c \ldots}{d} \; ; d \neq 0$$

NOTE: The numerators of the fractions are added or subtracted, and the denominator "d" goes as the denominator of the resulting fraction.

EXAMPLE: Perform the following operation:

- $\frac{14}{5} + \frac{3}{5} - \frac{8}{5} =$

SOLUTION: 1): Fractions with like denominators:

$$\frac{14}{5} + \frac{3}{5} - \frac{8}{5} = \frac{14+3-8}{5} = \frac{9}{5}$$

The addition or subtraction between algebraic fractions **with unlike denominators** is performed using the following algorithm:

$$\frac{a}{b} \pm \frac{c}{d} = \frac{ad \pm bc}{bd} \; ; bd \neq 0$$

NOTE: "bd" is the Least Common Multiple (M.C.M.) of the denominators, which is called **Least Common Denominator**

EXAMPLE: Perform the following operation:

- $\frac{1}{15} - \frac{2}{3} + \frac{5}{6} =$

SOLUTION: 1) Finding the L. C. D. of the denominators:

15-3-6	2
15-3-3	3
5-1-1	5
1-1-1	

2x3x5=30

2) Applying the algorithm to perform addition or subtraction of arithmetic fractions:

$$\frac{1}{15} - \frac{2}{3} + \frac{5}{6} = \frac{(2)(1) - (10)(2) + (5)(5)}{30} =$$

Dividing the L.C.D. by each denominator:

$\frac{30}{15} = 2$ $\quad \frac{30}{3} = 10$ $\quad \frac{30}{6} = 5$

3) Performing the products and simplifying:

$$= \frac{2 - 20 + 25}{30} = \frac{7}{30}$$

The Least Common Multiple (L. C. M.) of a set of numbers is the least number capable of being divided by each number; hence, we must factor the numbers into their prime factors writing them as a whole. The L. C. M. will be the product of the common and uncommon factors.

REDUCING FRACTIONS

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EQUIVALENT FRACTIONS

If $\frac{p}{q} \wedge \frac{r}{s} \in \mathbb{Q}; \Longrightarrow \boxed{\frac{p}{q} = \frac{r}{s}} \Leftrightarrow \boxed{ps = qr}$

Hence, if

$$\frac{p}{q} \in \mathbb{Q} \wedge k \in \mathbb{I}, k \neq 0, \Longrightarrow \boxed{\frac{p}{q} = \frac{kp}{kq}}$$

They represent the same quantity without sharing the same numerator and denominator ⇦ EQUIVALENT FRACTIONS

To **simplify a fraction** and obtain an **equivalent fraction** we must:

a) Find all the prime factors of the numerator and denominator.
b) Cancel identical factors (cancel the G. C. D.).

GREATEST COMMON DIVISOR (G. C. D.): is the largest integer that divides a set of numbers. Is calculated by:

a) Find all the prime factors of each number.
b) The product of the prime numbers contained in "all" the numbers of the set, will be the G. C. D.

EXAMPLE: Simplify the following fraction: $\frac{10}{15} =$

SOLUTION: 1) Find all the prime factors of the numerator and denominator:

$$\frac{10}{15} = \frac{2x5}{3x5} =$$

2) Canceling identical factors (GCD):

$$\frac{2x5}{3x5} = \frac{2}{3} \cdot \frac{5}{5} = \frac{2}{3} \Rightarrow \frac{10}{15} = \frac{2}{3}$$ } EQUIVALENT FRACTIONS

EXAMPLE: Find the G. C. D. of 12, 20, and 28:

12	2	20	2	28	2
6	2	10	2	14	2
3	3	5	5	7	7
1		1		1	

The G. C. D. of 12, 20, and 28 is: 2x2=4