**Lesson 20 Notes: Adding and Subtracting Rational Numbers**

**Common Denominators**

One of the most important skills in the use of fractions is to replace to fractions with different denominators by two fractions with equal denominators.

The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of two fractions is the \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ of their denominators.

**Example 1:** Identify the common denominator for each pair of fractions. Then, replace the fractions in each pair by equal fractions having the smallest common denominator.

1. b. c.

LCM: 4 = 4, 8, 12, 16, 20 LCM: 12 = 12, 24 LCM: 6 = 6, 12, 18

5 = 5, 10, 15, 20 8 = 8, 16, 24 18 = 18

**Adding Fractions with Like Denominators**

* Add the numerators
* Place the sum of the numerators over the like denominator
* Reduce, if necessary

**Example 2:**

**Adding Fractions with Unlike Denominators**

* Convert each fraction to an equivalent fraction with the common denominator
* The common denominator is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Example 3: Add the following fractions.**

Find the LCD of 6 and 4. 6 = 2 · 3 4 = 22 LCD = 22 · 3 = 12

Make equivalent fractions for the LCD.

Follow addition rules for like denominators. (which is reduced)

least common denominator

**Answer Key**

multiple

least common

least common denominator

**Example 4: Add the following fractions. Reduce if necessary.**

1. b) c)

d)  e)

**Adding Mixed-Numbers**

* Add the whole numbers
* Add the fractions separately

OR

* Convert each mixed number to an improper fraction
* Follow your addition rules to add
* Convert the improper fraction back to a mixed number

**Example 5**:

**Rules for Subtracting Fractions**

The rules for subtraction of fractions are similar to the rules for addition of fractions.

In other words, to subtract two fractions, the denominators of the fractions must be the \_\_\_\_\_\_\_\_\_\_.

same

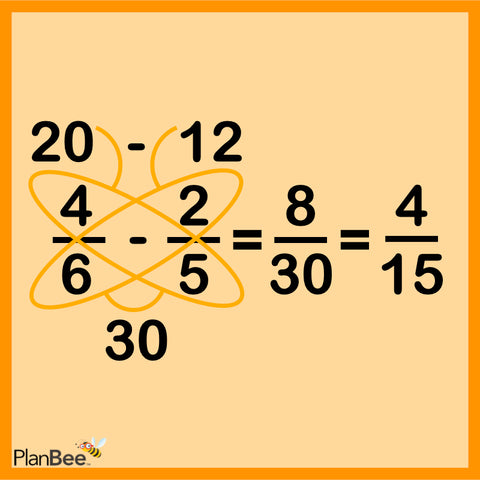
**Example 6: Subtract the following fractions. Reduce if necessary.**

1. b)

**Subtracting Mixed-Numbers**

Convert fractions into improper fractions and work accordingly.

**Butterfly Method of Adding and Subtracting Fractions**

To add or subtract fractions the butterfly way:

1. Write the fractions side-by-side as usual and draw two wings along the diagonals made by the numerator of one fraction and the denominator of the other fraction and draw an antenna on each wing.
2. As suggested by the wings, that look like a multiplication sign, multiply the numbers in each wing and put the product in the antenna for the wing.
3. Think or say: “This poor butterfly needs a body.” To give it a body, connect the bottom parts of the wings with a body-like loop and multiply the two denominators it connects, putting the product inside the body.
4. Add or subtract the numbers in the antennae in keeping with what is being done to the fractions and put the result over the number in the body.
5. If necessary. Reduce or simplify the result.

\*\*The only difference is subtracting fractions verses adding them is in the last step where the numbers in the antennae are subtracted instead of added.

**Example 7: Add the fraction using the Butterfly Method.**



28

7

12

Answer: