

# Basic Fractions Guide

## Simplifying/Reducing Fractions

Fractions need to be in lowest terms. This means that if you can think of a number that is a factor of both the numerator (top) and denominator (bottom) of the fraction, then you need to divide the numerator and denominator by that number. You continue doing this until there are no more common factors. It helps to think of the largest factor in order to save you time in the simplifying process.

Example: Simplify  $\frac{12}{18}$  We know that the factors of 12 are 1, 2, 3, 4, 6, and 12. The factors of 18 are 1, 2, 3, 6, 9, and 18. Therefore, the largest number that is a factor of both 12 and 18 is 6. So, to simply the fraction we will divide both the numerator and denominator by 6...  $\frac{12}{18} \div \frac{6}{6} = \frac{2}{3}$

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## Multiplying Fractions

Method #1: Multiply straight across, then simplify.

Method #2: Reduce diagonally or up/down, then multiply.

Example:  $\frac{3}{2} \cdot \frac{4}{9} = \frac{12}{18} \div \frac{6}{6} = \frac{2}{3}$

Example:  $\frac{1}{1} \cdot \frac{4}{3} = \frac{4}{3}$

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## Dividing Fractions

The procedure for dividing fractions doesn't actually involve division. Instead, we multiply the first fraction by the reciprocal of the second fraction. Many instructors like to say "keep, change, flip!" Keep the first fraction as it is, change the division to multiplication, and "flip" the second fraction. When you multiply, you can still choose between Method #1 and Method #2 above.

Example:  $\frac{2}{6} \div \frac{8}{6} = \frac{2}{6} \cdot \frac{6}{8} = \frac{12}{48} = \frac{1}{4}$

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## Adding/Subtracting Fractions

This process is completely different from multiplying/dividing fractions, and believe it or not, adding/subtracting fractions is considered more complicated than multiplying/dividing. This is because when adding/subtracting fractions you MUST have a common denominator, i.e. the denominators have to match. If they don't match to begin with, then we have to manipulate the problem to make them match. Once the denominators match, then to add or subtract the fractions, you add or subtract the numerators but keep the same denominator.

Example:  $\frac{3}{6} - \frac{1}{6}$  Notice that these fractions have the same denominator, 6. Therefore, all we have to do is subtract the numerators and keep the denominator. Then simplify if possible.

$$\frac{3}{6} - \frac{1}{6} = \frac{3-1}{6} = \frac{2}{6} \quad \text{Then simplify...} \quad \frac{2}{6} \div \frac{2}{2} = \frac{1}{3}$$

Example:  $\frac{1}{4} + \frac{5}{6}$

These fractions do not have the same denominator. So, we need to get a least common denominator (LCD). This is the smallest number that both 4 and 6 will go into, which is 12. So, we will change the denominators to 12. After seeing how the denominator changes, we change the numerator in the same way. For example, in the first fraction 4 would have to be multiplied by 3 to get 12. So, we multiply the numerator, 1, by 3 which is 3. For the second fraction, 6 would have to be multiplied by 2 to get 12. So, we multiply the numerator, 5, by 2 which is 10. Then we can add the numerators and keep the denominators. Simplify when possible.

$$\frac{1}{4} + \frac{5}{6} = \frac{3}{12} + \frac{10}{12} = \frac{13}{12}$$