How to Perform Basic Mathematical Operations on Fractions

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Introduction

In this manual, it is assumed that the user has a firm understanding of basic addition, subtraction, multiplication, division, and fractions. It is also beneficial to understand that $^{24}/_{2}$ is the same as 12 and $3^{2}/_{7}$ is the same as $^{23}/_{7}$ this is because every piece of '1' is broken up into seven parts. So 3 times 7 gives us 21 pieces of '7' then add the top (numorator) number and you get 23 "pieces" of 7. You could, of course, divide 23 by 7 and go back to the same number written as $3^{2}/_{7}$. This manual is broken into two parts, 'Basic Operations' and 'Short Cuts'. Upon completion of this manual, you should possess all the knowledge needed to quickly and accurately perform basic math functions on fractions.

Basic Operations

Addition

I. Find the lowest common denominator. This is the lowest number both denominators can evenly go into.

   ½+⅓= 6 (lowest common denominator)

II. Multiply the number of times the original denominator will go into the common denominator by the numerator for each fraction. This replaces the original numerator.

   ½+⅓= ⅗+⅖

III. Add the numerator and carry the common denominator.

   ⅗+⅖= ⅝

Subtraction

I. Find the lowest common denominator.

   ⁹⁄₁₀−⅕= 10

II. Multiply the number of times the original denominator will go into the common denominator by the numerator for each fraction. This is the same process as in addition.

   ⁹⁄₁₀−⅕= ⁹⁄₁₀−²⁄₁₀

III. Subtract the numerators.

   ⁹⁄₁₀−²⁄₁₀= ⁷⁄₁₀

Multiplication

To multiply fractions simply multiply the denominators, then multiply the numerators.

⅔*⁵⁄₁₂= ¹⁰⁄₃₆

NOTE: Next you may need to reduce the fraction to the lowest terms. To reduce, you need to find the greatest common factor of the numerator and the denominator.

Reduction

I. The greatest common factor is the largest number that can evenly go into both the numerator and the denominator. Divide the numerator by the greatest common factor.

$^{10}/_{36}$= 2 (greatest common factor)

II. Divide both the denominator and the numerator by the greatest common factor.

$^{10}/_{36}$= $^{5}/_{18}$ (reduced to lowest terms)

Division

I. Flip the places of the numerator and denominator in the second fraction.

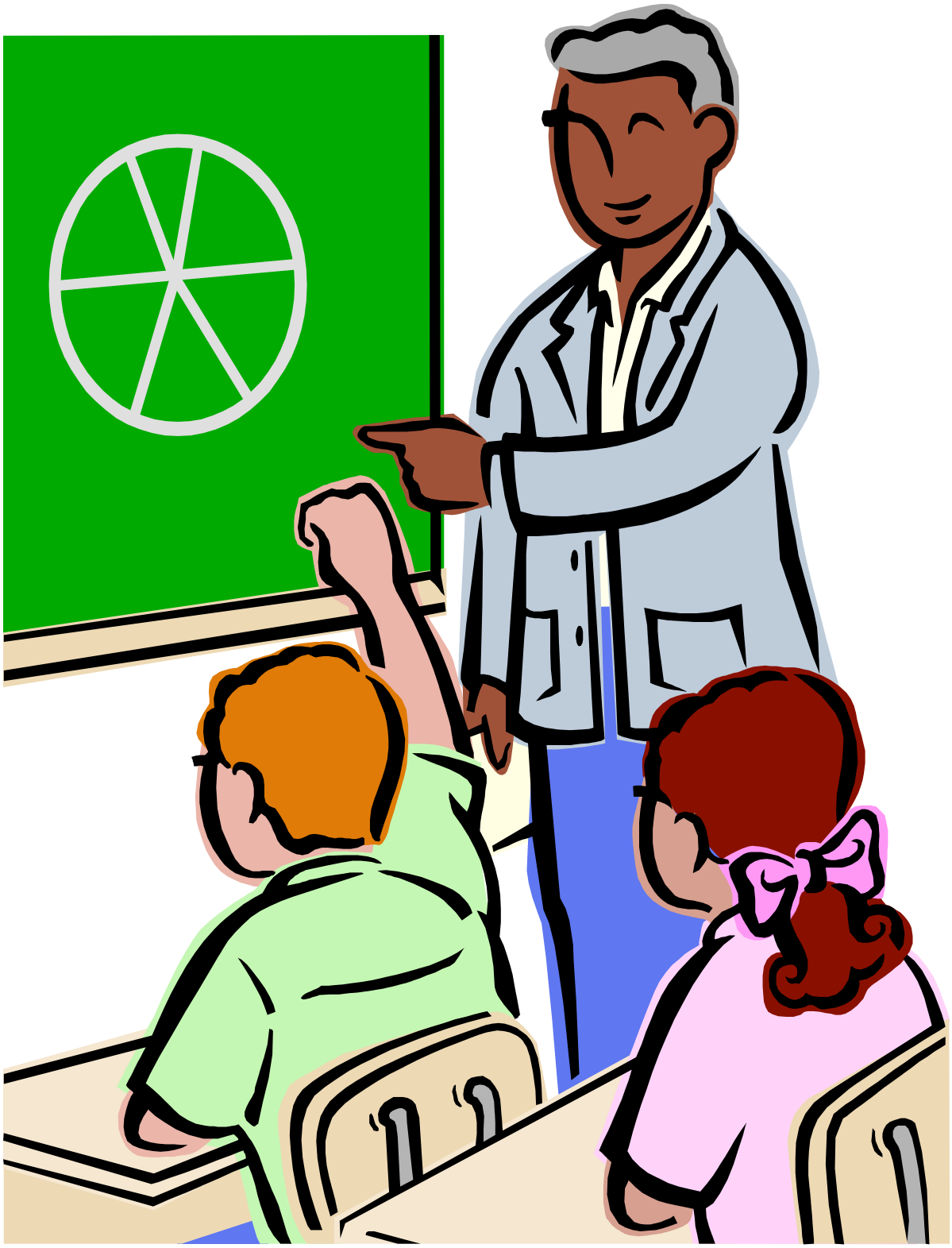
$^{1}/_{6}$/$^{1}/_{5}$= $^{1}/_{6}$/$^{5}/_{1}$

II. Multiply both numerators and denominators just as you would a standard multiplication problem.

$^{1}/_{6}$/$^{5}/_{1}$= $^{1}/_{6}$*$^{5}/_{1}$= $^{5}/_{6}$

NOTE: As in standard multiplication you may need to reduce the result to lowest terms.

Short Cuts



Canceling

To eliminate the need to reduce a result of multiplication and division problems, you can use a method called canceling.

I. Find the greatest common factor of the first fractions numerator and the second fractions denominator (if any).

   $\frac{2}{3} * \frac{5}{12} = 2$ (greatest common factor)

II. Divide the numerator and denominator by this number and replace with result respectively.

   $\frac{2}{3} * \frac{5}{12} = \frac{1}{3} * \frac{5}{6}$

III. Do the same with the first fractions denominator and the second fractions numerator if possible.

   $\frac{1}{3} * \frac{5}{6} = \frac{1}{3} * \frac{5}{6}$ (not possible)

IV. Multiply as a standard fraction, and the result will have already been reduced.

   $\frac{1}{3} * \frac{5}{6} = \frac{5}{18}$

Multiplying mixed numbers using improper fractions

Instead of multiplying the whole numbers and then the fractions respectively, you can make improper fractions and then multiply conventionally.

I. To make an improper fraction, multiply the whole number by the denominator.

   $3\frac{1}{3} * 2\frac{1}{4}$ $\quad 3\frac{1}{3} = 9$ $\quad 2\frac{1}{4} = 8$

II. Add the result to the numerator and replace in the numerators spot. Leave the denominator unchanged.

   $3\frac{1}{3} * 2\frac{1}{4} = \frac{10}{3} * \frac{9}{4}$

III. Multiply in the conventional way.

   $\frac{10}{3} * \frac{9}{4} = \frac{90}{12}$

NOTE: Reduction to simplest form is optional.