Fraction Operations Encyclopedia Article

Fraction Operations

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Fraction Operations

A fraction compares two numbers by division. To conduct basic operations, keep in mind that any number except 0 divided by itself is 1, and 1 times any number is itself. That is, , and 1 × 5 = 5. Thus, any number divided or multiplied by a fraction equal to one will be itself. For example, and .

When multiplying fractions, the numerators (top numbers) are multiplied together and the denominators (bottom numbers) are multiplied together. So . And .

To divide fractions, rewrite the problem as multiplying by the reciprocal (multiplicative inverse) of the divisor. So .

To add fractions that have the same, or a common, denominator, simply add the numerators, and use the common denominator. The figure below illustrates why this is true.

However, fractions cannot be added until they are written with a common denominator. The figure below shows why adding fractions with different denominators is incorrect.

To correctly add ½ and ⅓, common denominator must first be found. Usually, the least common multiple of the denominators (also called the least common denominator) is the best choice for the common denominator. In the example below, the least common multiple of the two denominators—2 and 3—is 6, so the least common denominator is 6. To convert the fractions, multiply ½ by (which is equivalent to 1) to get . Similarly, multiply ⅓ by (which is equivalent to 1) to get .

First

And

So , or

To model this problem visually, divide a rectangle into halves horizontally, then into thirds vertically, creating six equal parts (see the figure below). Shade one-half in color to show ½, and then shade one-third in gray to show ⅓. Since, as the figure shows, the upper left square has been shaded twice, it must be "carried" (see arrow). Now five of six squares are shaded; therefore, .

Subtraction of fractions is similar to addition, in that the fractions being subtracted must have a common denominator. So .