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Definition: **fraction** from *Philip's Encyclopedia*

Quotient written in the form of one number divided by another. A fraction is *a/b*, where *a* is the **numerator** and *b* the **denominator**. If *a* and *b* are whole numbers, the quotient is a **simple** fraction. If *a* is smaller than *b*, it is a **proper** fraction; if *b* is smaller than *a*, it is an **improper** fraction. In an **algebraic** fraction the denominator, or the numerator and denominator, are algebraic expressions, E.g. $x/(x^2+2)$. In *composite* fractions, both the numerator and denominator are themselves fractions.

Summary Article: **fraction**
From *The Columbia Encyclopedia*

[Lat.,=breaking], in arithmetic, an expression representing a part, or several equal parts, of a unit.

Notation for Fractions

In writing a fraction, e.g., 2/5 or 2/5, the number after or below the bar represents the total number of parts into which the unit has been divided. This number is called the denominator. The number before or above the bar, the numerator, denotes how many of the equal parts of the unit have been taken. The expression 2/5, then, represents the fact that two of the five parts of the unit or quantity have been taken. The present notation for fractions is of Hindu origin, but some types of fractions were used by the Egyptians before 1600 B.C. Another way of representing fractions is by decimal notation (see decimal system).

Characteristics of Fractions

When the numerator is less than the denominator, the fraction is proper, i.e., less than unity. When the reverse is true, e.g., 5/2, the fraction is improper, i.e., greater than unity. When a fraction is written with a whole number, e.g., 3 1/2, the expression is called a mixed number. This may also be written as an improper fraction, as 7/2, since three is equal to six halves, and by adding the one half, the total becomes seven halves, or 7/2. A fraction has been reduced to its lowest terms when the numerator and denominator are not divisible by any common divisor except 1, e.g., when 4/6 is reduced to 2/3.

Arithmetic Operations Involving Fractions

When fractions having the same denominator, as 3/10 and 4/10, are added, only the numerators are added, and their sum is then written over the common denominator: 3/10+ 4/10= 7/10. Fractions having unlike denominators, e.g., 1/4 and 1/6, must first be converted into fractions having a common denominator, a denominator into which each denominator may be divided, before addition may be performed. In the case of 1/4 and 1/6, for example, the lowest number into which both 4 and 6 are divisible is 12. When both fractions are converted into fractions having this number as a denominator, then 1/4 becomes 3/12, and 1/6 becomes 2/12. The change is accomplished in the same way in both cases—the denominator is divided into the 12 and the numerator is multiplied by the result of this division. The addition then is performed as in the case of fractions having the same denominator: 1/4+ 1/6= 3/12+ 2/12= 5/12. In subtraction, the numerator and the denominator are subjected to the same preliminary procedure, but then the numerators of the converted fractions are subtracted: 1/4− 1/6= 3/12− 2/12= 1/12.

In multiplication the numerators of the fractions are multiplied together as are the denominators

without needing change: 2/3× 3/5= 6/15. It should be noted that the result, here 6/15, may be reduced to 2/5 by dividing both numerator and denominator by 3. The division of one fraction by another, e.g., 3/5÷ 1/2, is performed by inverting the divisor and multiplying: 3/5÷ 1/2= 3/5× 2/1= 6/5. The same rules apply to the addition, subtraction, multiplication, and division of fractions in which the numerators and denominators are algebraic expressions.

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