# The Concept of Denominator/Denomination

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Each of the following is a denominator or denomination, telling the size of a ***uniform quantity*** that is being counted.

- a five-dollar bill
- the 3 in two-thirds
- conventions of place value (for example, the value of the 6 in 365)
- ounces

The purpose of this short paper is to describe connections between these ideas, and to strengthen understanding of each idea.

Cashing a check for $50 at a bank may produce the following question from the teller: "Will two twenties and a ten be all right, or do you need smaller denominations?" Here, denomination refers to the ***quantity*** (size) of money in a given piece of currency or bill.

The denominator 3 in two-thirds tells the ***quantity*** (size) of the fractional part that there are two of. In this sense, the denominator 3 tells amount or size in the same way that denomination of money does.

In the number 9743, the denomination or place value of the 7 is hundreds, by virtue of established ideas of place value. Place value communicates ***quantity*** or size like denomination symbols on currency or denominators of fractions. The same applies to both whole number and decimal place values. The denominations are there but invisible.

The names of units written after numbers establish denominations or ***quantities*** in the same way. Combinations of the above are possible. The denomination of the 7 in “9743 ounces” is *100 ounces*.

**Mixed forms** of fractions and decimals clarify place value further, and provide an instructive example of the occasional complexity of the concept of denomination. The place value of the 3 in $.005\frac{3}{8}$ is *1/8 of one-thousandth*, or 1/8000. The place value of the 5 is the agreed-on, invisible 1/1000, but the 3/8 is not a place-holder. A fraction carries its own place-value, or denominator.

Like an adjective, a fraction modifies the decimal place immediately to the fraction's left. T he mixed form given above is read, "Five and three-eighths thousandths." (Mixed forms are rarely used but may appear when a student attempts to change a common fraction to a decimal fraction. Vocational classes use these also.) Showing that $66\frac{2}{3}\%$ = $\frac{2}{3}$ will also involve a mixed form.

The denomination of the 3 in $.005\frac{3}{8}$ oz. is *1/8000 oz.*

The main purpose of the above discussion was to exemplify a connection between ideas in mathematics. Two other ideas may be evident.

(A) The ideas of place value, denominator, and denomination are complex; they are studied in graduate schools in mathematics.

(B) There is a great deal of mathematics in arithmetic.

Work with **denominate numbers** helps clarify the notions of denomination. Suppose we are to add the following:

2 ft 8 in + 1 yd 1 ft 9 in

The simplest answer will require carrying a 12-inch foot to the feet column. Re-writing:

$$\begin{array}{r} 2\text{ ft}\quad 8\text{ in} \\ +\ 1\text{ yd}\quad 1\text{ ft}\quad 9\text{ in} \\ \hline \end{array}$$

The similarity between this and carrying tens will help a student with the concept of carrying as well as the concept of denomination. The same applies to subtraction requiring donating {"borrowing") a foot and converting it to 12 inches.