Alternate Base Systems
for Cross-Curricular Fun & Engineering Applications

OVERVIEW OF WHAT BASES ARE: DOZENAL OR DUODECIMAL

DESCRIPTION OF DOZENAL BASE:

Uses twelve, the dozen, as its base, using the digits 0-9, plus two others. Twelve is the lowest *abundant* number (that is, its factors not including itself and one add up to more than its own value); this high number of factors gives it an unusually large number of clean fractions. For example, a sixth, a third, a quarter, and a half are all simple, single-digit, terminating fractions.

HISTORY OF DOZENAL BASE:

Dozenal has rarely been used as a cultural base, though it is not unheard of (some indigenous Nigerian languages, and a few from the Indian subcontinent, use it). Base-12 was suggested as a daily-use base by several practical scholars beginning in the nineteenth century, such as Thomas Leech, Admiral Elbrow, Rev. Thomas Freeman, and Wililam B. Smith. In 1934, F. Emerson Andrews published an article ("An Excursion in Numbers") on dozenals in *The Atlantic*, and from this sprung a group advocating the use of dozenal, the Dozenal Society of America, which still continues today. Similar groups arose in the United Kingdom, and some works, such as the French *Douze: notre dix futur*, by Jean Essig, were written and published in non-English-speaking countries.

USE OF THE DOZENAL BASE:

Because of its greater number of factors, dozenal creates a more regular multiplication table, and the more frequently used fractions (halves, quarters, thirds, sixths, eighths, sixteenths) are shorter and simpler than in other bases of its scale. Its proponents argue that it is therefore ideal for daily human use. Dozenal is not essential to any technology, as binary is.

EXAMPLES:

Here is a number in base-10: 201.
What does it mean? It means:
> two one-hundreds,
> zero tens, and
> one one.

What does this base-10 number, 201, equal in base-12?
It is 149. What does it mean? It means
> One gross,
> four dozens, and
> nine ones.

(A gross is what we call twelve twelves.)

QUESTIONS:

1.) In decimal, we considered finger-counting as the source of a number base. What similar counting method could have produced a dozenal, or duodecimal, system?

2.) Dozenal is the first *transdecimal* (higher than ten) base we've looked at, so it's the first time we had to pick extra digit symbols. What would make good transdecimal digits? Why?

3.) Is dozenal a convenient base for daily human use? Why or why not?