Introduction to Other Number Bases

POSITIONAL SYSTEMS

Each number base builds on the face and place values of that base. Base ten has face values 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. Notice that 10 is not a face value because it uses two digits. Ten represents one group and no units, or that a group of ten has been formed and so the notation "rolls over". Note there are ten face values for base ten, with ten completing a group.

Similarly, the number of face values for other bases will be equal to the base number, and the base number will complete a group for that number system. For example, base seven will have seven face values: 0, 1, 2, 3, 4, 5, 6. Seven items will be represented by 1-0 since a group has been completed and hence the notation "rolls over". Using a dash mark between the digits helps our brains distinguish this number from 10 which we immediately interpret as ten, whereas 1-0 is one group and no units in ANY base number system.

Place values in base ten are powers of ten. Similarly, place values in any other number system are powers of the base number in that system. For example, base seven has place values of 1, 7, 49, 343, etc.

Other examples of positional systems include the Babylonian and Mayan number systems.

SIMPLE GROUPING SYSTEMS

Some number systems do not depend on the position or place value. These systems rely on repetitive symbols and may be additive or subtractive systems. Examples include the Roman and Yoruban number systems.

CIPHER SYSTEMS

Some number systems use notation for both face and place value, without requiring the numbers to be in a certain position. Examples include the Chinese and Egyptian number systems.

OTHER NUMBER BASES

Mathematicians can create number bases using almost any number for the base (which numbers don't make sense to use?). There are even [negadecimals](#) where the number base is a negative number.

POSITIONAL NUMBER SYSTEMS

READ: The Indo-Arabic System (pp. 155-156)

1. The most universally used number system today is the _____
_____ system which as a _____ system.

2. A base ten system has _____ special characters called
_____.

3. Expanded notation allows us to write the face value (digit) and _____
value for any given digit in a given number.

4. The place values are _____ of _____ in order
from left to right.

READ: Physical Models for Positional Systems (pp. 156-159)

1. Historically, our number system derived from the use of
_____ _____ and
_____.

2. The wires on the abacus pictured on p. 156 stand for each _____
value.

3. When all ten beads accumulate on any wire, we "regroup" to accomplish what?