Base expansion definition

Definition For b an integer greater than 1 and n a positive integer, the base b expansion of n is

$$(a_{k-1}\cdots a_1a_0)_b$$

where k is a positive integer, $a_0, a_1, \ldots, a_{k-1}$ are (symbols for) nonnegative integers less than $b, a_{k-1} \neq 0$, and

$$n = \sum_{i=0}^{k-1} a_i b^i$$

Notice: The base b expansion of a positive integer n is a string over the alphabet $\{x \in \mathbb{N} \mid x < b\}$ whose leftmost character is nonzero.

Base b	Collection of possible coefficients in base b expansion of a positive integer
Binary $(b=2)$	$\{0,1\}$
Ternary $(b=3)$	$\{0, 1, 2\}$
Octal $(b = 8)$	$\{0, 1, 2, 3, 4, 5, 6, 7\}$
Decimal $(b = 10)$	{0,1,2,3,4,5,6,7,8,9}
Hexadecimal $(b = 16)$	$\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F\}$
	letter coefficient symbols represent numerical values $(A)_{16} = (10)_{10}$ $(B)_{16} = (11)_{10}$ $(C)_{16} = (12)_{10}$ $(D)_{16} = (13)_{10}$ $(E)_{16} = (14)_{10}$ $(F)_{16} = (15)_{10}$

Base expansion examples

Examples:

 $(1401)_2$

 $(1401)_{10}$

 $(1401)_{16}$

Base expansion review

Find and fix any and all mistakes with the following:

- (a) $(1)_2 = (1)_8$
- (b) $(142)_{10} = (142)_{16}$
- (c) $(20)_{10} = (10100)_2$
- (d) $(35)_8 = (1D)_{16}$

Base expansion final review

Convert $(2A)_{16}$ to

- binary (base ____)
- decimal (base ____)
- octal (base ____)
- \bullet ternary (base ____)