ALL YOUR BASE ARE BELONG TO US

Counting in Other Bases

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Nashville PHP
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BASE .//

BASE-10

- Otherwise known as “the decimal system”
- Greek *déka*; Latin *decem*
- *decade*, *decagon*, *decameter*, *December*
- A numeral system having 10 symbols to represent numbers

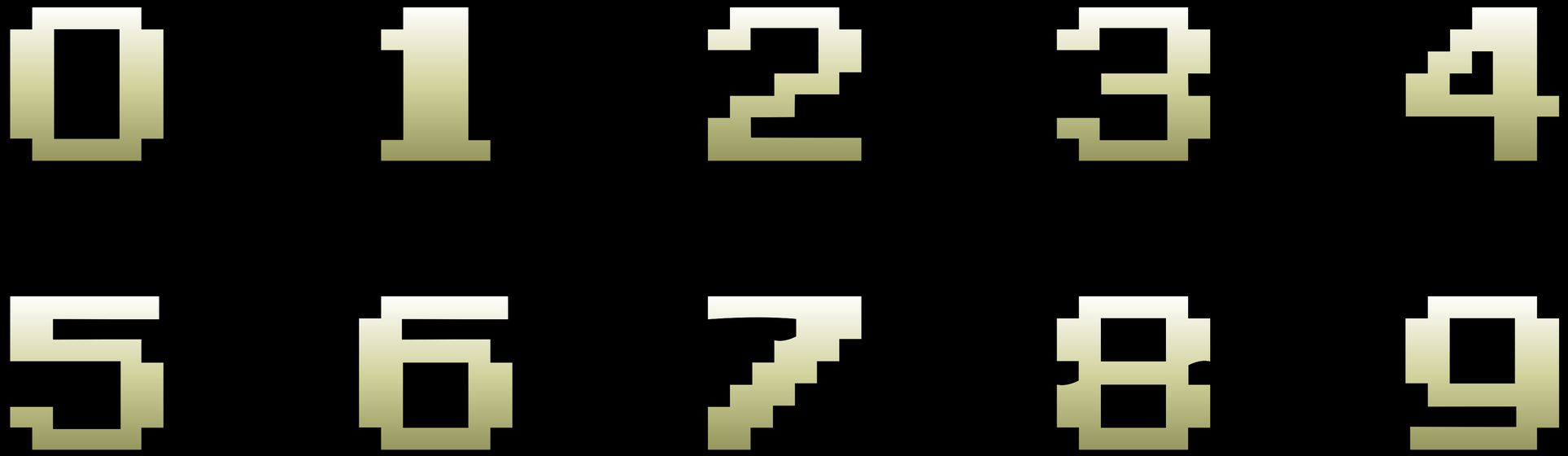
1

24

432

1 489

12 794 676


0 1 2 3 4
5 6 7 8 9

12 794 676

ones

12 794 676

tens

12 794 676

hundreds

12 794 676

thousands

12 794 676

ten thousands

12 794 676

hundred thousands

12 794 676

millions

12 794 676

ten millions

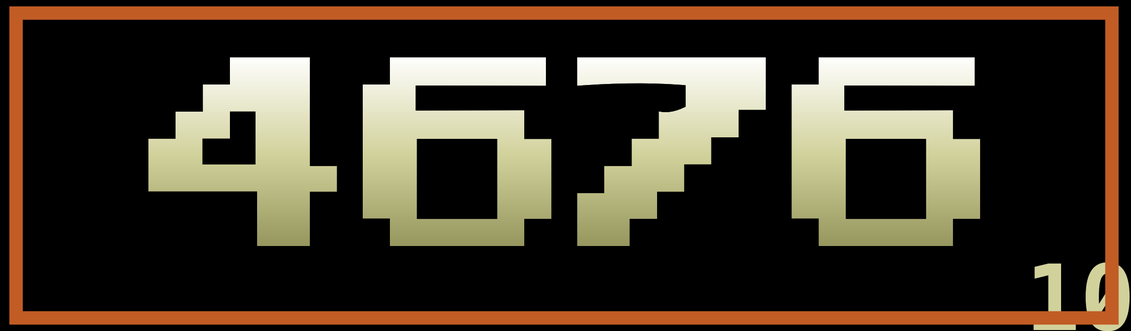
12 794 676

Each place (or position) in the number represents a value.

POSITIONAL NOTATION .4.4

PLACE-VALUE NOTATION .4.4

4676_{10}



digits

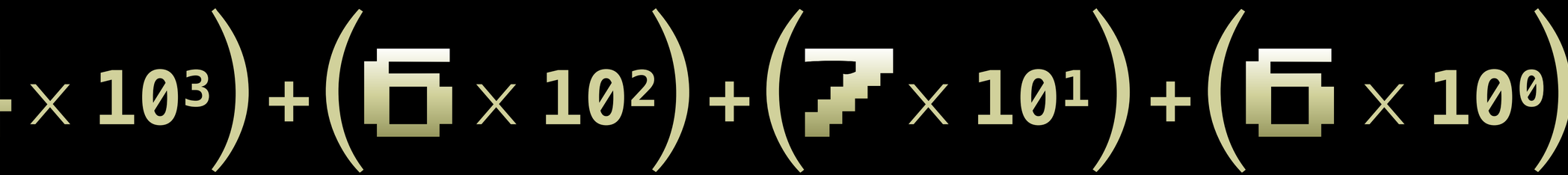
10

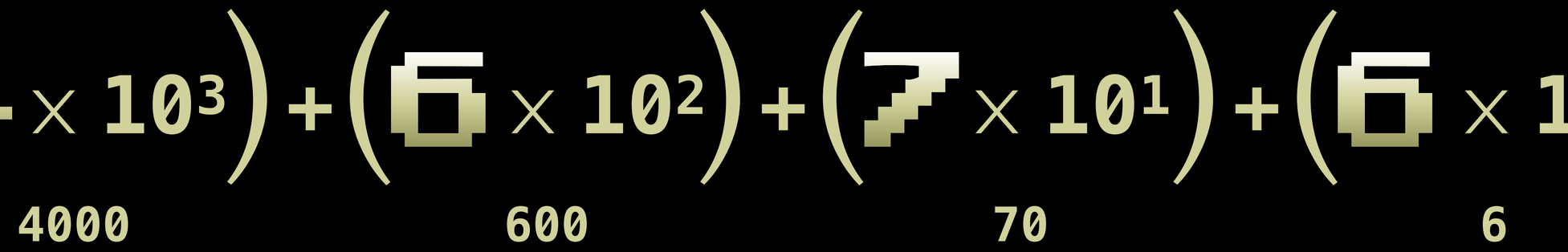
position


3 2 1 0
index
4676
10


4676
10
radix

$$(4 \times 10^3) + (6 \times 10^2) + (7 \times 10^1) + (6 \times 10^0)$$


(4 × 10^3) + (6 × 10^2) + (7 × 10^1) + (6 × 10^0)
4000
600
70
6



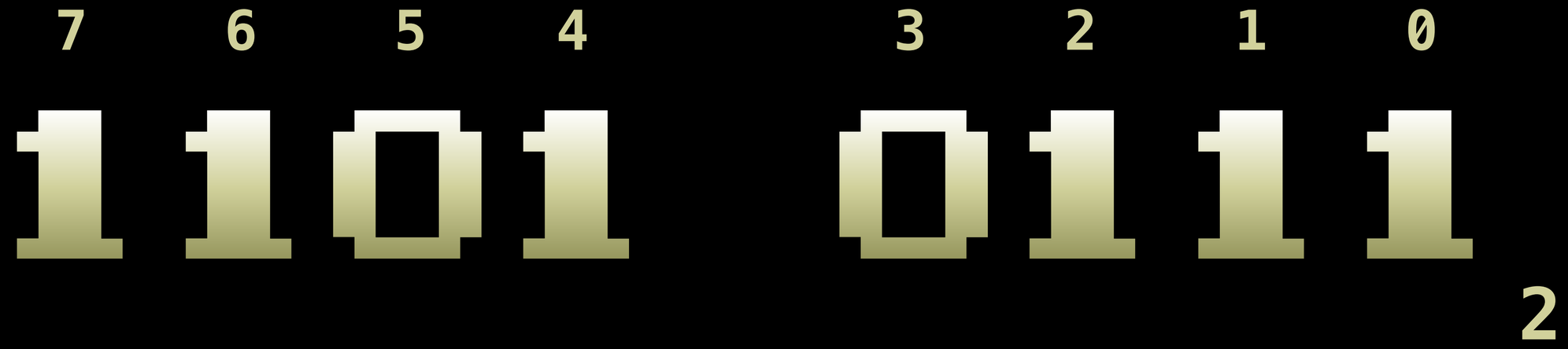
= 4676

WHAT YOU SAY .*.*

BASE-2

- Binary
- A numeral system having 2 symbols to represent numbers
- 0 and 1

$$1101\ \ 0111_{2}$$


7 6 5 4 3 2 1 0
1101 0111
2

$$(1 \times 2^{7}) + (1 \times 2^{6}) + (0 \times 2^{5}) + (1 \times 2^{4})$$

$$+ (0 \times 2^{3}) + (1 \times 2^{2}) + (1 \times 2^{1}) + (1 \times 2^{0})$$

$$(1 \times 2^{7}) + (1 \times 2^{6}) + (0 \times 2^{5}) + (1 \times 2^{4})$$

$$128 \qquad 64 \qquad 0 \qquad 16$$

$$+ (0 \times 2^{3}) + (1 \times 2^{2}) + (1 \times 2^{1}) + (1 \times 2^{0})$$

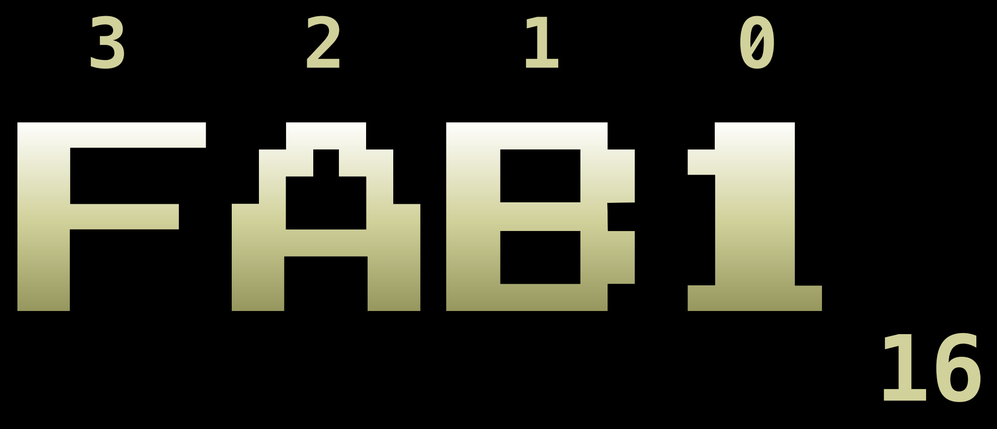
$$0 \qquad 4 \qquad 2 \qquad 1$$

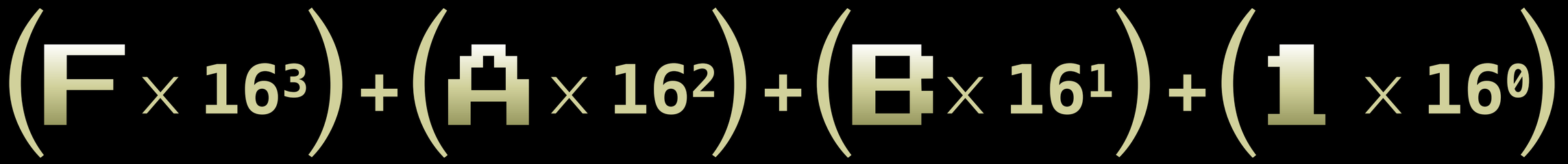
$$= 215$$

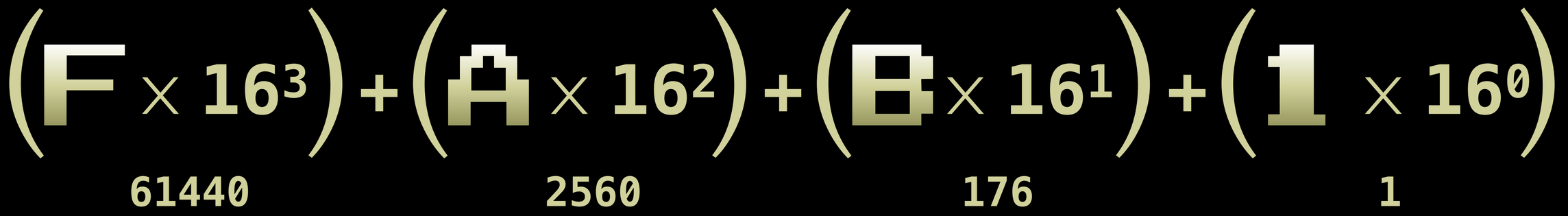
BASE-16

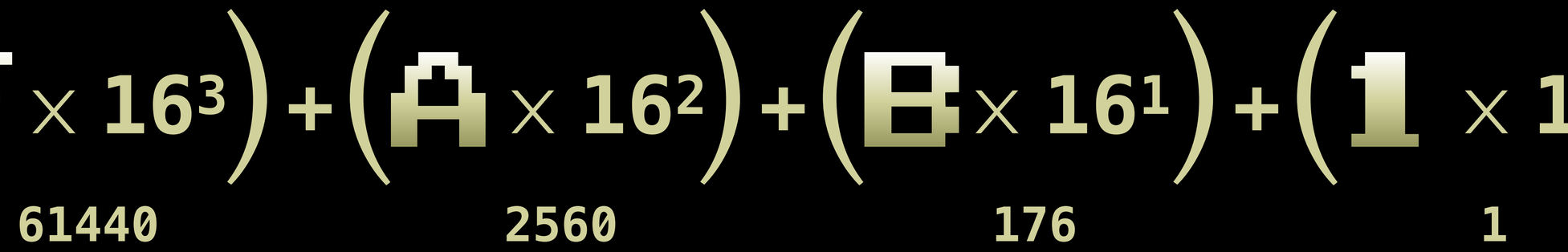
- Hexadecimal
- A numeral system having 16 symbols to represent numbers
- 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 and commonly A, B, C, D, E, and F for numbers 10–15

FAB1$_{16}$


3 2 1 0
FAB1
16


(F × 16³) + (A × 16²) + (B × 16¹) + (1 × 16⁰)


(F × 16³) + (A × 16²) + (B × 16¹) + (1 × 16⁰)
61440
2560
176
1



$$= 64177$$

CATS: ALL YOUR BASE ARE BELONG
TO US.