COUNTING

1 2 3

1 2 3

 10^2 10^1 10^0

 $= 1 \times 10^2 + 2 \times 10^1 + 3 \times 10^0$

 $= 1 \times 100 + 2 \times 10 + 3 \times 1$

= 123

$$= 4 \times 10^{3} + 1 \times 10^{2} + 2 \times 10^{1} + 3 \times 10^{0}$$

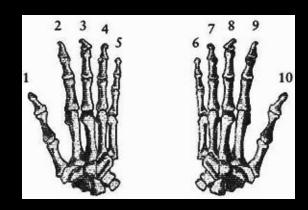
$$= 4 \times 10^{3} + 1 \times 10^{2} + 2 \times 10^{1} + 3 \times 10^{0}$$

$$= 4 \times 1000 + 1 \times 100 + 2 \times 10 + 3 \times 1$$

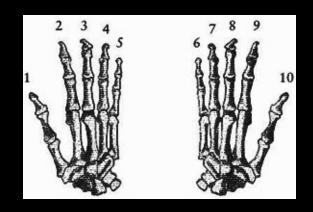
$$= 4 \times 10^{3} + 1 \times 10^{2} + 2 \times 10^{1} + 3 \times 10^{0}$$

$$= 4 \times 1000 + 1 \times 100 + 2 \times 10 + 3 \times 1$$

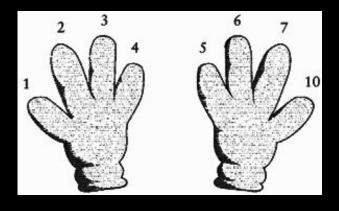
$$= 4123$$



human hand



human hand



cartoon character's hand

2 3 (octal)

1 2 3 (octal)

8² 8¹ 8⁰

1 2 3 (octal)

8² 8¹ 8⁰

$$= 1 \times 8^2 + 2 \times 8^1 + 3 \times 8^0$$

2 3 (octal) 8² 8¹ 8⁰

$$= 1 \times 8^{2} + 2 \times 8^{1} + 3 \times 8^{0}$$

$$= 1 \times 64 + 2 \times 8 + 3 \times 1$$

3

(octal)

8²

8¹

80

$$= 1 \times 8^2 + 2 \times 8^1 + 3 \times 8^0$$

$$= 1 \times 64 + 2 \times 8 + 3 \times 1$$

= 83 (decimal)

decimal octal 8

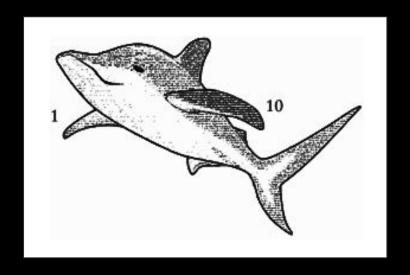
decimal octal

? ----

decimal octal 16 ?

decimal octal

? • 100



what now?

0, 1, ...

0, 1, 10, ...

0, 1, 10, 11, ...

0, 1, 10, 11, 100, ...

0, 1, 10, 11, 100, 101, ...

0, 1, 10, 11, 100, 101, 110

(binary)



1 0 (binary)
2² 2¹ 2⁰

$$= 1 \times 2^{2} + 1 \times 2^{1} + 0 \times 2^{0}$$

2² 2¹ 2⁰ (binary)

$$= 1 \times 2^{2} + 1 \times 2^{1} + 0 \times 2^{0}$$

$$= 1 \times 4 + 1 \times 2 + 0 \times 1$$

(binary)

$$= 1 \times 2^{2} + 1 \times 2^{1} + 0 \times 2^{0}$$

$$= 1 \times 4 + 1 \times 2 + 0 \times 1$$

= 6 (decimal)

2 3 4 5 6 0, 1, 10, 11, 100, 101, 110

place value systems

$$N = d_n * R^{n-1} + ... + d_2 * R^1 + d_1 *$$

$$d \in \{0, 1, ... R-1\}$$

$$n = number of digits$$

R = base

R ≥ 2