

Objectives - 1/18/2022 (Tue)

- Number bases
- ASCII

two-hundred

sixty-four

10^2

10^1

10^0

100's

10's

1's

2 6 4

= 100 × 2

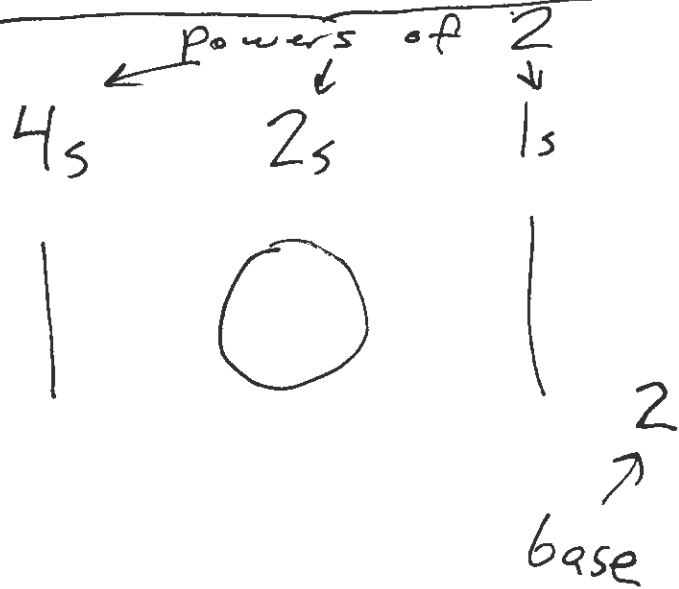
10 × 6

1 × 4

2 6 4

		digits
base	16	0 to f
base	10	0 to 9
base	36	0 to z
base	2	0 to 1

"five" from base 2 (binary)



$$\begin{array}{r} 4_{10} \times 1 \\ 2_{10} \times 0 \\ 1_{10} \times 1 \\ \hline 5_{10} \end{array}$$

"five"

decimal

base 10

5_{10}

binary

base 2

101_2

$(2^2 \quad 2^1 \quad 2^0)$

$4 \quad 2 \quad 1$

$1 \quad 0 \quad 1_2$

4×1

2×0

1×1

5_{10}

Express "eleven" in base 2

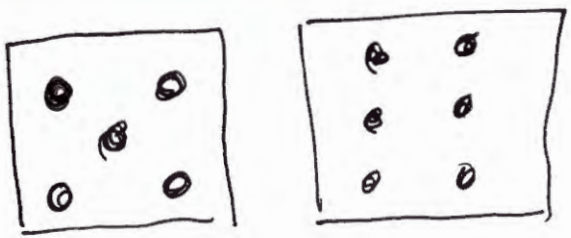
$$11_{10} \div 2_{10} = 5_{10} \text{ R } 1 \quad 1's$$

$$5_{10} \div 2_{10} = 2_{10} \text{ R } 1 \quad 2's$$

$$2_{10} \div 2_{10} = 1_{10} \text{ R } 0 \quad 4's$$

$$1_{10} \div 2_{10} = 0_{10} \text{ R } 1 \quad 8's$$

~~11~~ 1011₂



"eleven" - express in base 2

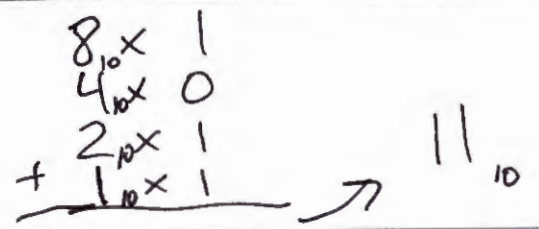
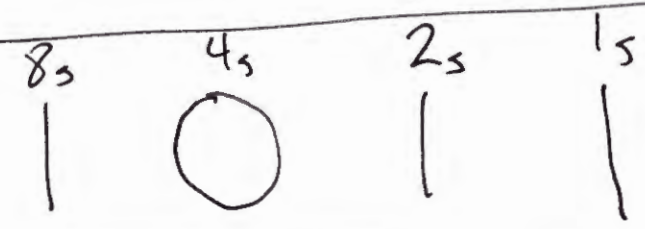
base

$$11 \div 2 = 5 \quad R \quad 1 \quad \text{1's place}$$

$$5 \div 2 = 2 \quad R \quad 1 \quad \text{2's place}$$

$$2 \div 2 = 1 \quad R \quad 0 \quad \text{4's place}$$

$$1 \div 2 = 0 \quad R \quad 1 \quad \text{8's place}$$



Eleven in base 2

$$\begin{array}{cccc} 8_s & 4_s & 2_s & 1_s \\ | & \bigcirc & | & | \\ & & & 2 \end{array}$$

$$\begin{array}{r} 8_{10} \times 1 \\ 4_{10} \times \bigcirc \\ 2_{10} \times 1 \\ + 1_{10} \times 1 \\ \hline 11_{10} \end{array}$$

"two-hundred sixty-four"

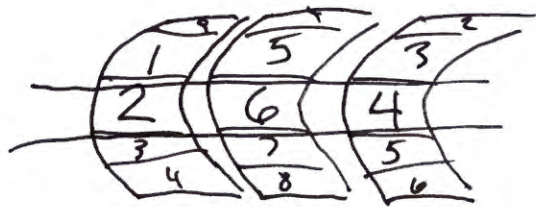
powers of 10
↓ ↓ ↓

100s 10s 1s

2 6 4

$$\begin{array}{r} 100 \times 2 \\ 10 \times 6 \\ + 1 \times 4 \\ \hline \end{array}$$

264



For each ~~pos~~ position 10 possible digits

"Sixty-five" expressed in base 8 (octal)

$$65 \div 8 = 8 \text{ R } 1$$

$$8 \div 8 = 1 \text{ R } 0$$

$$1 \div 8 = 0 \text{ R } 1$$


powers of 8
64s 8s 1s


1 0 1₈


In C code:

0101

Do NOT say....

 "print_integer ~~converts~~ from decimal to some other base."

 "print_integer expresses a value in a given number base."

 A variable is just a quantity and has no inherent number base.

To the compiler (gcc),

')' is the same as

41 or

0x29 or

051

~~8's~~
~~1's~~

8's 1's

5 | 8

$$\begin{array}{r} 8 \times 5 \\ 1 \times 1 \\ \hline 41 \end{array}$$

If your code refers to
a character, then use
a character constant.