ENR-325/325L Principles of Digital Electronics and Laboratory

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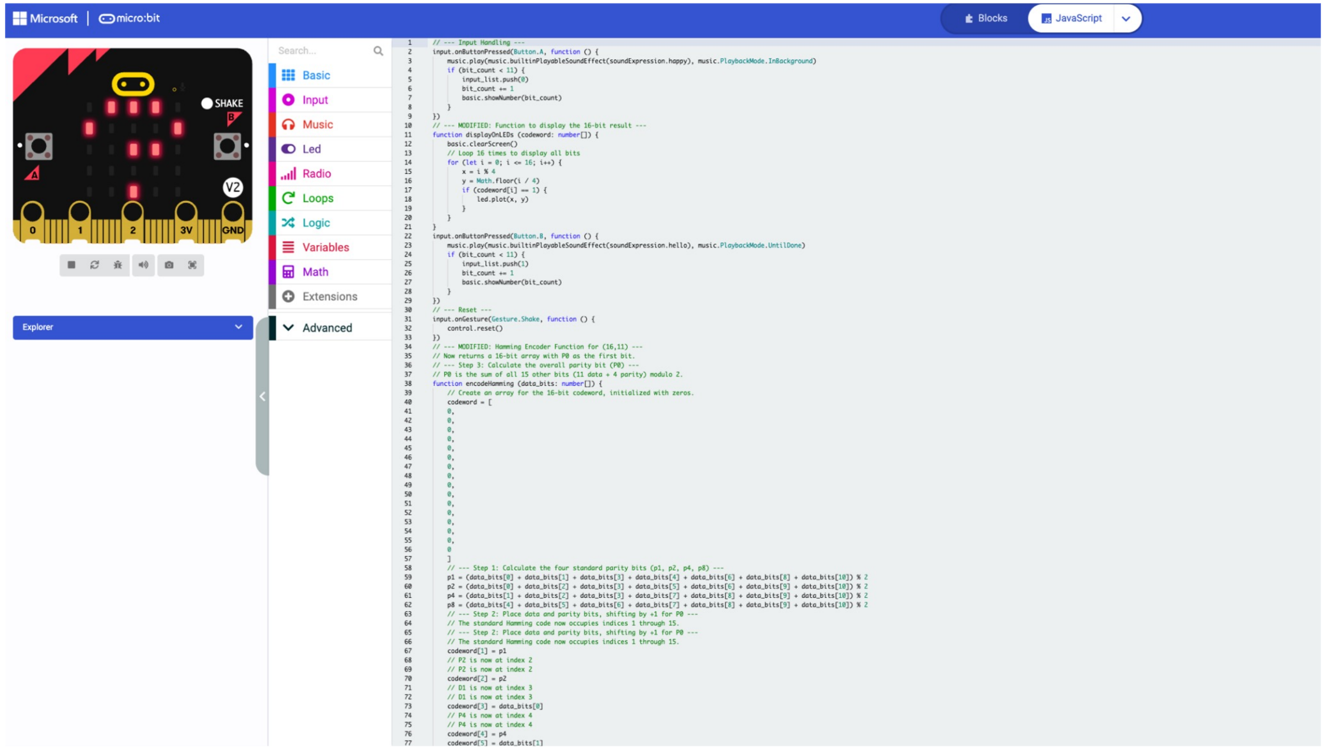
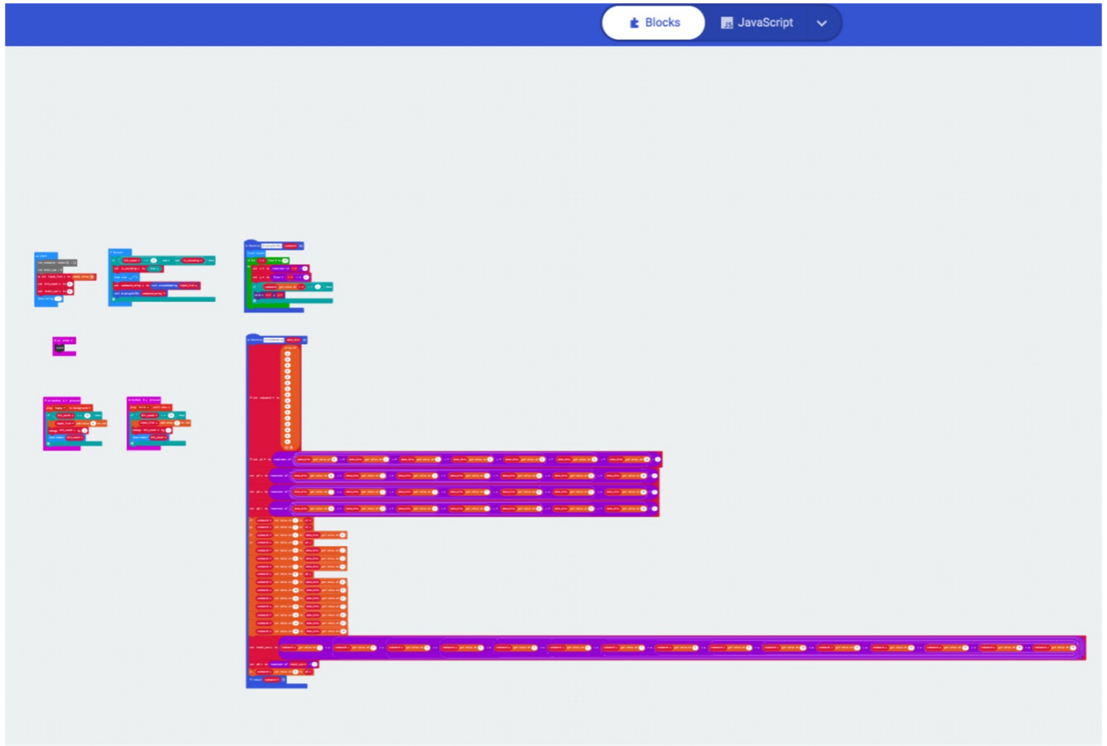
Coe College

Hamming codes can be done in the CS way





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Hamming codes can be done in the EE way

- Before that, we need to acquire some basic skill sets.

Pre-step: Data forms

Step 1: Data manipulation

Step 2: Information storage

Step 3: Interface

Pre-step: Data forms

- Say bye-bye to base 10:

Base 10 (0,1,2,3,4,5,6,7,8,9):

$$(4321)_{10}=$$

$$\begin{array}{cccc} 4\times & 3\times & 2\times & 1\times \\ +10^3 & +10^2 & +10^1 & +10^0 \end{array}$$

Base 2 (0,1):

$$(1011)_2=$$

$$\begin{array}{cccc} 1\times & 0\times & 1\times & 1\times \\ +2^3 & +2^2 & +2^1 & +2^0 \end{array}$$

Base 16 (0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F):

$$(FF12)_{16}=$$

$$\begin{array}{cccc} 15\times & 15\times & 1\times & 2\times \\ +16^3 & +16^2 & +16^1 & +16^0 \end{array}$$

Looking up how we do base conversions manually and in python.

The calculation of base 2 are pretty boring compared to base 10

Base 10	Base 2	Base 10	Base 2
$\begin{array}{r} 324 \\ \underline{+123} \end{array}$	$\begin{array}{r} 110 \\ \underline{+101} \end{array}$	$\begin{array}{r} 324 \\ \underline{\times 123} \end{array}$	$\begin{array}{r} 110 \\ \underline{\times\, 101} \end{array}$
$\begin{array}{r} 324 \\ \underline{-123} \end{array}$	$\begin{array}{r} 110 \\ \underline{-101} \end{array}$	$\begin{array}{r} 324 \\ \underline{\div\ 6} \end{array}$	$\begin{array}{r} 110 \\ \underline{\div 10} \end{array}$

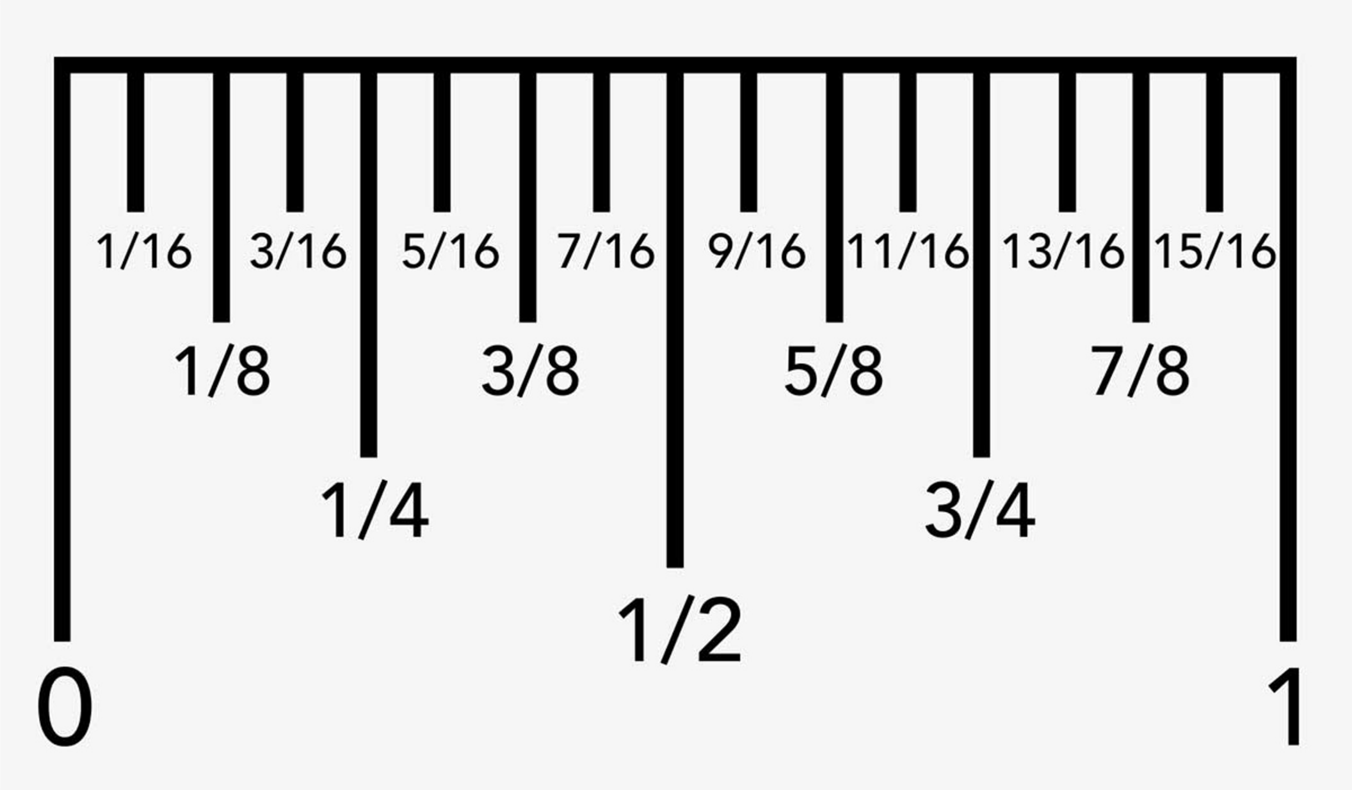
We will revisit more binary arithmetic operation later, after the logic gates!

Discuss: the origin of base 16?

Discuss: the origin of base 16?

My theory:
An easy and fair way to compute with a weightless balance scale.

https://commons.wikimedia.org/w/index.php?curid=79229218



https://www.inchcalculator.com/how-to-read-a-ruler/

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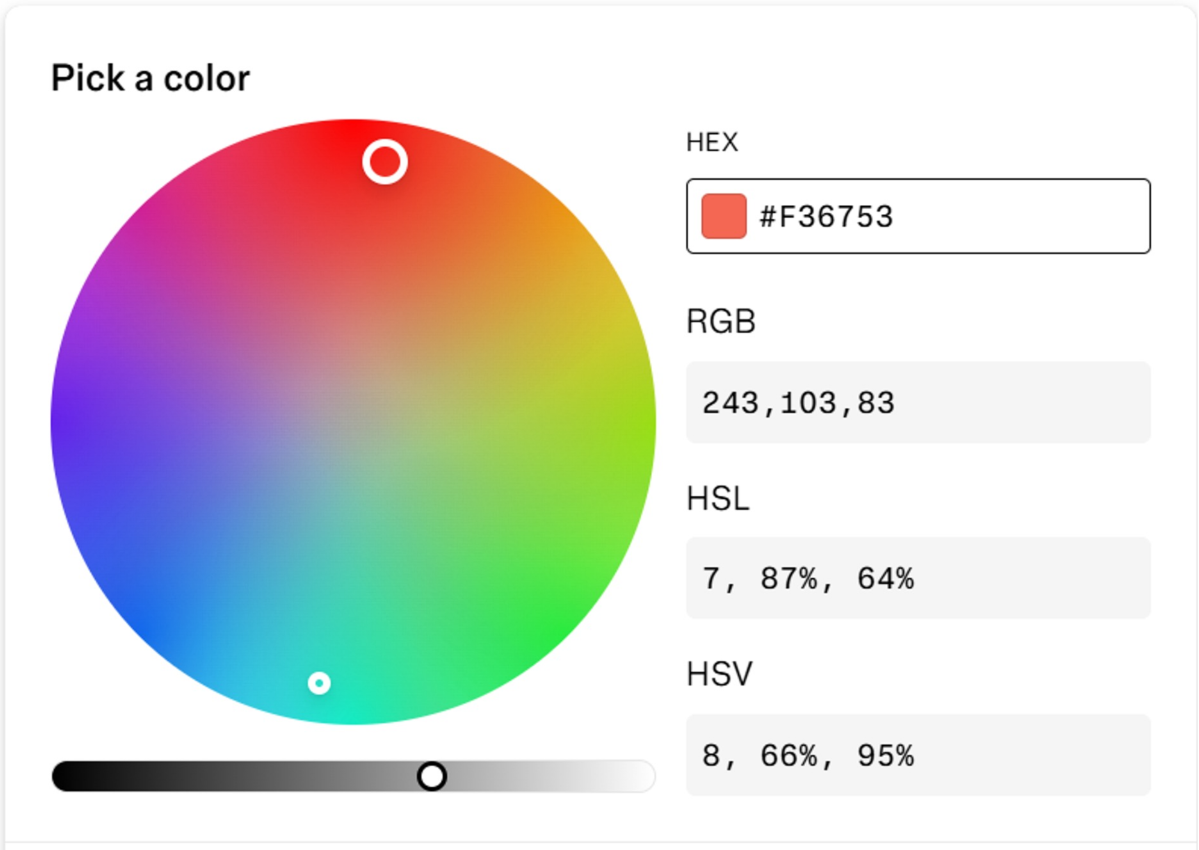
Discuss: why CS loves Hex(decimal) coding

`0b`:00111001001011111010

`0x`:392FA

Example: why CS loves Hex(decimal) coding

- Example: RGB (8bit) color code or Hex code



https://www.figma.com/color-wheel/

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R:
Bin(243)=11110011

G:
Bin(103)=01100111

B: Bin(83)=01010011