CS 145 Day 15 worksheet – representing values

Part A: binary

1. Write each binary number in decimal. Then check in Thonny, e.g., `int("10110", 2)`

	2^7 = 128	2^6 = 64	2^5 = 32	2^4 = 16	2^3 = 8	2^2 = 4	2^1 = 2	2^0 = 1
a. 10110	0	0	0	1	0	1	1	0
b. 111000	0	0	1	1	1	0	0	0
c. 1000001	0	1	0	0	0	0	0	1

a. `10110` = 16 + 4 + 2 = 22

b. `111000` = 32 + 16 + 8 = 56

c. `1000001` = 64 + 1 = 65

2. Write each decimal number in binary. Then check in Thonny, e.g., `bin(37)`

	2^7 = 128	2^6 = 64	2^5 = 32	2^4 = 16	2^3 = 8	2^2 = 4	2^1 = 2	2^0 = 1
a. 37	0	0	1	0	0	1	0	1
b. 100	0	1	1	0	0	1	0	0

a. 37 = 0010 0101

b. 100 = 0110 0100

3. Add in binary. Write each carry in the top row. Then check in Thonny, e.g., `bin(0b1101 + 0b0111)`

	Binary					Check in decimal
carries	1	1	1	1		
		1	1	0	1	= 8+4+1 = 13
	+	0	1	1	1	= 4+2+1 = 7
sum	1	0	1	0	0	= 16+4 = 20

Part B: hexadecimal

4. Write each hex number in decimal.
   Then check in Thonny, e.g., `int("1F", 16)`

   a. 1F = 16 + 15 = 31

   b. C8 = 192 + 8 = 200

5. Convert between binary and hex, four bits at a time.
   Then check in Thonny, e.g., `hex(0b10110110)` or `bin(0x7E)`

   a. `10110110` in hex = B 6 B6

   b. 7E in binary = 0111 1110

6. Colors.
   Then check in Thonny, e.g., `int("A5", 16)` or `hex(128)`

   a. `#FFA500` as a (red, green, blue) tuple
   240 + 15
   160 + 5

   (255 , 165 , 0)

   b. `(0, 128, 128)` as a hex color code

   # 008080

Dec	Binary	Hex	× 16
0	0000	0	0
1	0001	1	16
2	0010	2	32
3	0011	3	48
4	0100	4	64
5	0101	5	80
6	0110	6	96
7	0111	7	112
8	1000	8	128
9	1001	9	144
10	1010	A	160
11	1011	B	176
12	1100	C	192
13	1101	D	208
14	1110	E	224
15	1111	F	240