

Team Info (only fill out for the sheet to be turned in)

Team Name:

Group members (up to four):

1.	2.
3.	4.

Instructions

Only one sheet per team will be turned in. Each team member can work on their own sheet for practice, but then the group as a whole should discuss the answers and collaborate on the turn-in sheet. Everyone can take home their own sheets.

Goals

1. Be able to convert between number systems
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1. Introductory Practice

The set of digits in the base-10 (decimal) number system is {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}

a) Write out the set of digits in the octal (base-8) number system (___/1)

b) Write out the set of digits in the binary (base-2) number system (___/1)

c) Write out the set of digits in the hexadecimal (base-16) number system (___/1)

2. Digits

For the decimal number 2,368, we can extend this as:

Thousands 10^3	Hundreds 10^2	Tens 10^1	Ones 10^0
2	3	6	8

And then as the mathematical equation $2 \cdot 10^3 + 3 \cdot 10^2 + 6 \cdot 10^1 + 8 \cdot 10^0$

For the binary number 0100 0001, we can write it as:

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
0	1	0	0	0	0	0	1

And then as: $1 \cdot 2^6 + 1 \cdot 2^0$

a) Write out the number $(19)_{10}$ (19 base-10) as a mathematical equation (___/1)

10^1	10^0

b) Write out the number $(0101101)_2$ (binary) as a mathematical equation (___/1)

2^5	2^4	2^3	2^2	2^1	2^0

c) Write out the number $(FFAA66)_{16}$ (hexadecimal) as a mathematical equation (___/1)

16^5	16^4	16^3	16^2	16^1	16^0

3. Converting

Algorithm for converting a decimal number to **base b** :

1. Input a natural number n
2. While $n > 0$, do the following:
 1. Divide n by b and get a quotient q and remainder r .
 2. Write r as the next (right-to-left) digit.
 3. Replace the value of n with q , and repeat.

a) Convert $(35)_{10}$ to binary (___/1)

b) Convert $(125)_{10}$ to binary (___/1)

c) Convert $(123)_{10}$ to base-5 (___/1)

Hexadecimal to Binary

Hex	0	1	2	3
Binary	0000	0001	0010	0011
Hex	4	5	6	7
Binary	0100	0101	0110	0111
Hex	8	9	A (10)	B (11)
Binary	1000	1001	1010	1011
Hex	C (12)	D (13)	E (14)	F (15)
Binary	1100	1101	1110	1111

Example: Convert 11001 from binary to hex

1. Write out in chunks of four: $\begin{array}{cc} 0001 & 1001 \end{array}$
 2. Swap out each “nibble” with hex: $\begin{array}{cc} 1 & 9 \end{array}$
- $(11001)_2 = (19)_{16}$

Example: Convert DAD from hex to binary

1. Convert each digit to binary: $\begin{array}{ccc} D = 1101 & A = 1010 & D = 1101 \end{array}$
- $(DAD)_{16} = (110110101101)_2$

a) Convert $(1F0B)_{16}$ to binary

b) Convert $(01000110)_2$ to hexadecimal