

# Binary to Decimal

Q Convert 00101101 to decimal

1. Write out the binary columns
2. Add up the numbers:  $32 + 8 + 4 + 1$

128	64	32	16	8	4	2	1
0	0	1	0	1	1	0	1

**Answer: 45**

# Decimal to Binary

Q Convert 73 to 8-bit binary

1. Find largest bin column less than 73 (64s)
2. Then  $73 - 64 = 9$ , so find largest col less than 9
3.  $9 - 8 = 1$

128	64	32	16	8	4	2	1
	1			1			1

**Answer: 01001001**

# Adding binary

Q Convert 73 to 8-bit binary

1. Add in each column normally
2. Remember: 2 = 10 and 3 = 11

$$\begin{array}{r} 01001110 \\ 01000100 \\ + \underline{01000001} \\ 1\mathbf{1}010\mathbf{0}11 \\ \mathbf{1} \quad \mathbf{1} \quad \mathbf{1} \end{array}$$

# Hexadecimal numbers

Hexadecimal is base 16:

Hex	Decimal
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7

Hex	Decimal
8	8
9	9
10	A
11	B
12	C
13	D
14	E
15	F

# Binary to hexadecimal

Q Convert 11000111 to hexadecimal

1. Split the number in half to create two 4-bit binary numbers: 1100 and 0111
2. Convert each half into a hexadecimal value:  
 $1100 = 8 + 4 = \text{decimal } 12 = \text{hex } C$   
 $0111 = 4 + 2 + 1 = 8$

**Answer: C8**

# Hexadecimal to binary

Q Convert A8 to binary

1. Split the number in half  
A and 8
2. Create two 4-bit numbers, one from each half  
 $A = 10 = 1010$  and  $8 = 1000$
3. Join them together: 10101000

**Answer: 10101000**

# Hexadecimal to decimal

Q Convert 3C to decimal

1. First part is the 16s:

$$3 \times 16 = 48$$

2. Second part is units:

$$C = 12$$

3. Add them together:  $48 + 12 = 60$

**Answer: 60**

# Decimal to hexadecimal

Q Convert 156 to decimal

1. Divide by 16 to get the first part:  
 $157 / 16 = 9$  remainder 13
2. Second part is the remainder:  
Remainder 13 = D in hex
3. Join them together: 9D

**Answer: 9D**



# Left binary shift

**Q** Apply a left binary shift of 3 to 00001101

1. Remove the first three 0s: ~~000~~01101
2. Put the 0s on the right end: 01101**000**
3. Check the 1s have moved 3 places left

**Answer: 01101000**

1 left: double; 2 left: x4; 3 left: x8; 4 left: x16

# Right binary shift

Q Apply a right binary shift of 2 to 01101000

1. Remove the last two 0s: 011010~~00~~
2. Add the 0s on the left end: **00011010**
3. Check the 1s have moved 2 places right

**Answer: 00011010**

1 right: half; 2 right: quarter ( div by 4); 3 right:  
eighth (div by 8) etc...

# Bits, Bytes and so on

8 bits in a Byte

1000 Bytes in a kiloByte

1000 kB in a Megabyte

1000MB in a Gigabyte

1000GB in a Terrabyte

# Bits, Bytes and so on

Q Convert 16,000,000 bits to Megabytes

$16,000,000 / 8 = 2,000,000$  Bytes

$2,000,000 / 1000 = 2,000$  kiloBytes

$2,000 / 1000 = 2$  Megabytes

**Answer: 2 MB**

# Bits, Bytes and so on

Q Convert 4 GB to kiloBytes

$$4 \times 1000 = 4,000 \text{ MB}$$

$$4,000 \times 1000 = 4,000,000 \text{ kB}$$

**Answer: 4,000,000 kB**