# Hacker 30days:

Binary:

Booleans:

1 TRUE

0 FALSE

Numbers:  
Digits 0-9

90

37

2

BASE 10

C\* 10^2 + B \* 10^1 + A \* 10^0 = #

What is Base 10?

10 is 10

childhood:

when we looked at a number like 723 we would put them in columns:  
 7 2 3  
100s 10s 1s

7\*10^2 + 2\*10^1 + 3\*10^0 = 723

binary is base 2:

1x2^2 = 1x4 = 4 1x2^1 = 1x2 = 2 1x2^0 = 1x1 = 1

1 1 1 = 7 = 111

Binary Base10

1 = 1

11 = 3

101 = 5

1110 = 14

1111 = 15

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Binary | 1 | 1 | 1 | 1 | 1 | 1 |
| Base 10 | 32 | 16 | 8 | 4 | 2 | 1 |
| Powers of 2 | 2^5 | 2^4 | 2^3 | 2^2 | 2^1 | 2^0 |

Base10 Binary

2 2

8 1000

6 110

Base10 to Binary:  
34

34/2 r = 0

17/2 r = 1

8/2 r = 0

4/2 r = 0

2/2 r = 0

2/1 r = 1

then take numbers from bottom to top:  
100010

binary:  
 1 + 1

32 + 2

Base10:Binary

0:0

1:1

2:10

3:11

4:100

5:101

6:110

7:111

8:1000

9:1001

10:1010

11:1011

12:1100

13:1101

14:1110

15:1111

Operations on binary:

0+0 =0

0+1 =1

1+0 =1

1+1=10

6 + 7 = 7+7 = 5+7 =

110 111 101

+111 +111 +111

1101 1110 1100

Two’s Complement

How to represent negative numbers in binary

1. Two’s Complement “flip the bits add 1 =

extending the sign to 8 bits

Byte = 8 bits = 10111101

6 = 110 to 8 bit = 00000110

12 = 1100 to 8 bit = 00001100

-12 = flip the bits: = 11110011

add 1 = 11110100