

# Decimal numbers

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$$4527 = 4 \times 10^3 + 5 \times 10^2 + 2 \times 10^1 + 7 \times 10^0 = 4527$$

$10^3$   $10^2$   $10^1$   $10^0$

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<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
0	1 0	1 0 0
1	1 1	1 0 1
2	1 2	1 0 2
3	...	...
...	1 9	9 9 9
9	2 0	
	2 1	
	2 2	
	...	
	9 9	

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$2^3$     $2^2$     $2^1$     $2^0$

[illegible]

# Decimal to binary

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$$19 = ?$$

I

$$19 : 2 = 9$$

$$9 : 2 = 4$$

$$4 : 2 = 2$$

$$2 : 2 = 1$$

$$1 : 2 = 0$$

1  
1  
0  
0  
1

10011

$$19 = ?$$

11

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

$$0 \times 19 = 1 \times 16^1 + 9 \times 16^0 = 16 + 9 = 25$$

$\swarrow$   $\searrow$   
 $16^1$   $16^0$

$0 \times [\text{NUMBER}]$   
 $\Rightarrow$  Hex number

	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	0	16	1 0
1	1	17	1 1
2	2	18	1 2
	3		...
	4	25	1 9
	...	26	1 A
9	9		1 B
10	A		...
11	B		1 F
12	C		2 0
13	D		2 1
14	E		...
15	F	255	F F

$$0 \times 1A = 1 \times 16^1 + 10 \times 1 = 16 + 10 = 26$$

$\swarrow$   $\searrow$   
 $16^1$   $16^0$

$$0 \times 1A$$

$\swarrow$   $\searrow$   
 $0001$   $1010$

$$0 \times F = 15 (\text{decimal}) = 1111 (\text{binary})$$

FF - FF - FF - FF - FF - FF

1111 ..... 1111

48 bits "1"

## Some useful binary numbers

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<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
128	64	32	16	8	4	2	1

$$10000000 = 128$$

$$11000000 = 192$$

$$11100000 = 224$$

$$11110000 = 240$$

$$11111000 = 248$$

$$11111100 = 252$$

$$11111110 = 254$$

$$11111111 = 255$$

192.168.5.15    255.255.255.0 /24

Network

Host

$\begin{array}{cccccccc} \underline{1} & \underline{1} & \underline{0} & \underline{0} & \underline{0} & \underline{0} & \underline{0} & \underline{0} \\ \underline{1} & \underline{0} & \underline{1} & \underline{0} & \underline{1} & \underline{0} & \underline{0} & \underline{0} \\ \underline{0} & \underline{0} & \underline{0} & \underline{0} & \underline{0} & \underline{1} & \underline{0} & \underline{1} \\ \underline{0} & \underline{0} & \underline{0} & \underline{0} & \underline{1} & \underline{1} & \underline{1} & \underline{1} \end{array}$   
 $\begin{array}{cccccccc} \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} \\ \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} \\ \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{1} \\ \underline{0} & \underline{0} & \underline{0} & \underline{0} & \underline{0} & \underline{0} & \underline{0} & \underline{0} \end{array}$

192.168.5.0 → Network address  
 192.168.5.255 → Broadcast address

255.255.255.0 = /24  
 255.255.0.0 = /16  
 255.0.0.0 = /8  
 255.192.0.0 = /10

/9  
 255.128.0.0  
 $\begin{array}{cccc} \uparrow & \uparrow & \uparrow & \uparrow \\ 11111111 & 10000000 & 00000000 & 00000000 \end{array}$