

# Introduktion til Programmering og Problemløsning (PoP)

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# Alt på computeren er relateret til binære tal

Decimal:

- Base – 10
- Alphabet – {0,1,...,9}

Binær:

- Base – 2
- Alphabet – {0,1}

$\overbrace{d_n \dots d_2 d_1 d_0}^n . \overbrace{d_{-1} d_{-2} \dots d_{-m}}^m$   
 $d_n \dots d_2 d_1 d_0 . d_{-1} d_{-2} \dots d_{-m}$

117,42

$$v = \sum_{i=-m}^n d_i 10^i.$$

$2^n \quad \dots \quad 2^1 \quad 2^0 \quad 2^{-1} \quad 2^{-2} \quad \dots \quad 2^{-m}$   
 $b_n \dots b_2 b_1 b_0 . b_{-1} b_{-2} \dots b_{-m}$

101,11<sub>2</sub>

$$v = \sum_{i=-m}^n b_i 2^i,$$

Dec	Bin
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
16	10000
17	10001
18	10010
19	10011
20	10100
21	10101
22	10110
23	10111
24	11000
25	11001
26	11010
27	11011
28	11100
29	11101
30	11110
31	11111

Dec	Bin
32	100000
33	100001
34	100010
35	100011
36	100100
37	100101
38	100110
39	100111
40	101000
41	101001
42	101010
43	101011
44	101100
45	101101
46	101110
47	101111
48	110000
49	110001
50	110010
51	110011
52	110100
53	110101
54	110110
55	110111
56	111000
57	111001
58	111010
59	111011
60	111100
61	111101
62	111110
63	111111

# Dividér med 2 algoritmen

Fra binær til decimal

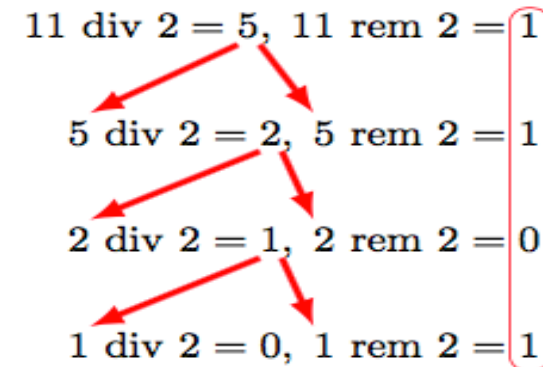
$$1010_2 = ?$$

$$v = \sum_{i=-m}^n b_i 2^i,$$

$$\begin{aligned} 1010_2 &= 1 \cdot 2^3 + 0 \cdot 2^2 + 1 \cdot 2^1 + 0 \cdot 2^0 \\ &= 8 + 0 + 2 + 0 \\ &= 10 \end{aligned}$$

Fra decimal til binær

$$11 = ?_2$$



# Oktale og Heksadecimale tal

Oktale tal:

- Base – 8
- Alphabet – {0,1,2,3,4,5,6,7}

$$8^n \quad 6^4 \quad 8 \quad 1 \quad 1/8 \quad 1/64 \quad 1/8^m$$

$$O_n \cdots O_2 O_1 O_0, O_{-1} O_{-2} \cdots O_{-m}$$

$$27,3_8$$

Oktalciffer svarer til 3 bit:

$$10111_2 \rightarrow 010 \ 111_2 \rightarrow 27_8$$

Heksadecimale tal:

- Base – 16
- Alphabet: {0,1,2,3,4,5,6,7,8,9,a,b,c,d,e,f}

$$16^n \quad 256 \quad 16 \quad 1 \quad 1/16 \quad 1/256 \quad 1/16^m$$

$$h_n \cdots h_2 h_1 h_0, h_{-1} h_{-2} \cdots h_{-m}$$

$$a3,9_{16}$$

Heksalciffer svarer til 4 bit:

$$10111_2 \rightarrow 0001 \ 0111_2 \rightarrow 17_{16}$$

Et heksalciffer

Et oktalciffer

Dec	Bin	Oct	Hex	Dec	Bin	Oct	Hex
0	0	0	0	32	100000	40	20
1	1	1	1	33	100001	41	21
2	10	2	2	34	100010	42	22
3	11	3	3	35	100011	43	23
4	100	4	4	36	100100	44	24
5	101	5	5	37	100101	45	25
6	110	6	6	38	100110	46	26
7	111	7	7	39	100111	47	27
8	1000	10	8	40	101000	50	28
9	1001	11	9	41	101001	51	29
10	1010	12	a	42	101010	52	2a
11	1011	13	b	43	101011	53	2b
12	1100	14	c	44	101100	54	2c
13	1101	15	d	45	101101	55	2d
14	1110	16	e	46	101110	56	2e
15	1111	17	f	47	101111	57	2f
16	10000	20	10	48	110000	60	30
17	10001	21	11	49	110001	61	31
18	10010	22	12	50	110010	62	32
19	10011	23	13	51	110011	63	33
20	10100	24	14	52	110100	64	34
21	10101	25	15	53	110101	65	35
22	10110	26	16	54	110110	66	36
23	10111	27	17	55	110111	67	37
24	11000	30	18	56	111000	70	38
25	11001	31	19	57	111001	71	39
26	11010	32	1a	58	111010	72	3a
27	11011	33	1b	59	111011	73	3b
28	11100	34	1c	60	111100	74	3c
29	11101	35	1d	61	111101	75	3d
30	11110	36	1e	62	111110	76	3e
31	11111	37	1f	63	111111	77	3f

# Resumé

I denne video har du hørt om:

- Talsystem (decimale, binære, oktale, hexadecimale)
- Dividér med 2 algoritmen