

# Seminarer

Oscar 1-5, 11-12

Mario 6-10

3 duggor - datum kommer

3 labbar -

Schemaändring 30/1 ev. konsekvenser

Hemsida uppdateras

## Tal & kodor

Binär

$$X = \sum x_i 2^i$$

$$x_i \in \{0, 1\}$$

Tiofö

$$D = \sum d_i 10^i$$

$$d_i \in \{0, 1, 2, \dots, 9\}$$

Omvandling  $\omega$   $87_{10} \leftarrow$  bas

Metod 1

$$87 \text{ vdda} \Rightarrow x_0 = 1$$

$$\frac{87-1}{2} = 43 \text{ vdda} \Rightarrow x_1 = 1$$

$$\frac{43-1}{2} = 21 \text{ vdda} \Rightarrow x_2 = 1$$

$$\frac{21-1}{2} = 10 \text{ jämt} \Rightarrow x_3 = 0$$

$$\frac{10-0}{2} = 5 \text{ vdda} \Rightarrow$$

Metod 2

$$87 \leq 128 \Rightarrow \text{7 bitar}$$

$$87 \geq 64 \Rightarrow x_6 = 1$$

$$87 - 64 = 23 \geq 16 \Rightarrow x_5 = 1$$

$$23 - 16 = 7 \geq 4 \Rightarrow x_4 = 1$$

$$7 - 4 = 3 \geq 2 \Rightarrow x_3 = 1$$

$$3 - 2 = 1 \geq 1 \Rightarrow x_0 = 1$$

$\leftarrow x_5 = 0$

$\leftarrow x_3 = 0$

Umwandlung ~~von~~ ~~1011~~  $11011_2$  in decimal

$$1 + 2 + 8 + 16 = 27_{10}$$

1.3 c

1.1 b

Hexadecimalt bas 16

Oktalet bas 8

Binär  $\rightarrow$  hex  
 $\searrow$   
 $\rightarrow$  oktalet

$\overbrace{110}^2 \overbrace{111}^7 \overbrace{00}^1$   
 $\underbrace{\hspace{1.5cm}}_{11=B} \quad \underbrace{\hspace{1.5cm}}_9$

Hex  $\uparrow$   $\Rightarrow$  dec  
oct  $\downarrow$

$$C3A_{16} \Rightarrow 12 \cdot 16^2 + 3 \cdot 16 + 10 = \begin{array}{r} 256 \\ 12 \\ \hline 3072 \\ 48 \\ \hline 3120 \end{array} = 3072 + 48 + 10 = 3130$$

$$273_8 = 2 \cdot 8^2 + 7 \cdot 8 + 3 = 128 + 56 + 3 = 187$$

Hex  $\uparrow$   $\Rightarrow$  bin  
oct  $\downarrow$

$$C3A_{16} = 110000111010$$

$$273_8 = 010111011$$

BCD

Dec  $\rightarrow$  Hex  
Oct

Delar med  $16/8 \Rightarrow$  ~~siffror~~ rest + heltals  
siffror + rest

BCD

Binary coded decimal

Varje decimal siffror för sig, binärt.

~~08~~

0010 0100  
0011

Fraktionella del

vikt  $2^{-i}$  (jämför  $10^{-i}$ )

0,63

2 metoder

$x_{-1} = 0$

$$0.63 \times 2 = 1.26$$

$$1.26 - 1 = 0.26 \quad x_2 = 0$$

$$0.26 \times 2 = 0.52$$

$$0.52 - 0 = 0.52 \quad x_3 = 1$$

$$0.52 \times 2 = 1.04$$

$$1.04 - 1 = 0.04 \quad x_4 = 0$$

$$0.04 \times 2 = 0.08$$

$$0.08 \times 2 = 0.16$$

$$0.16 \times 2 = 0.32$$

$$0.32 \times 2 = 0.64$$

$$0.64 \times 2 = 1.28$$

~~Addition~~

Negativ tal

Tva komplement

$$-X = X \text{ invertat} + 1 \text{ LSB}$$

$$-7 = -0111 = 1000 + 0001 = 1001$$

"MSB-vikten har minustecken"

$$\begin{array}{r}
 1001 = -7 \\
 \uparrow \quad \quad \downarrow \\
 -8 \quad \quad 1
 \end{array}$$

Teckenbiten måste med!

$$7 = 0111 \neq 111 = -3$$

Uttryck  $-24$  i tvåkomplement

### Addition/subtraktion

"Som vanligt" men annan bas

binärt	$\begin{array}{r} \overset{1}{0} \overset{1}{1} \overset{1}{0} \overset{1}{1} \\ + 00111 \\ \hline 10101 \end{array}$	$\begin{array}{r} 11 \\ 7 \\ \hline 18 \end{array}$
--------	---	---

tvåkomplement	$\begin{array}{r} 11010 \quad -6 \\ + 11100 \quad -4 \\ \hline 11110 \quad -10 \end{array}$	$-6 + -4 = -10$
---------------	---	-----------------

	$\begin{array}{r} \overset{1}{1} \overset{1}{0} \overset{1}{0} \overset{1}{1} \\ + 0011 \\ \hline 10100 \quad 4 \end{array}$	
--	--	--

### Subtraktion

Ändra tvåkomplementet

$4 - 3$	$\begin{array}{r} \overset{1}{0}100 \\ \hline 1101 \\ \hline 0001 \end{array}$	$0100$ <del>0100</del> 1101
---------	--	-----------------------------------

$-3 + 7 = 4$	$\begin{array}{r} \overset{1}{0}100 \\ \hline 1100 \\ \hline 10001 \end{array}$	$-1$
--------------	---	------