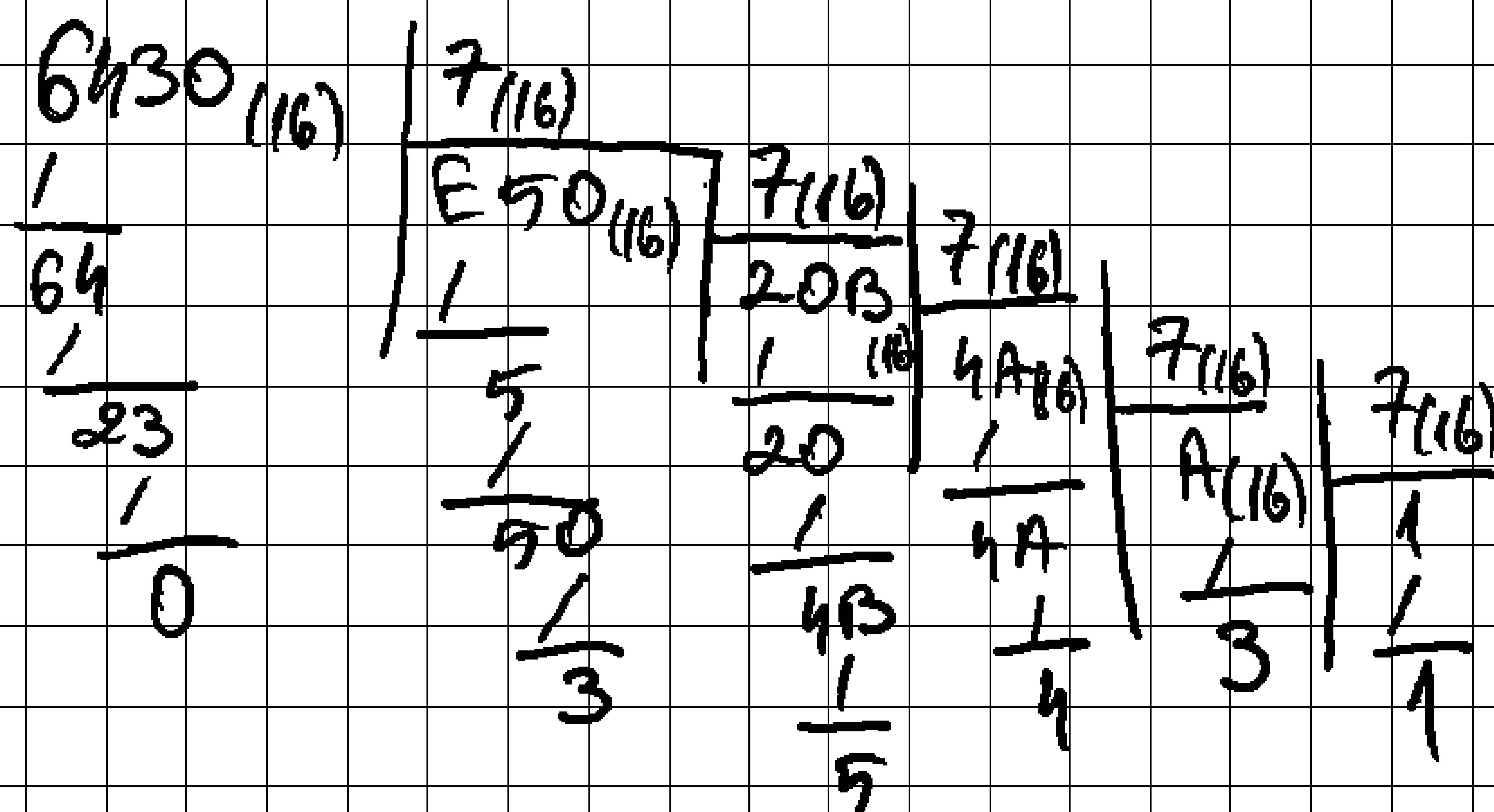
Succ. div. and multipl.

Ex 1: $6430,51_{(16)} = ?_{(7)}$ with 3 digits at the fract. part in base 7



Calculations

$64_{(16)} = 6 \cdot 16 + 4 = 100$

$100 / 7 = 14 = E_{(16)}$ $100 \% 7 = 2$

$23_{(16)} = 2 \cdot 16 + 3 = 35$

$35 / 7 = 5$ $35 \% 7 = 0$

$E_{(16)} = 14$ $14 / 7 = 2$ $14 \% 7 = 0$

$50_{(16)} = 5 \cdot 16 + 0 = 80$ $80 / 7 = 11 = B_{(16)}$ $80 \% 7 = 3$

$20_{(16)} = 2 \cdot 16 + 0 = 32$ $32 / 7 = 4$ $32 \% 7 = 4$

$4B_{(16)} = 4 \cdot 16 + B = 75$ $75 / 7 = 10 = A_{(16)}$ $75 \% 7 = 5$

$4A_{(16)} = 74$ $74 / 7 = 10$ $74 \% 7 = 4$

$0{,}51_{(16)} = 0{,}213_{(16)} \quad (7)$

$\overset{2}{0}{,}\overset{0}{5}\overset{0}{1}_{(16)} \cdot 7_{(16)} = 2{,}37_{(16)}$ $\qquad 35/16 = 2 \; ; \; 35\%16 = 3$

$\overset{1}{0}{,}\overset{3}{3}\overset{0}{7}_{(16)} \cdot 7_{(16)} = 1{,}81_{(16)}$ $\qquad 7 \cdot 7 = 49 \quad 49/16 = 3 \quad 49\%16 = 1$

$3 \cdot 7 + 3 = 24 \quad 24/16 = 1 \quad 24\%16 = 8$

$\overset{3}{0}{,}81_{(16)} \cdot 7_{(16)} = 3{,}87_{(16)}$ $\qquad 7/16 = 0 \quad 7\%16 = 7$

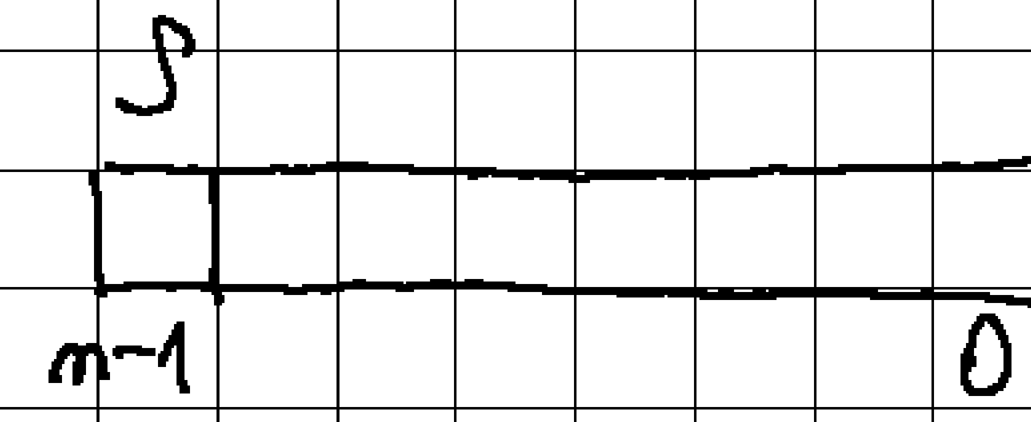
$7 \cdot 8 + 0 = 56, \; 56/16 = 3$

$56\%16 = 8$

$\Rightarrow \; 6430{,}51_{(16)} = 134530{,}213_{(7)}$

Codes for signed integers

Ex 1: $n = 8$ bits



$$X = 52 = 2^5 + 2^4 + 2^2 = 110100_{(2)}$$

$$y = 83 = 64 + 16 + 2 + 1 = 2^6 + 2^4 + 2^1 + 2^0 = 1010011_{(2)}$$

$[52]_{dir} = [52]_{inv} = [52]_{compl}$

S							
0	0	1	1	0	1	0	0
							0

$[-52]_{dir}$

S							
1	0	1	1	0	1	0	0
							0

$[-52]_{inv}$

S							
1	1	0	0	1	0	1	1
							0

$[-52]_{compl}$

S							
1	1	0	0	1	1	0	0
							0

$[83]_{compl}$

S							
0	1	0	1	0	0	1	1

$[-83]_{compl}$

S							
1	0	1	0	1	1	0	1

Addition in complementary code

Ex1: $[52+52]_{compl} = [52]_{compl} \oplus [52]_{compl}$

	S								
$[52]_{compl}$	0	0	1	1	0	1	0	0	$\oplus$
$[52]_{compl}$	0	0	1	1	0	1	0	0	
$[104]_{compl}$	0	1	1	0	1	0	0	0	correct result

$1101000 = 2^3+2^5+2^6 = 8+32+64 = 104$

Ex2: $[52+83]_{compl} = [52]_{compl} \oplus [83]_{compl}$

	S_7								
$[52]_{compl}$:	0	0	1	1	0	1	0	0	$\oplus$
$[83]_{compl}$:	0	1	0	1	0	0	1	1	
	1	0	0	0	0	1	1	1	overflow

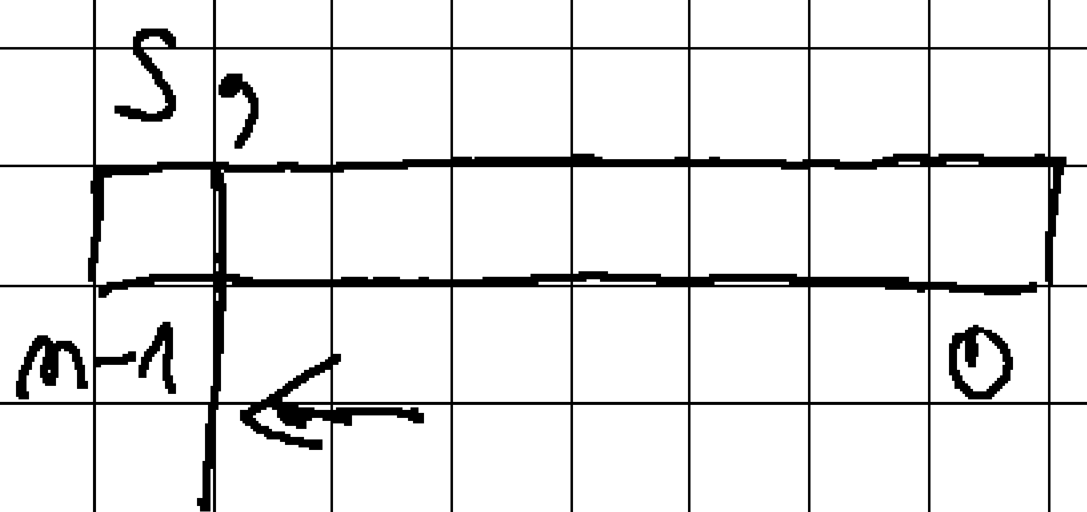
Ex3 $[52-83]_{compl} = [52]_{compl} \oplus [-83]_{compl}$

	S_7								
$[52]_{compl}$	0	0	1	1	0	1	0	0	$\oplus$
$[-83]_{compl}$	1	0	1	0	1	1	0	1	
$[-31]_{compl}$	1	1	1	0	0	0	0	1	correct result

complement

	S_7								
$2^0+2^1+2^2+2^3+2^4=31$	0	0	0	1	1	1	1	1	$= [31]_{compl}$

Codes for subunitary numbers



Ex1: $n = 8$ bits

$X = 11/16 \left(= 0{,}6875\right) = 11 \cdot 16^{-1} = 0{,}B_{(16)} = 0{,}1011_{(2)}$

$y = 0{,}57 = 0{,}443_{(8)} = 0{,}100100011_{(2)}$

$0{,}57 \cdot 8 = 4{,}56$

$0{,}56 \cdot 8 = 4{,}48$

$0{,}48 \cdot 8 = 3{,}84$

	S							
$[11/16]_{dir} = [11/16]_{inv} = [11/16]_{compl}$	0	1	0	1	1	0	0	0
$[-11/16]_{dir}$	1	1	0	1	1	0	0	0
$[-11/16]_{inv}$	1	0	1	0	0	1	1	1
$[-11/16]_{compl}$	1	0	1	0	1	0	0	0
$[0{,}57]_{compl}$	0	1	0	0	1	0	0	0
$[-0{,}57]_{compl}$	1	0	1	1	1	0	0	0

$$[11/16 + 0{,}57]_{compl} = [11/16]_{compl} \oplus [0{,}57]_{compl}$$

$[11/16]_{compl}$ S, $\boxed{0|1\,0\,1\,1\,0\,0\,0}$ $\oplus$

$[0{,}57]_{compl}$ S, $\boxed{0|1\,0\,0\,1\,0\,0\,0}$

S, $\boxed{1|0\,1\,0\,0\,0\,0\,0}$ overflow

we get a negative number from a positive numbers

$$[11/16 - 0{,}57]_{compl} = [11/16]_{compl} \oplus [-0{,}57]$$

$[11/16]_{compl}$ S, $\boxed{0|1\,0\,1\,1\,0\,0\,0}$ $\oplus$

$[-0{,}57]_{compl}$ S, $\boxed{1|0\,1\,1\,1\,0\,0\,0}$

$[0{,}125]_{compl}$ 1   S, $\boxed{0|0\,0\,1\,0\,0\,0\,0}$ correct result

$$= 2^{-3} = 0{,}125$$

$$0{,}6875 - 0{,}57 = 0{,}125\ldots$$

$[0,57 - 11/16]_{compl} = [0,57]_{compl} \oplus [-11/16]_{compl}$

	S								
$[0,57]_{compl}$	0	1	0	0	1	0	0	0	$\oplus$
$[-11/16]_{compl}$	1	0	1	0	1	0	0	0	

	S								
$[-0,125]_{compl}$	1	1	1	1	0	0	0	0	correct result

we complement

S								
0	0	0	1	0	0	0	0	$= [0,125]_{compl}$

$[11/16 - 11/16]_{compl} = [11/16]_{compl} \oplus [-11/16]$

	S								
$[11/16]_{compl}$	0	1	0	1	1	0	0	0	$\oplus$
$[-11/16]_{compl}$	1	0	1	0	1	0	0	0	

		S							
$[0]_{compl}$	$\cancel{1}$	0	0	0	0	0	0	0	0