Unsigned Binary - what you worked with before (ex 0010 as 2)

Signed Magnitude Notation - left most bit represents
the sign (t/-); other bits represent the magnitude

Exi Represent +5 using signed magnitude notation (using 4-bits)

sign Magnitude

0/1 0 1

A:

+ 15 0

Ex: Represent -5 using s.m.n.

sign | Magnitude

-5 is 1101

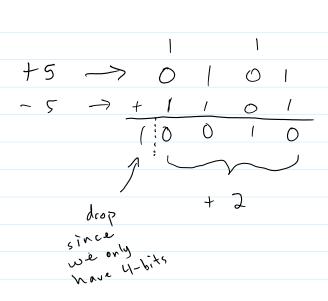
Ex: Represent O using signed magnitude notation.

sign i magnitude

0 1 0 0 0 0 ← + 0 } two zerosi

1 ( 0 0 0 0 ← - 0 ) rot ideal

Ext Add -5 and +5 using S.MN.



## One's Complement Notation

Wednesday, April 7, 2021 2:19 PM

Det The complement of a binary number is formed by reversing every bit.

Ex Complement the binary value 0100.

5.1: 1011

Exi Represent +5 using one's complement notation

Sol= 0101 A magnitude
sign

Ex: Represent -5 using 0-C.N.

Sols 0101 = 1010

complement 1 magnitude

Ex: Represent +2 and -2 using O. N. C +2 complement -2 501: 0010 > 1101

Ex: Represent O.

Sol: 0000 +0 } still have two zeros

Ex: Add +5 and -5.
<u>5.1:</u> +5 0101 -5 + 1010
-5 +   0   0
-5 + 1010 1111 -> -0 <sub>10</sub>
1 0
Try this: Add +5 and -2
Sol: +5 is 0/01 +2 is 00/0
-2 is 1101
45 <del>-&gt;</del> 0101
+ -2 -> + 1101
10010
drop 2010 3 + 2
51 gu 0 4 4 y

## Two's Complement Notation

Wednesday, April 7, 2021 2:35 PM

Positive values are the same as unsigned binary.

To negate values:

Stepl: Start with given value in binary

Stepa: Complement every bit.

Step 3: Add 1

Ex: Write -5 using two's complement

1.) +5 13 0101

2.) Complement

3.) Add 1 (1010)

1011 < 1011 is - 5 using T.C.

Try this: Write -2 using two's complement

Sol' 1.) + 2 is

0010

2.) Complement

1 / 0 l 1 l 0 l + 0 0 0 l

3.) Add 1

1110

Try this: Convert -> (1001) +0 +7

Sol: 1) -7 is 1001

2) Complement 0110

3.) Add 1 0111 
$$\rightarrow$$
 +7 is 0111

Ex. Find -0 from +0.

Sol! () +0 is 0000

111

2) complement 1111  $\downarrow$  +0001

3) Add 1 0000  $\leftarrow$  10000

Amp

De only have 1 zero!!

Ex. Add +5 and -5

Sol: +5 is 0101  $\Rightarrow$  0101

Large 0  $\rightarrow$  0101

Ang 0  $\rightarrow$  0000

Arithmetic works easily!

We're worked with 4-bits of storage?

Min value is  $-2^{4-1}=-2^3=-8$ 

Max value is  $2^{4-1}-1=2^{3}-1=8-1=7$ 

In general with n-bits.

Min value is -2

Max value is 2 - 1

## Overflow

Wednesday, April 7, 2021 3:00 PM

Def: Overflow - o cours when the value that is to be stored is outside the range of permissible values.

Handle by adding more bits or just detecting and reporting

## Detecting Overflow:

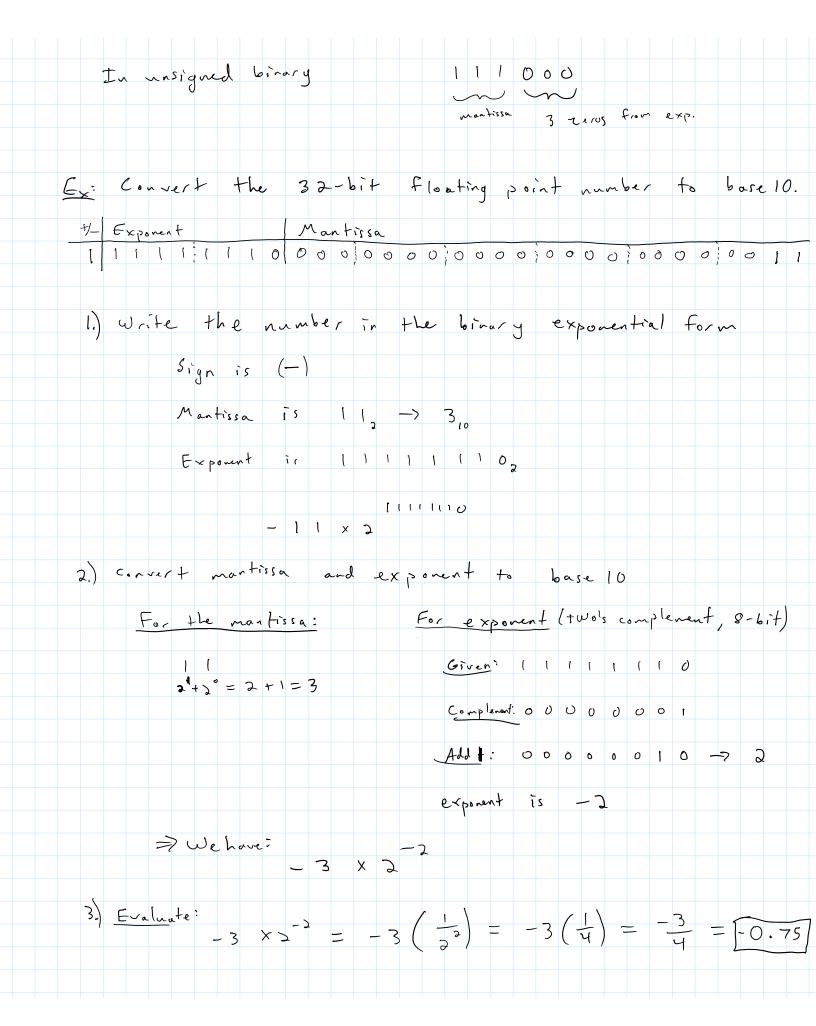
American Standard Code for Information Interchange

Character aroun	Range							
Character group	Decimal	Hexadecimal						
Control characters	0-31	0 – 1F						
Punctuation	32 – 47	20 – 2F						
Digits	48 – 57	30 – 39						
More punctuation	58 – 64	3A – 40						
Uppercase letters	65 – 90	41 – 5A						
More punctuation	91 – 96	5B - 60						
Lowercase letters	97 – 122	61 – 7A						
More punctuation	123 – 126	7B – 7E						
One final control character	127	7F						

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4	<u>@</u>	A	В	С	D	Е	F	G	Н	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
6	`	a	b	с	d	e	f	g	h	I	j	k	1	m	n	o
7	р	q	r	s	t	u	v	w	х	у	z	-{		}	~	

$$A = 41_{16} = 01000001_{3}$$
 $a = 61_{16} = 01100001_{3}$ 

Floating	, Poin	t Notati	on																						
Monday, April 1	2, 2021	1:34 PM																							
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3,	) <u>Eval:</u>		_ ζ ×	2 - 3		> exp i		
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