

Signed Integers

① Signed magnitude

- not used in practice (simple, but inefficient)
- use 1 bit for sign, and the rest for magnitude

e.g. in 6-bit signed magnitude,

$$\begin{array}{rcl} +5 & = & 0 \mid 00101 = 000101 \\ -10 & = & 1 \mid 01010 = 101010 \end{array}$$

② Two's complement

Basic idea: roll forwards or backwards from zero, like a car's odometer

e.g. 4-bit 2's complement:

roll forward ↗	2	0010
	1	0001
roll backward ↘	0	0000
	-1	1111
	-2	1110
	-3	1101

Convention: first bit yields the sign (0 is +ve, 1 is -ve)

Thus, in 4-bit 2's complement,
largest positive number is 0111, i.e. 7
most negative number is 1000, i.e. -8

Trick: to negate a number, flip all the bits and
add 1.

e.g. In 4-bit 2's complement,

3 is	0011	
flip bits:	1100	
add one:	1101	← this is -3