ACOL 215 (08 Sept. 2025)

Radix complement

The r's complement of an n-digit number N in base r is defined as $r^n - N$ (for $N \neq 0$) and as 0 (for $N = 0$).

Comparing with (r-1)'s complement, note that r's complement is obtained by adding 1 to (r-1)'s complement.

For example,

The 10's complement of $(2389)_{10}$ is

$(7611)_{10}$

$$\begin{array}{r} 9999 \\ 2389 \\ \hline 7610 \\ +\ 1 \\ \hline 7611 \end{array}$$

Subtraction using complement

Suppose we are subtracting two n-digit unsigned numbers M, N in base r

M − N

→ ① $M + (r^n - N)$ ← if $M \geq N$

r^n − 1

$r^n - (N - M)$ if $M < N$

$$\frac{r^n - (N-M)}{r\text{'s complement of } (N-M)}$$

Take r's complement again, and negate

Example

M N

72532 - 03250

72532
96750

169282
100000

69282

99999
03250

96749
+1

96750

3250 - 72532

```
  03250
  27468
+
-------
  30718
```

```
  99999
  72532
-------
  27467
    +1
-------
  27468
```

```
  99999
  30718
-------
  69281
    +1
```

-69282

Ans

Exercise

$X = 1010100$

$Y = 1000011$

find out $X - Y$ using 2's complements.

Exercise

Technique + 2 examples