(r-1)'s complement :-

Complement makes Subtractions Easy for Integers

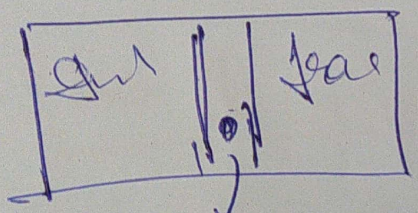
Diminish Comp :-

$(r-1)$'s comp $= (r^n - 1) - N$

$= (r^n - r^{-m} - N)$ for fraction

& where is r = Radix / Base

n = number of digits in Integer



N = Actual Number

m = number of digits in fractional Part

Example $(7543)_{10}$ $(r-1)$'s Comp.

$= (r^n - 1) - N$

$= (10^4 - 1) - 7543$

$= (10000 - 1) - 7543$

$= 9999 - 7543$

$= (2456)$ 9's comp

* denis

	r's	(r-1)'s
B	2's	1's
O	10's	9's
O	8's	7's
H	16's	15's

ample (2) fraction

$(0.763)_{10}$ Calculate 9's complement

$= (r^n - r^{-m}) - N$

$= (10^0 - 10^{-3}) - 0.763$

$= 1 - \frac{0001}{1000} - 0.763$

$= 1 - 0.762 = (0.236)$

Try

$\hookrightarrow (25.25)_{10}$

Calculate (r-1)

$= (r^n - r^{-m} - N)$

$= (10^2 - 10^{-2} - 25.25$

$= 100 - \frac{1}{100} - 25.25$

$= (74.74)$

How To Calculate (r-1)'s Short Cut

1's

$(XXXX)_2$

1111

$-$ XXXX

Example

~~$(7543)_{10}$~~

$(1011)_2$

1111

-1011

9's

$(4444)_{10}$

9999

$-$ 4444

$(7543)_{10}$

9999

$-$ 7543

2456

7's

$(2222)_8$

7777

$-$ 2222

$(2057.34)_8$

7777.77

2057.34

5720.43

15's

$(PQRS)_{16}$

FFFF

PQRS

F20.BAE

FFF.FF

F20.3AE

0DF.C5

Example: fraction $(r-1)$'s complement's

One method is to use $(r-1)' = (r^m - r^{-m})_N$

method ①: ignore Radix Point (Morris)

Example ①

(0.763) take $(r-1)$'s comp (763)

$= (10^3 - 1) - N(763)$

$= (1000-1) - 763$

$= 999 - 763$

$= (0.236)$ replacing Point

Example ②

$25.25 = 2525$

$= (10^4 - 1) - 2525$

$= (10000-1) - 2525$

$= 9999 - 2525$

$= 7474$

& replace pt

R's Complement

$= R^n - N$

R = Radix
N = Positive #
n = number of digits

$(5555)_{10}$ Example: Calculate (r-1)'s comp

$= (10^4 - 5555) = (10000 - 5555) = 4445$

10's comp of $(76.34)_{10}$ Otherway

Example 2:

$= (R^n - R^{-m} - N+1)$

$= (10^2 - 10^{-2} - 76.34+1)$

$= 100 - \frac{1}{100} - 76.34+1$

$= 23.65 + 0.001$

$= 23.66$

10-1 = 9
10-2 = 8
10-3 = 7
10-4 = 6
10-5 = 5

Otherway:

76.34

99.99
-76.34
23.65
+ 1
23.66

111 1101 calculate 2's comp

$= (R^n - N)_2$ $2^4 - (101)_2$

$= (16)_{10} - 1101_2 = 10000 - 1101$

$= (0011)_{2's comp}$

or

1111
-1101
0010
+1
0011

16's complements

(i) $(F21.3AE)_{16}$

Use shortcut method

r's complement = $(r-1)'s + 1$

$= (0DE.C52)_{16}$ 2's comp

```
  FFF.FFF
- F21.3AE
---------
  0DE.C51
       +1
---------
  0DE.C52
```

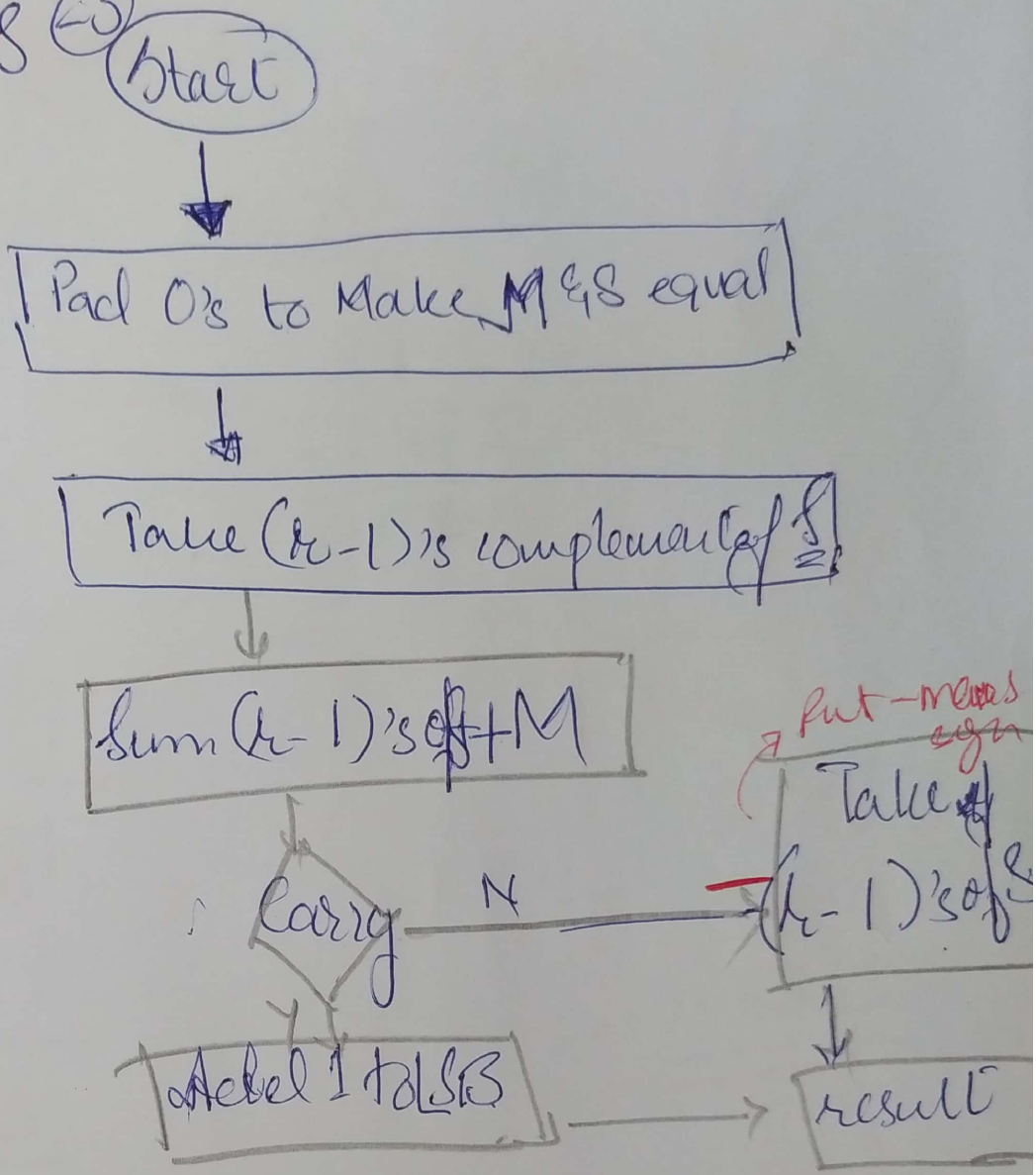
(ii) 8's Comp: 2057.34

2057.34 = 5720.44

```
  7777.77
  2057 34
---------
  5720 43
       +1
---------
  5720.44
```

Minuend M 5

Subtrahend S 3



Subtraction Using (R-1)'s Complement

Example:-

Using 9's complement 76532 − 4250

(M) (S)

① first pad zero's 04250

② Taking (r−1)'s comp

  99999
− 04250
  95749

③
  76532
+ 95749
 172281

1 carry → +1

 72282

Check
  76532
− 4250
  72282

r.k.l

Example: using 1's comp

01010 − 11011

① padding

② r−1's comp 00100 M

③ Sum + 01010 S
  01110

④ No carry

⑤ 01110 again (r−1)'s

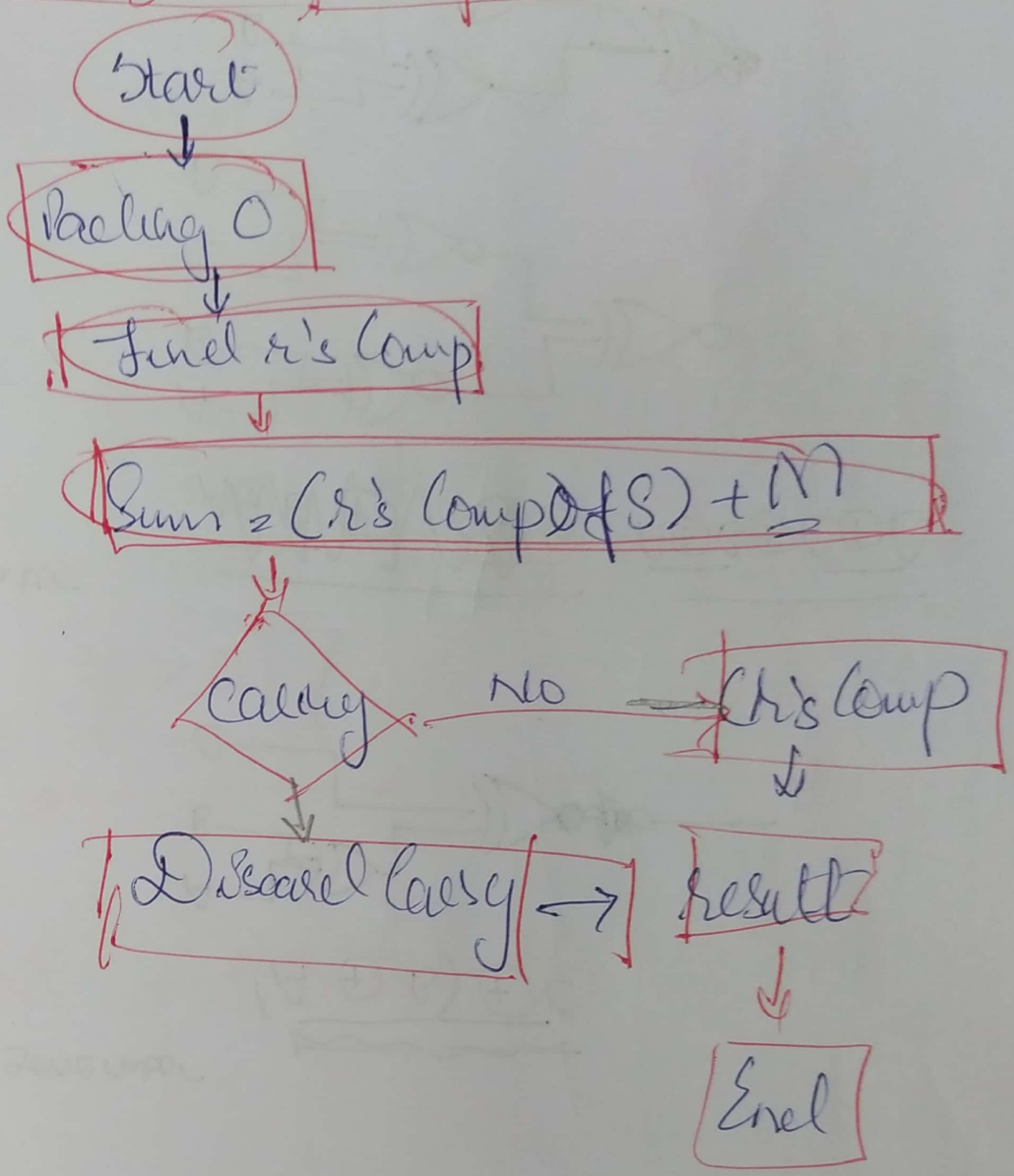
− 10001

Subtraction Using R's Complement

Minuend ← M

Subtrahend ← S

Sum



(i) 5554

− 0034 ⇒

(1) Padding

(2) 9999
0034
9965
+1
9966

(ii) 1 1 1
5554
9966
5520

Example ① 11101 — 01100

Perform Using 2's Comp Sub.

① Padding

② 2's comp 10100

③ M + (2's comp)

	11101	M
+	10100	S
	①10001	

disca(rd)

check

11101
01100
10001

Example ②

04AB.68 − 507D.76

① Padding

② 2's Comp

FFFF.FF
507D.76
AF82.89
+ 1
AF82.8A

③ + 04AB.68
B42D.F2

S ≤ M

no carry so 2's comp again

18−16=2
18−16=2
20−16=6

FFFF.FF
B42D.F2
4BD2.0D
+1
4BD2.0E