$123|_7 = ?|_9$

step 1

$123|_7 - ?|_{10}$

$3 \times 1 = 3$

$2 \times 7 = 14$

$1 \times 49 = 49$

$66|_{10}$

step 2

$66|_{10} = ?|_9 = 73|_9$

$9\overline{)66}$

$9\overline{)7}$ R3

$9\overline{)0}$ R7

0 R0 ↑

Counting in other bases

Octal (base 8)

0, 1, 2, 3, 4, 5, 6, 7, 10, 11, 12 ··· 16, 17, 20, 21

- 26, 27, 30, ··· 75, 76, 77, 100

base 4

0, 1, 2, 3, 10, 11 12, 13, 20, 21, 22, 23 30, 31, 32, 33, 100

(Base 2) Binary	(Base 16) Hex	(Base 8) Octal	(Base 10) decimal
0000	0	0	0
0001	1	1	1
0010	2	2	2
0011	3	3	3
0100	4	4	4
0101	5	5	5
0110	6	6	6
0111	7	7	7
1000	8		8
1001	9		9
1010	A		10
1011	B		11
1100	C		12
1101	D		13
1110	E		14
1111	F		15

$1100\ 1001|_2 = ?\ |_{16}$

128
64
8
1
201 $|_{10}$

16 | 201
16 | 12 R9
0 R12 (C) ↑

$= C9|_{16}$

(Base 2) Binary	(Base 16) Hex	(Base 8) Octal	(Base 10) decimal
0000	0	0	0
0001	1	1	1
0010	2	2	2
0011	3	3	3
0100	4	4	4
0101	5	5	5
0110	6	6	6
0111	7	7	7
1000	8		8
1001	9		9
1010	A		10
1011	B		11
1100	C		12
1101	D		13
1110	E		14
1111	F		15

$\underbrace{1100}_{C}\underbrace{1001}_{9}|_2 = ?|_{16} = C9|_{16}$

① Group bits in groups of 4 ($2^4 = 16$)

$1100\,1001|_2 = ?|_8 = 311|_8$

$\underbrace{011}_{3}\underbrace{001}_{1}\underbrace{001}_{1}|_2$

To convert to base 8,
Group bits in groups of 3
($2^3 = 8$)

(Base 2) Binary	(Base 16) Hex	(Base 8) Octal	(Base 10) decimal
000	0	0	0
001	1	1	1
0010	2	2	2
0011	3	3	3
0100	4	4	4
0101	5	5	5
0110	6	6	6
0111	7	7	7
1000	8		8
1001	9		9
1010	A		10
1011	B		11
1100	C		12
1101	D		13
1110	E		14
1111	F		15

$$AB2C3D|_{16} = ?|_{8}$$

1010 1011 0010 1100 0011 1101

5 2 6 2 6 0 7 5 $|_{8}$

AND (&)

A	B	A&B
0	0	0
0	1	0
1	0	0
1	1	1

OR (|)

A	B	A | B
0	0	0
0	1	1
1	0	1
1	1	1

SHIFT

SHIFT 6

XOR (^)

A	B	A^B
0	0	0
0	1	1
1	0	1
1	1	0

Compliment (~)

A	~A
0	1
1	0

1100 & 0110 = 0100

```
  1100
& 0110
------
  0100
```

1100 | 0110 = ?= 1110

```
  1100
| 0110
------
  1110
```