BCD Addition

i) Sum ≤ 9 ; FC = 0 ; Answer is correct

ii)

	S	C	
0 + 0 =	0	0	} binary addition.
0 + 1 =	1	0	
1 + 1 =	0	1	

2) Sum ≤ 9; FC = 1 ; Answer is Incorrect,
To correct ans add 6 (0110)

3) Sum > 9; FC = 0 ; Answer is Incorrect
To correct ans add 6 (0110)

Ex1:- Add $(2)_{10} + (6)_{10}$; Perform BCD addition

```
 1 1
 0 0 1 0
 0 1 1 0
---------
 1 0 0 0   ; FC = 0
=========
```

Ans is correct. = 1000 = (8) Sum < 9

Ex2:- Add $(3)_{10} + (7)_{10}$; perform BCD addition

```
  1 1 1
  0 0 1 1
  0 1 1 1
-----------
Sum = 1 0 1 0 = (10) > 9   FC = 0
-----------
```

→ binary

So add 0110

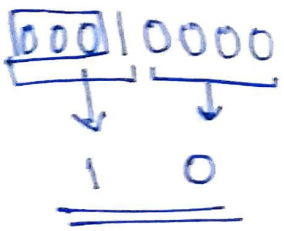
$$\begin{array}{r} {\scriptstyle 1\quad\ 1} \\ 1010 \\ +\ 0110 \\ \hline 10000 \end{array}$$

NOTE
→ BCD is for decimal digits (0 to 9), but bits used are 4 bits, so 16 combinations, so 4bit binary no (0 to 15), so invalid BCD

$15 - 9 = 6$.

So $(3)_{10} + (7)_{10} = (10)_{10}$ in BCD

0001 0000 → This BCD ans.



Ex3:- Add $(8)_{10} + (9)_{10}$; Perform BCD addition

$$\begin{array}{r} 1000 \\ 1001 \\ \hline (1)\,0001 \end{array} \rightarrow \text{Sum} < 9$$

FC=1

Add 0110 →

```
  1 0 0 0 1
+   0 1 1 0
-----------
0 0 0 1 0 1 1 1
  ↓     ↓
  1     7  →
```

$(8)_{10} + (9)_{10} \rightarrow (17)_{10}$

0001 0111

Imp

Ex:- $(57)_{10} + (26)_{10}$

```
0101 0111 → 57
0010 0110 → 26
-------------
0111 1101
-------------
 7<9  13>9   Case III
+0000 0110
-------------
1000 0011
  ↓    ↓
  8    3
```

```
  1
  5 7
+ 2 6
-----
  8 3
```

HW

Perform BCD addition.

1) $(3)_{10} + (4)_{10}$

2) $(7)_{10} + (9)_{10}$

3) $(7)_{10} + (8)_{10}$

4) $(83)_{10} + (34)_{10}$

SHIFT ADD-3 METHOD

Convert Binary to BCD

15 → 1111 Binary

↓ BCD

0001 0101

Operations	Tens	Ones	Decimal
original no			1 1 1 1
Shift left		1	1 1 1
Shift	1	1 1	1 1
Shift		1 1 1	1
Add 3		+ 0 1 1	
Shift	1	0 1 0 1	1 *

Stop

↓

15

If binary no > 4, Stop Shifting

else continue shifting

14 → 1110

Operation	Tens	Ones	Decimal
Original no			1110
Shift		1 <4	110
Shift		11 <4	10
Shift		111 <4	0
Add 3		+011	
Shift	1	0100	X
	↓	↓	
	4	4	

Ex:1 HW

23

11

~~23~~ 45