**Binary to BCD :**

**Double dabble algorithm:**

step 1: initialize the scratch space (i.e., BCD output) with zeros

step 2:value to be converted is stored in original register(i.e., binary input)

step 3:now left shift the original value to the scratch space

step 4:repeat step 3 until the value in scratch space is greater than 4

step 5:now add bin value of 3 to the value

step 6:repeat step 3,4,5 until the original value is empty

The double-dabble algorithm, performed on the value 243, looks like this:

**BCD output binary**

0000 0000 0000 11110011 Initialization

0000 0000 0001 11100110 Shift

0000 0000 0011 11001100 Shift

0000 0000 0111 10011000 Shift

0000 0000 1010 10011000 Add 3 to ONES, since it was 7

0000 0001 0101 00110000 Shift

0000 0001 1000 00110000 Add 3 to ONES, since it was 5

0000 0011 0000 01100000 Shift

0000 0110 0000 11000000 Shift

0000 1001 0000 11000000 Add 3 to TENS, since it was 6

0001 0010 0001 10000000 Shift

0010 0100 0011 00000000 Shift

2 4 3

**BCD to binary**

**Reverse double dabble algorithm:**

step 1: initialize the scratch space (i.e., binary output) with zeros

step 2:the BCD code that needs to be converted is stored in BCD input

step 3:now right shift the BCD value to the binary output

step 4:repeat the step 3 till the value in the BCD is greater than 8

step 5:now subtract the BCD value with bin value of 3

step 6:repeat the steps 3,4,5

The reverse double dabble algorithm, performed on the three BCD digits 2-4-3, looks like this:

**BCD Input Binary output**

0010 0100 0011 00000000 Initialization

0001 0010 0001 10000000 Shifted right

0000 1001 0000 11000000 Shifted right

0000 0110 0000 11000000 Subtracted 3 from 2nd group, because it was 9

0000 0011 0000 01100000 Shifted right

0000 0001 1000 00110000 Shifted right

0000 0001 0101 00110000 Subtracted 3 from 3rd group, because it was 8

0000 0000 1010 10011000 Shifted right

0000 0000 0111 10011000 Subtracted 3 from 3rd group, because it was 10

0000 0000 0011 11001100 Shifted right

0000 0000 0001 11100110 Shifted right

0000 0000 0000 11110011 Shifted right

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