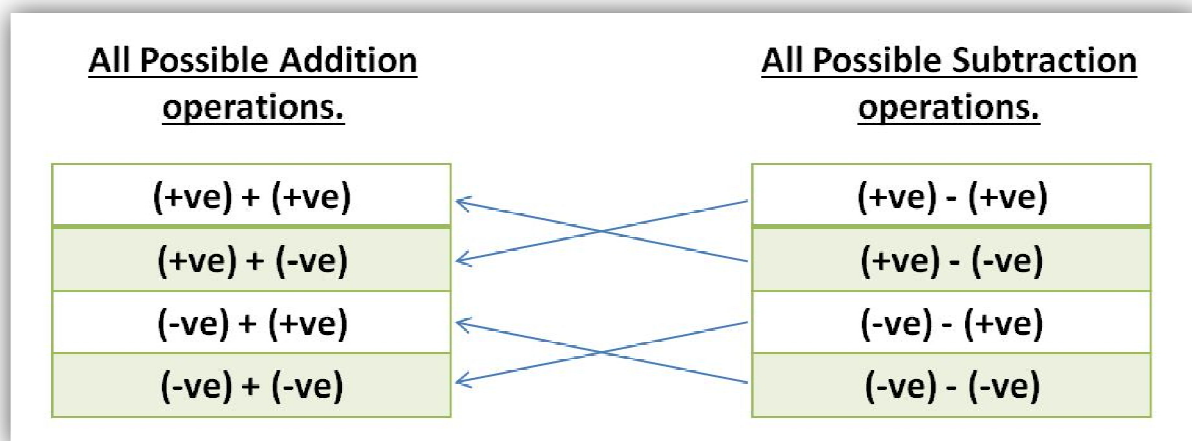


Binary Addition and Subtraction: Binary addition or subtraction is carried out as a very basic practice of Half Adders and Full Adders. Further since we know that subtraction is nothing but a complemented addition, we can use the methods of addition for subtractions as well.

The following figure shows the interrelationships of addition and subtraction methods-



Here it must be kept in mind that the -ve numbers will always be in 2's complement form and to avoid the error caused by overflow during addition operations, registers should be taken of sufficiently larger sizes.

Process of addition:

- 1.** Seeing the sign of numbers, represent it in sufficiently larger registers.
- 2.** Add both numbers bit by bit from right to left using the rules of Half and Full adders.
- 3.** Now seeing the sign of the calculated sum (checking the MSB), convert it into decimal to find the actual sum.

Addition of two positive numbers (+ve) + (+ve):

Ex.1- Find the sum of $(+27)_{10} + (+23)_{10}$

Here we see that both numbers require 5 bits at least. We will use 8-bit registers for this addition.

$$\begin{array}{rcl} (+27)_{10} & \rightarrow & \begin{array}{|c|c|c|c|c|c|c|c|} \hline 0 & 0 & 0 & 1 & 1 & 0 & 1 & 1 \\ \hline \end{array} \\ (+23)_{10} & \rightarrow & \begin{array}{|c|c|c|c|c|c|c|c|} \hline 0 & 0 & 0 & 1 & 0 & 1 & 1 & 1 \\ \hline \end{array} \\ & + & \\ (+50)_{10} & \leftarrow & \begin{array}{|c|c|c|c|c|c|c|c|} \hline 0 & 0 & 1 & 1 & 0 & 0 & 1 & 0 \\ \hline \end{array} \end{array}$$

Thus the result is- $(00110010)_2 = (+50)_{10}$

Note that $(+27)_{10} + (23)_{10}$ will also be $(+50)_{10}$

Assignment:

1. Write the clear cut steps to add two numbers in binary.
2. Add $(+34)_{10}$ and $(+41)_{10}$ and find the sum.