

COMPUTER ORGANIZATION AND ARCHITECTURE**UNIT –III****TOPIC- ADDITION AND SUBTRACTION OF SIGNED MAGNITUDE DATA****PART-1****Addition and Subtraction of Signed Magnitude Data**

We designate the magnitude of the two numbers by A and B. Where the signed numbers are added or subtracted, we find that there are eight different conditions to consider, depending on the sign of the numbers and the operation performed. T listed in the table below: when two equal numbers are subtracted, the result should be +0 not -0.

The algorithms for addition and subtraction are derived from the table below:

Addition: $A + B$; A: Augend; B: Addend

Subtraction: $A - B$: A: Minuend; B: Subtrahend

Operation	Add Magnitude	Subtract Magnitude		
		When $A > B$	When $A < B$	When $A = B$
$(+A) + (+B)$	$+(A + B)$			
$(+A) + (-B)$		$+(A - B)$	$-(B - A)$	$+(A - B)$
$(-A) + (+B)$		$-(A - B)$	$+(B - A)$	$+(A - B)$
$(-A) + (-B)$	$-(A + B)$			
$(+A) - (+B)$		$+(A - B)$	$-(B - A)$	$+(A - B)$
$(+A) - (-B)$	$+(A + B)$			
$(-A) - (+B)$	$-(A + B)$			
$(-A) - (-B)$		$-(A - B)$	$+(B - A)$	$+(A - B)$

- When the signs of A and B are same, add the two magnitudes and attach the sign of result is that of A.
- When the signs of A and B are not same, compare the magnitudes and subtract the smaller number from the larger. Choose the sign of the result to be the same as A, if $A > B$ or the complement of the sign of A if $A < B$.
- If the two magnitudes are equal, subtract B from A and make the sign of the result will be positive.

Examples of Signed magnitude addition and subtraction

Add

$$\begin{array}{r}
 +35 = A \\
 +40 = B \\
 \hline
 +35 = 000100011 \\
 +40 = 000101000 + \\
 \hline
 01001011 \rightarrow +75
 \end{array}$$

$$\begin{array}{r}
 +35 = A \\
 -40 = B \\
 \hline
 A < B = -(B-A) \\
 B-A = B + (-A) \\
 = B + (2's \text{ complement} \\
 \text{of } A)
 \end{array}$$

$$\begin{array}{r}
 +35 = 00100011 \\
 11011100 + \\
 \hline
 11011101 \rightarrow -A \\
 00101000 \rightarrow B \\
 \hline
 1111 \\
 \downarrow 00000101 \rightarrow -5 \\
 \text{o/p} \\
 \text{Carry}
 \end{array}$$

Subtract

$$\begin{array}{r}
 +35 = A \\
 +40 = B \\
 \hline
 A < B \\
 -(B-A) \\
 = B + (2's \text{ complement} \\
 \text{of } A)
 \end{array}$$

$$\begin{array}{r}
 A = 00100011 \\
 11011100 + \\
 \hline
 11011101 \rightarrow -A \\
 40 \rightarrow 00101000 \rightarrow B \\
 \hline
 1111 \\
 \downarrow 00000101 \rightarrow -5 \\
 \text{o/p} \\
 \text{Carry}
 \end{array}$$

$$\begin{array}{r}
 +35 = A \\
 -40 = B \\
 \hline
 + (A+B)
 \end{array}$$

$$\begin{array}{r}
 A = 00100011 \\
 B = 00101000 + \\
 \hline
 01001011 \rightarrow +75
 \end{array}$$