

3) IEEE 754 defines standards for rounding from point numbers

→ Rounding means, representing any number which does not have floating point representation to the nearest value i.e. approximate value

(I) Roundings to nearest

(i) Tie to even: In this method of rounding, we rounds to the nearest value.

Ex: Rounding to integer :

$$+23.9 \Rightarrow +24$$

$$+23.4 \Rightarrow +23$$

→ If the number is midway b/w two integers, it is rounded to the nearest value with even least significant digit.

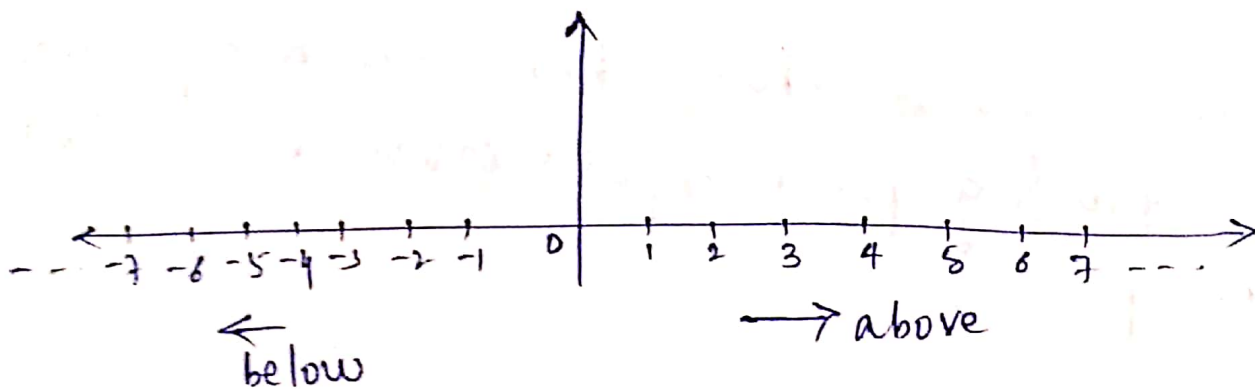
Ex:  $+45.5 \Rightarrow +46$   
 $+46.5 \Rightarrow +46$

(ii) Ties away from zero

→ In this method of rounding, we round to the nearest value.

Ex:  $+11.9 \xrightarrow{\text{rounded to}} +12.0$   
 $+10.9 \longrightarrow +11.0$

→ If the number is midway, it is rounded to nearest value above for positive numbers and below for negative numbers



Ex:  $+28.5 \xrightarrow{\text{rounded to}} +29.0$   
 $+32.5 \longrightarrow +33.0$   
 $-11.5 \longrightarrow -12.0$   
 $-23.5 \longrightarrow -24.0$

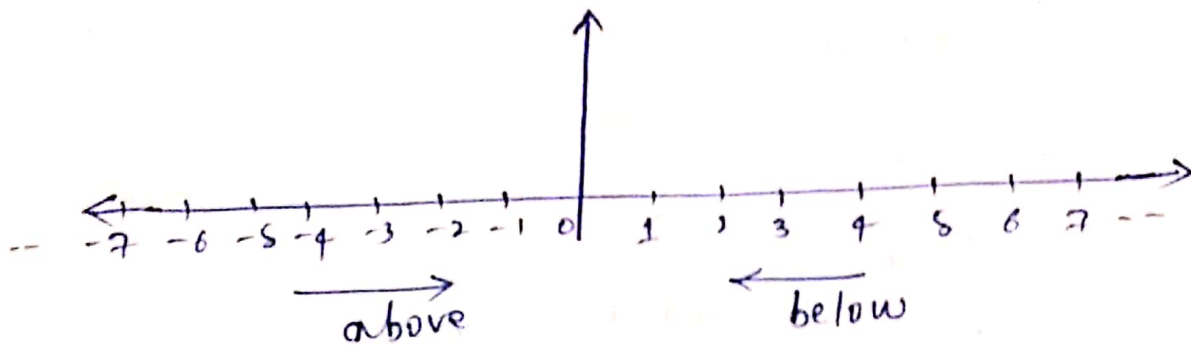
ie., all the roundings are away from zero, as shown in figure.

→ rounding of positive numbers are towards  $+\infty$  and rounding of negative numbers are towards  $-\infty$ .

## Directed roundings

### (i) Rounding towards Zero

→ In this method of rounding, we are rounded to any number towards Zero.



→ for negative no's, rounded to above Value  
and for positive no's, rounded to below Value.

EX:-

$$+7.5 \xrightarrow{\text{rounded to}} +7.0$$

$$+4.5 \xrightarrow{\text{rounded to}} +4.0$$

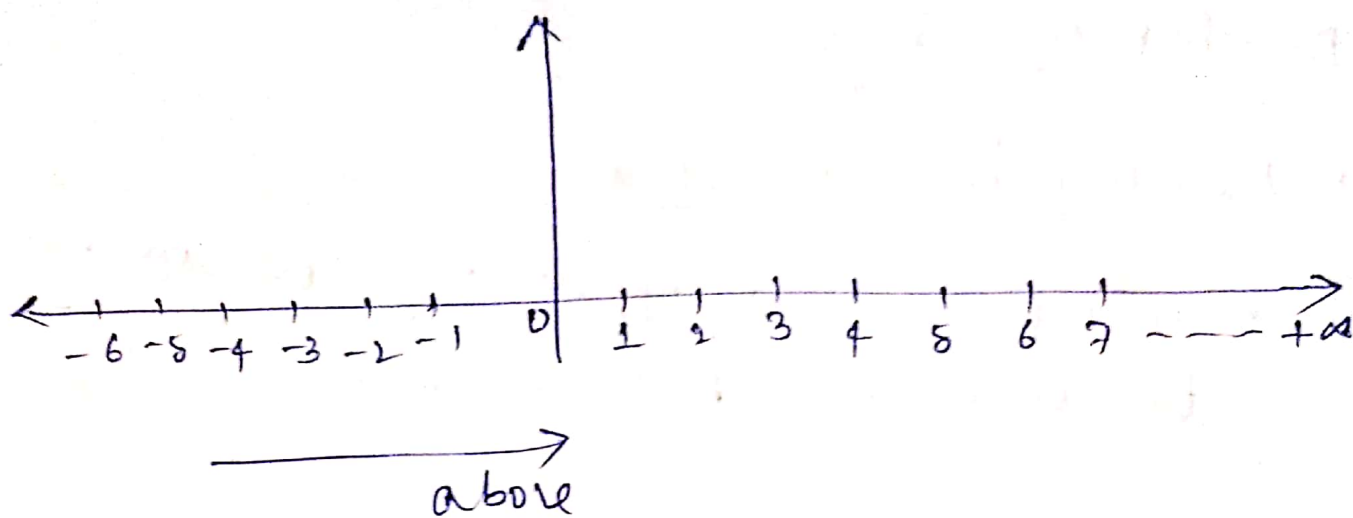
$$-10.5 \xrightarrow{\text{rounded to}} -10.0$$

$$-7.5 \xrightarrow{\text{rounded to}} -7.0$$

### (ii) Rounding towards $+\infty$

→ In this method of rounding, we are rounded to their above value i.e., towards  $+\infty$ .

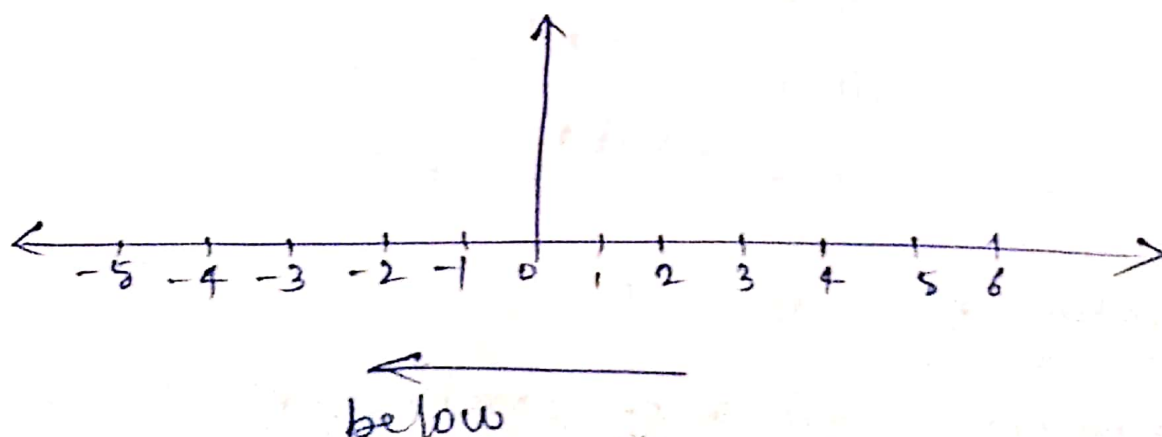
→ For all the no's i.e., for both positive and negative, rounded to their above values.



Ex:  $-6.5 \xrightarrow{\text{rounded to}} -6.0$   
 $-1.5 \xrightarrow{\text{rounded to}} -1.0$   
 $+3.5 \xrightarrow{\text{rounded to}} +4.0$   
 $+6.5 \xrightarrow{\text{rounded to}} +7.0$

(iii) Round towards  $-\infty$ :

→ In this method of rounding, we are rounded to their below values i.e., towards  $-\infty$ .



Ex:  $+6.5 \xrightarrow{\text{rounded to}} +6.0$   
 $+3.5 \xrightarrow{\text{rounded to}} +3.0$   
 $-1.5 \xrightarrow{\text{rounded to}} -2.0$   
 $-6.5 \xrightarrow{\text{rounded to}} -7.0$