(Number of Integral Solutions) Step-4:This equation will have infinite number of integral solutions but finite number of non-negative integral solutions. Let's see how we can find it.

We can keep increasing the value of y in the positive direction but x will be decreasing simultaneously and become less than 0 at one point. As lowest non negative integral value of y is 1,highest allowable positive value of x is 18 and it is decreasing by 3. So, x can take 7 non negative integral values and they are- 18, 15, 12, 9, 6, 3 and 0.Hence the given equation has 7 non negative integral values.

Note: In equation Ax + By = C, if C is divisible by any of A or B, then number of non-negative integral solutions = {C/LCM(A,B)} + 1

2. **Equation type: $x_1+x_2+\cdots+x_r=n$**

Case-1: Positive integral solutions.

Let us understand the concept from an example:

$X_1 + X_2 + X_3 = 8$.

To solve this, imagine that there are 8 identical objects placed next to each other with gaps separating them.8 objects have 7 gaps between them. Now, I can select 2 gaps from among the 7 in ${}^7C_2$ ways. These selected gaps will hold the plus signs of the given equation. Now, the number of objects to the left of the first plus sign, the number of objects between the two plus signs and the number of objects to the right of the second plus sign will be the values of X_1, X_2 and X_3 respectively.

Therefore, number of positive integral solutions of equation $x_1+x_2+\cdots+x_r=n$

= Number of ways in which n identical balls can be distributed into r distinct boxes where each box must contain at least one ball

$= {}^{(n-1)}C_{(r-1)}$

Case-2: Number of Non-negative integral solutions