Where, $1N = 10^5 dyne$

Such conversion is carried by using dimensional analysis.

Conversion formula:

Let us consider a physical quantity with dimensional formula $[M^a L^b T^c]$. If N_1 be the numerical value of a quantity in one system and N_2 be the numerical value of the quantity in another system, then

$$\boldsymbol{N_1}\ [M_1^a L_1^b T_1^c] = \boldsymbol{N_2}[M_2^a L_2^b T_2^c]$$

This relation is called as ***conversion formula***.

Example:

Convert 3 .2 newton into dyne by dimensional method.

Ans: Here Newton is the SI unit of force and Dyne is its CGS unit. The dimensional formula of force is: $[M^1 L^1 T^{-2}]$.

Let, 3.2 $Newton = N_2\ dyne$

In SI system	*In CGS system*
Mass M_1= 1 kg=1000gram	*Mass M_2= 1 gram*
Length L_1= 1 m=100cm	*Length L_2= 1 cm*
Time T_1= 1 s	*Time T_2= 1 s*
N_1=3.2	*N_2=?*

According to conversion formula:

$$\boldsymbol{N_1}\ \left[{M_1}^1 {L_1}^1 {T_1}^{-2}\right] = \boldsymbol{N_2}\left[{M_2}^1 {L_2}^1 {T_2}^{-2}\right]$$

Or, $$\boldsymbol{N_2 = N_1}\ \frac{\left[{M_1}^1 {L_1}^1 {T_1}^{-2}\right]}{\left[{M_2}^1 {L_2}^1 {T_2}^{-2}\right]}$$

Or $$\boldsymbol{N_2 = 3.2 \times \left[\frac{M_1}{M_2}\right]^1 \times \left[\frac{L_1}{L_2}\right]^1 \times \left[\frac{T_1}{T_2}\right]^{-2}}$$

Or $$\boldsymbol{N_2 = 3.2 \times \left[\frac{1kg}{1gram}\right]^1 \times \left[\frac{1m}{1cm}\right]^1 \times \left[\frac{1s}{1s}\right]^{-2}}$$

Or $$\boldsymbol{N_2 = 3.2 \times \left[\frac{1000\ gram}{1gram}\right]^1 \times \left[\frac{100cm}{1cm}\right]^1 \times \left[\frac{1s}{1s}\right]^{-2}}$$

Or $$\boldsymbol{N_2 = 3.2 \times \left[\frac{1000}{1}\right]^1 \times \left[\frac{100}{1}\right]^1 \times \left[\frac{1}{1}\right]^{-2}}$$

Or $$\boldsymbol{N_2 = 3.2 \times 1000^1 \times 100^1 \times 1^{-2}}$$

Or $$\boldsymbol{N_2 = 3.2 \times 10^3 \times 10^2}$$

Or $$\boldsymbol{N_2 = 3.2 \times 10^5}$$

Hence, $3.2\ N = 3.2 \times 10^5\ dyne$

Check Yourself:

1. *Convert* $10\ erg$ *into SI system.*
2. *Convert* $13600\ kg/m^3$ *into CGS system*