Normal / Gaussian distribution

→ A continuous probability distribution

→ Bell-Shape distribution.

→ Most of the real world data follows a normal distribution

Example:-

→ Height of a population
→ IQ of a population
→ Measurement errors
→ Exam scores
→ Blood Pressure.
→ Size of things

* Characteristics of N.D

→ Symmetrical about mean
→ mean = median = mode.
→ Skewness = 0

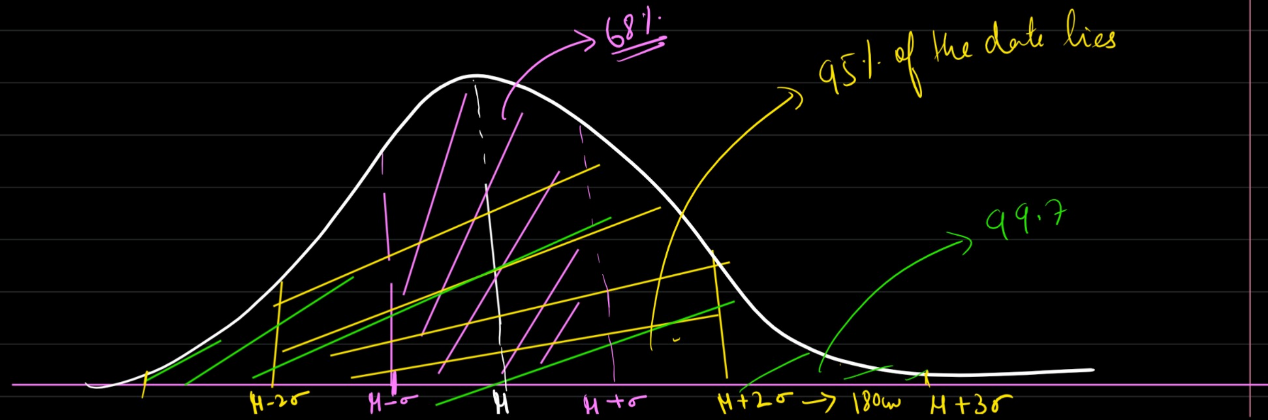
Empirical rule of a Normal distribution.

68% – 95% → 99.7% rule.

→ 68% of the data values lies within 1 standard deviation from the mean value

$x = \{160, 161, 162.5 \ldots\}$

→ 95% ⟶ within 2 SD
→ 99.7% ⟶ within 3 SD



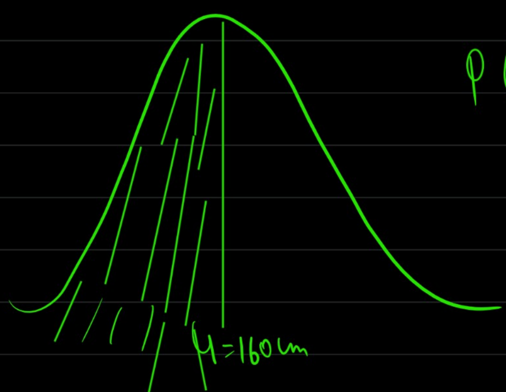
$\mu - 3\sigma$ $\downarrow$ 140 $\downarrow$ 150

$\mu = 160cm$ (160, 170) $\rightarrow$ 68% $\rightarrow$ 160−10 and 160+10

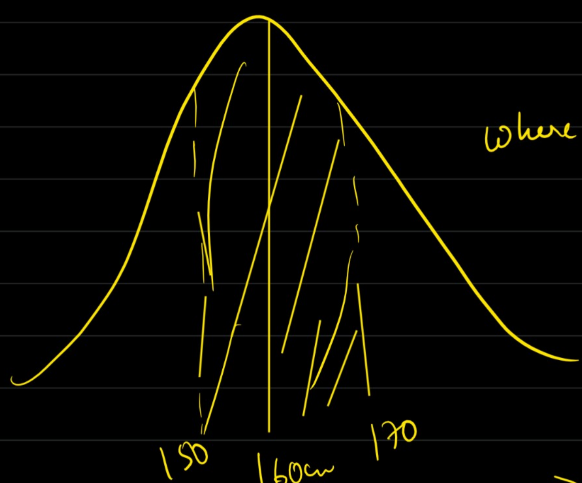
$\sigma = 10cm$ $\rightarrow$ 150 to 170 cm.

95% $\begin{cases} \mu - 2\sigma \rightarrow 160 - 2\times10 \Rightarrow 140cm \\ \mu + 2\sigma \rightarrow 160 + 2\times10 = 180cm \end{cases}$

99.7% $\begin{cases} \mu - 3\sigma - 160 - 3\times10 \Rightarrow 130cm \\ \mu + 3\sigma - 160 + 3\times10 \Rightarrow 190cm \end{cases}$



$P(X \le 160cm) = 50\% = 0.5$



where $\mu = 160$
$\sigma = 10$

$\rightarrow Pr(\mu - \sigma \le X \le \mu + \sigma) \approx 68\%$
$\Rightarrow 0.68$

$\rightarrow Pr(\mu - 2\sigma \le X \le \mu + 2\sigma) \approx 95\%$
$Pr(140 \le X \le 180) = 0.95$

$\rightarrow Pr(\mu - 3\sigma \le X \le \mu + 3\sigma) \approx 99.7\%$
$Pr(130 \le X \le 190) = 0.997$