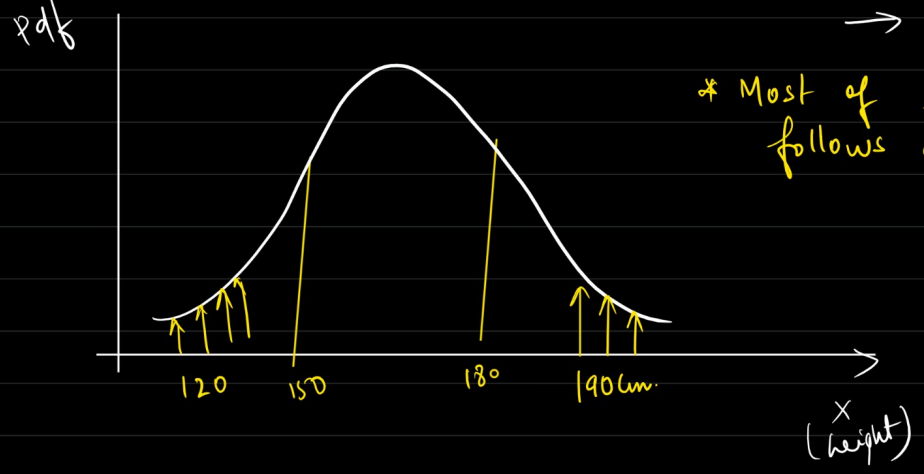
Normal / Gaussian distribution

→ A continuous probability distribution.

→ Bell-shaped distribution.



* Most of the real world data follows a normal distribution.

Example
- → Height of a population
- → IQ of a population
- → Measurement error.
- → Exam scores
- → Blood pressure
- → Size of tangible object.

Why real word data follows a ND?

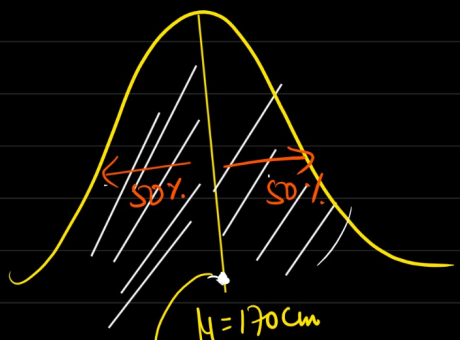
→ Example – Height of students
- → Shorter in height (few)
- → Taller " " (few)
- → Most Average height

* Characteristics of ND

→ Symmetrical about mean.

→ mean = median = mode

→ Skewness = 0



→ Central (mean) of the distribution

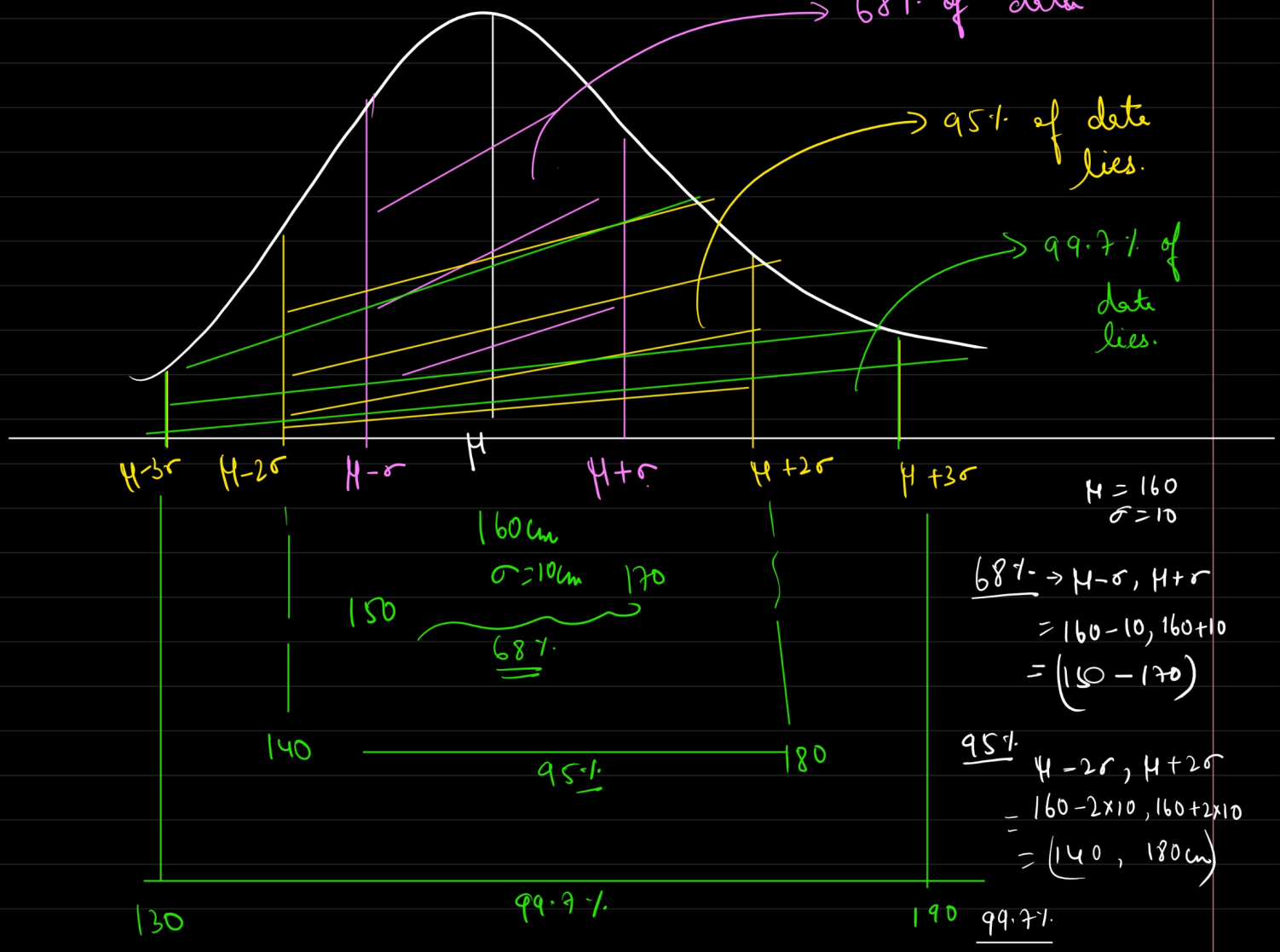
* Empirical rule of a Normal distribution

68% – 95% – 99.7% rule.

→ 68% of data of a ND lies within 1 standard deviation from mean.

→ 95% ⟶ within → 2 Sd

→ 99.7% ⟶ within → 3 Sd.



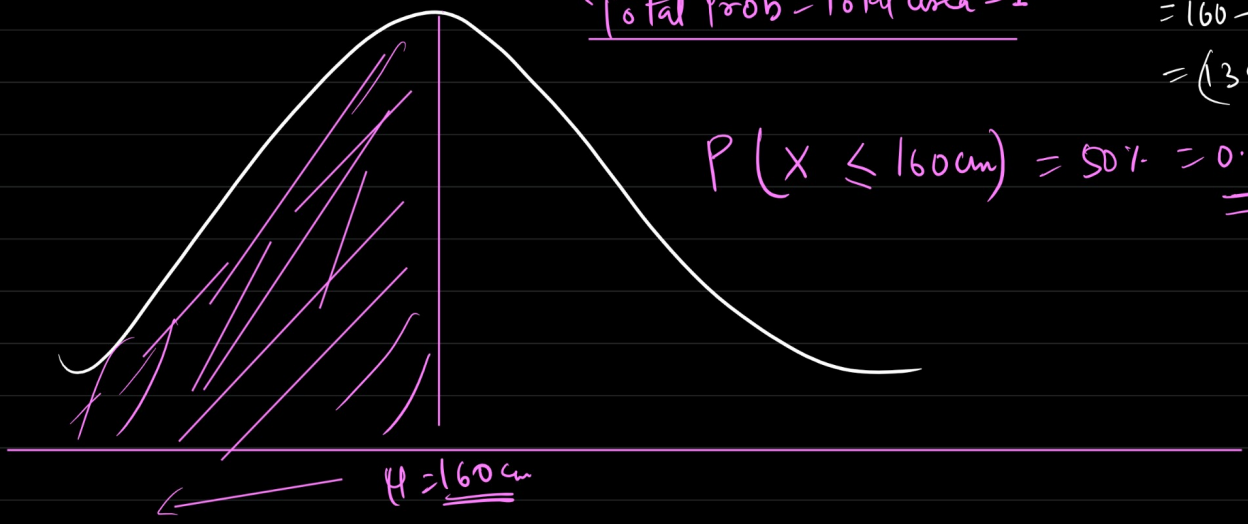
$\mu = 160$
$\sigma = 10$

68% → $\mu-\sigma, \mu+\sigma$
$= 160-10, 160+10$
$= (150-170)$

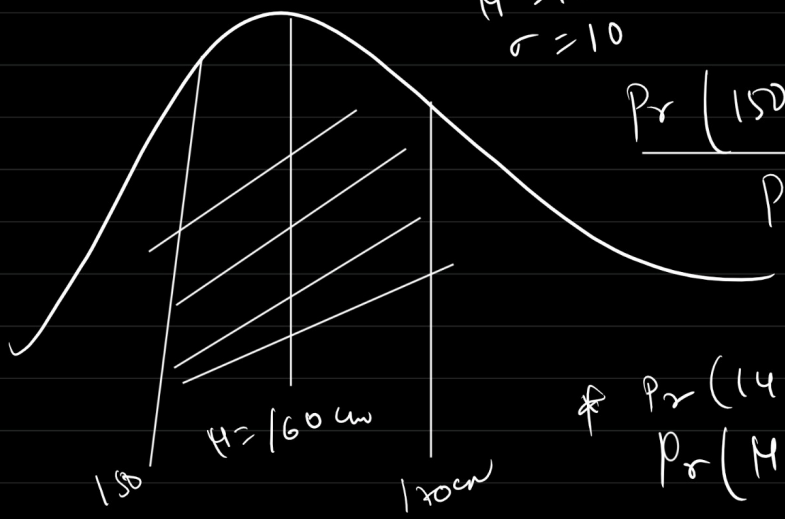
95% $\mu-2\sigma, \mu+2\sigma$
$= 160-2\times10, 160+2\times10$
$= (140, 180\text{cm})$

99.7% $\mu-3\sigma, \mu+3\sigma$
$= 160-3\times10, 160+3\times10$
$= (130, 190)$

Total Prob = Total area = 1



$P(X \leq 160\text{cm}) = 50\% = 0.5$



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

$$\frac{Pr(150 \le X \le 170)}{Pr(\mu - \sigma \le x \le \mu + \sigma)} \approx 68\%$$

* $Pr(140 \le x \le 180)$
$Pr(\mu - 2\sigma \le x \le \mu + 2\sigma)$
$= 95\%$

* $Pr(130 \le x \le 190)$
$Pr(\mu - 3\sigma \le x \le \mu + 3\sigma)$
$= 99.7\%$