

4/11/19 - 1

X_1 : GAUSSIAN

X_1 $\mu = 10$ $\sigma^2 = 10$

X_2 $\mu = 20$ $\sigma^2 = 5$

X_3 $\mu = 30$ $\sigma^2 = 20$

$X = X_1 + X_2 + X_3$

Y : GAUSSIAN $\mu = 60$

$\sigma^2 = 35$

X_n UNCORRELATED

$X_n = N(\underbrace{0}_{\text{MEAN}}, \underbrace{1}_{\text{VARIANCE}})$

$Y = \text{MEAN OF } N \text{ } X_n$

WHAT IS VAR OF Y ?

$\sum X_n = N(0, N)$ \uparrow VAR.

$Y = \frac{\sum X_n}{N}$: MEAN 0, VAR. $\frac{1}{N} \sigma^2 = \frac{1}{N}$

STUDENT SAT SCORES

2

VERBAL $\mu = 500$, $\sigma = 100$ GAUSSIAN

OBSERVE 1 PERSON $\mu = 500$ $\sigma = 100$

$$P[X > 600] = 1/6$$

OBS 4 STUDENTS $X = [x_1, x_2, x_3, x_4]$

$\bar{X}_N =$ MEAN OF THOSE 4 SATS.

WHAT ARE $E[\bar{X}]$, ~~VAR~~ STD $[\bar{X}]$?

$$E[\bar{X}] = \mu = 500$$

$$\text{VAR}[\bar{X}] = \frac{\sigma^2}{N}$$

$$\text{STD}[\bar{X}] = \frac{\sigma}{\sqrt{N}}$$

$$\sigma_N = \frac{100}{2} = 50$$

Q: WE OBSERVE $\bar{X}_4 = 600$. SURPRISING!

NOW OBSERVE 100 STUDENTS $P = .02$

$$E[\bar{X}_{100}] = 500 \quad \text{STD}[\bar{X}_{100}] = \frac{\sigma}{10} = 10$$