

19/02/2021

NORMAL DISTRIBUTION

$$P(|X-30| > 5) = ?$$

$$\Rightarrow P((X-30) > 5) \text{ or } (X-30) < -5)$$

$$\Rightarrow P(X-30 > 5) + P(X-30 < -5)$$

$$\Rightarrow P\left(\frac{X-30}{\sigma} > \frac{5}{\sigma}\right) + P\left(\frac{X-30}{\sigma} < -\frac{5}{\sigma}\right)$$

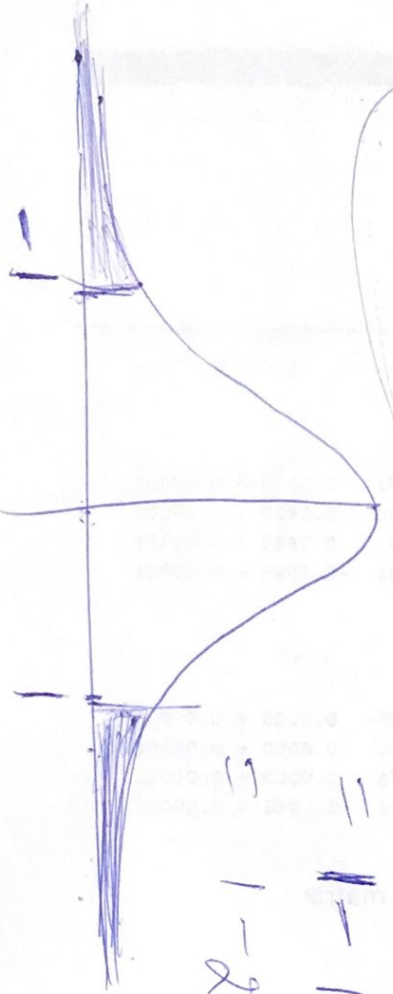
$$\Rightarrow P(Z > 1) + P(Z < -1)$$

$$= 1 - P(-1 < Z < 1)$$

$$= 1 - 2P(0 < Z < 1)$$

$$= 1 - 2 \cdot (0.3413)$$

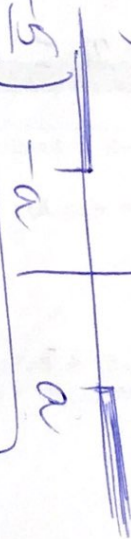
$$= 1 - 0.6826 = 0.3174$$



$$\boxed{X \sim N(\mu, \sigma^2)} \\ \mu = 30, \sigma = 5$$

$$|X| > a \Rightarrow \begin{matrix} X > a \\ \text{or} \\ X < -a \end{matrix}$$

$$Z = \frac{X - \mu}{\sigma}$$



Q8. Find the Eigen values and Eigenvectors of the following matrices:
 Objective: To solve the problem on Eigen values and Eigen vectors.

$$\frac{10 \mid 316}{3-4 \mid \mu}$$

$$\mu = 352 \quad \text{S.D} = 31$$

$$P(X > 400)$$

$$X \sim N(\mu, \sigma^2)$$

↓
no. of telephone calls.

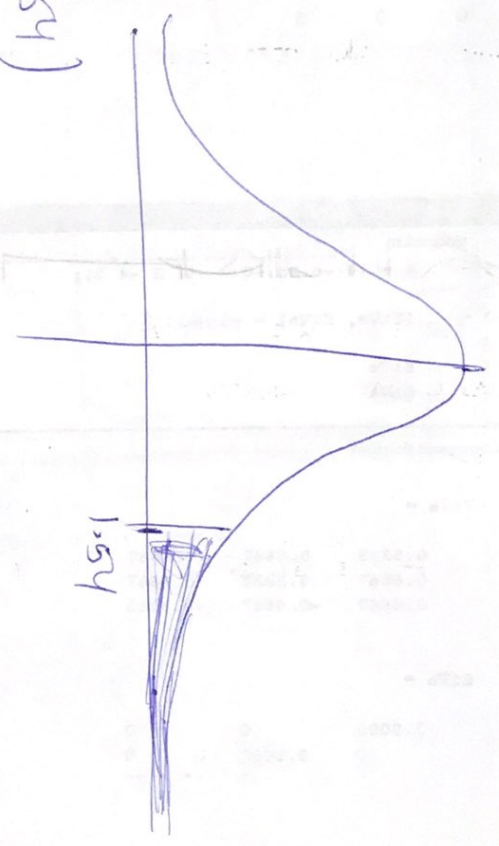
$$= P\left(\frac{X - \mu}{\sigma} > \frac{400 - \mu}{\sigma}\right)$$

$$= P\left(Z > \frac{400 - 352}{31}\right)$$

$$= P(Z > 1.54)$$

$$= 0.5 - P(0 < Z < 1.54)$$

$$= 0.5 - 0.4382 = 0.0618$$



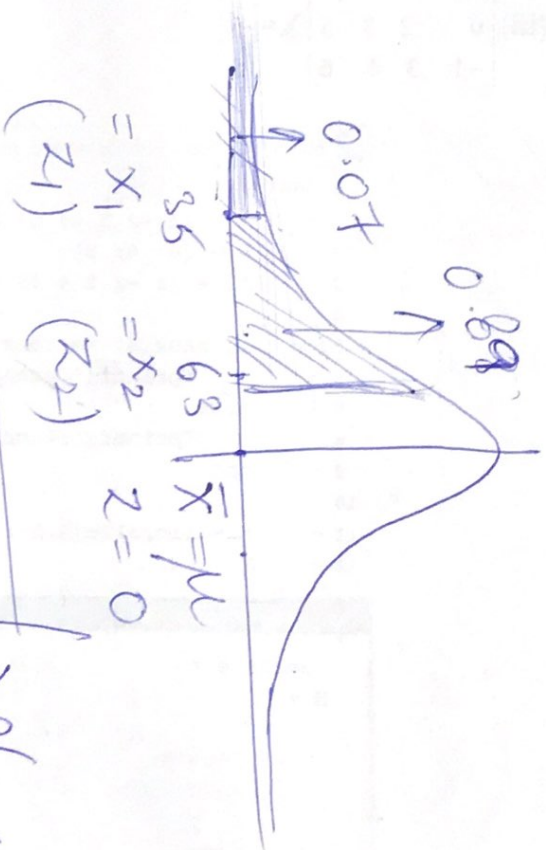
$$= 6.18\%$$

80
316

7% under 35, 89% under 63

$\mu, \sigma = ?$

$$\begin{cases} P(\bar{X} < 35) = 0.07 \\ P(X < 63) = 0.89 \end{cases}$$



$$P(X < 35) = 0.07$$

$$P\left(Z < \frac{35 - \mu}{\sigma}\right) = 0.07$$

$$\Rightarrow P(Z < Z_1) = 0.07 \quad \left(\begin{matrix} 0.07 \\ Z_1 = \frac{35 - \mu}{\sigma} \end{matrix} \right)$$

$$\Rightarrow 0.5 - P(Z_1 < Z < 0) = 0.07$$

$$\Rightarrow P(Z_1 < Z < 0) = 0.43$$

$$\left[\begin{matrix} \mu = 50.29 \\ \sigma = 10.33 \end{matrix} \right]$$

$$\Rightarrow P(0 < Z < Z_1) = 0.43$$

$$\Rightarrow P\left(0 < Z < \frac{\mu - 35}{\sigma}\right)$$

$$= 0.43$$

$$\Rightarrow \frac{\mu - 35}{\sigma} = 0.48$$

$$\frac{63 - \mu}{\sigma} = 1.23$$

③

$$\mu - 1.48\sigma = 35$$

$$\mu + 1.23\sigma = 63$$

$$2.41\sigma = 28$$

$$\sigma = 11.61$$

$$\mu - 1.48\sigma = 35$$

$$\mu + 1.23\sigma = 63$$

$$-2.0711\sigma = 28$$

$$\sigma = 10.33$$



~~28~~

$$\sigma = 11.61$$



$$P(X < 63) = 0.89$$

$$\Rightarrow P(Z < \frac{63 - \mu}{\sigma}) = 0.89$$

$$\Rightarrow 0.5 - P(Z_1 < Z < 0) = 0.89$$

$$\Rightarrow -0.89 = P(Z_1 < Z < 0)$$

$$\Rightarrow -0.89 = P(0 < Z < -Z_1)$$

$$-Z_1 = 0.89$$

$$Z_1 = 1.23$$

$$\frac{63 - \mu}{\sigma} = 1.23$$

(OK)

$$P\left(Z < \frac{63 - \mu}{\frac{\sigma}{\sqrt{n}}}\right) = 0.89$$

$$\Rightarrow 0.5 + P\left(0 < Z < \frac{63 - \mu}{\frac{\sigma}{\sqrt{n}}}\right) = 0.89$$

$$\Rightarrow P\left(0 < Z < \frac{63 - \mu}{\frac{\sigma}{\sqrt{n}}}\right) = 0.39$$

$$\Rightarrow \boxed{\frac{63 - \mu}{\frac{\sigma}{\sqrt{n}}} = 1.23 \checkmark}$$