19/02/2021

NORMAL DISTRIBUTION

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

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

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

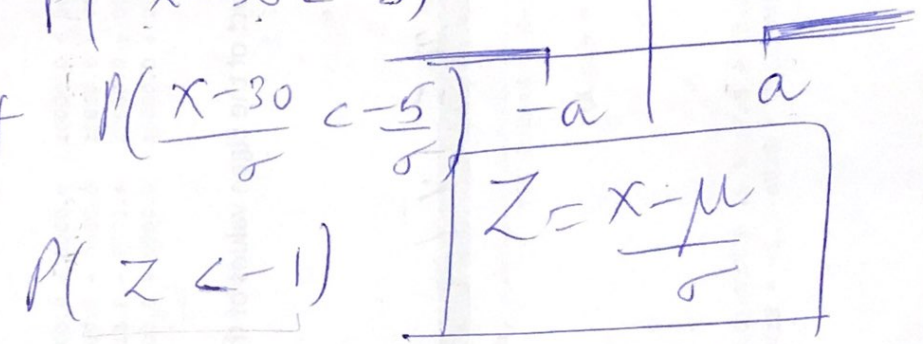
$\Rightarrow P\left(\frac{X-30}{\sigma} > \frac{5}{\sigma}\right) + P\left(\frac{X-30}{\sigma} < -\frac{5}{\sigma}\right)$

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

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

$\mu = 30, \sigma = 5$

$|x|>a \Rightarrow x>a$ or $x<-a$



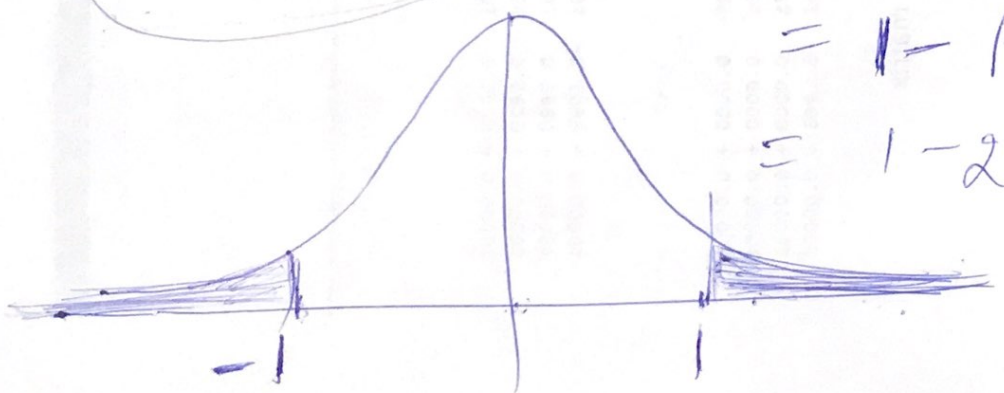
$Z = \frac{X-\mu}{\sigma}$

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

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

$= 1 - 2(0.3413)$

$= 1 - 0.6826 = 0.3174$



10/316 3-4 PM $\mu = 352$ S.D = 31

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

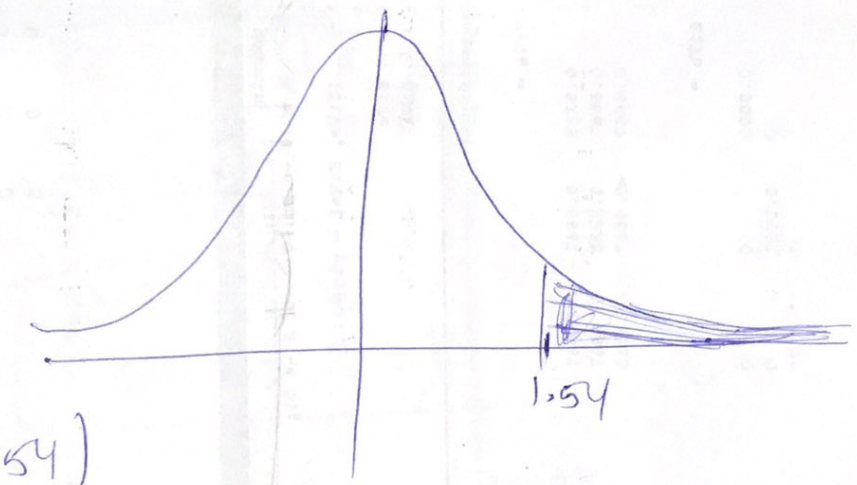
↓ no. of telephone calls.

$P(X > 400)$

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

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

$= P(Z > 1.54)$



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

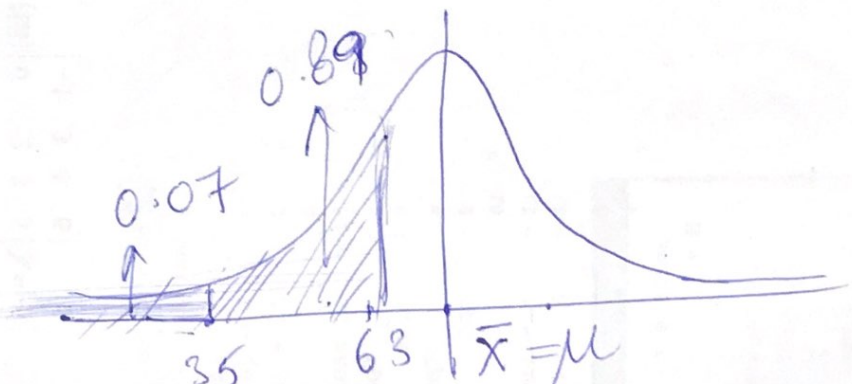
$= 0.5 - 0.4382 = 0.0618$

$= 6.18\%$

8 @ 316

7% under 35, 89% under 63

$(\mu, \sigma) = ?$



$P(X < 35) = 0.07$

$P(X < 63) = 0.89$

$P(X < 35) = 0.07$

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

$\Rightarrow P(z < z_1) = 0.07 \quad \left(\because z_1 = \frac{35-\mu}{\sigma}\right)$

$\Rightarrow 0.5 - P(z_1 < z < 0) = 0.07$

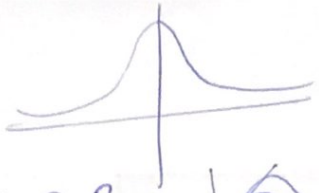
$\Rightarrow \boxed{P(z_1 < z < 0) = 0.43}$

$\boxed{\mu = 50.29, \quad \sigma = 10.33}$

$\Rightarrow P(0 < z < -z_1) = 0.43$

$\Rightarrow P\left(0 < z < \frac{\mu-35}{\sigma}\right) = 0.43$

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



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

$\mu - 1.48\sigma = 35$

$\mu + 1.23\sigma = 63$

$2.71\sigma = 28$

$\sigma = 10.33$ ✓

6

$\mu - 1.48\sigma = 35$

$\mu + 1.23\sigma = 63$

$2.71\sigma = 28$

$\sigma = 11.61$

$P(X < 63) = 0.89$

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

$\Rightarrow 0.5 - P(z_1 < Z < 0) = 0.89$

$\Rightarrow -0.39 = P(z_1 < Z < 0)$

$\Rightarrow -0.39 = P(0 < Z < -z_1)$

$-z_1 = 1.23$

$z_1 = 1.23$

$\frac{63-\mu}{\sigma} = 1.23$ ✓

Q8

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

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

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

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