T-shirt problem

No. of employees in company
= 100,000

Sample of 500 employees has
300 XL and 200 L size shirt

∴ now calculate Confidence interval (CI) for 100000 employees for XL and L size shirts, i.e

calucate how many XL and L t shirt you need to order

∴ for XL,

$$\hat{p} = \frac{300}{500} = 0.6$$

taking $\alpha = 0.05$ CI = 95%

$$CI = \hat{p} \pm Z \times \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \times \sqrt{\frac{N-n}{N-1}}$$

where
$\hat{p}$ = probability w.r.t sample
Z = Z score value based on decision boundary
n = size of sample data
N = size of population data

$$\therefore CI = 0.6 \pm 1.96 \times \sqrt{\frac{0.6 \times 0.4}{500}} \times \sqrt{\frac{100000 - 500}{100000 - 1}}$$

we get,

$$CI = [0.557,\ 0.643]$$

$$\therefore \boxed{XL = [55,700 \leftrightarrow 64,300]}$$ Ans

similary for L, take $\hat{p} = 0.4$ we get,

$$CI = [0.357,\ 0.443]$$

$$\therefore \boxed{L = [35,700 \leftrightarrow 44,300]}$$ Ans

∴ conclusion,

I need to order about size
55,700 to 64,300 XL shirts

And
35,700 to 44,300 L size shirts

Ans