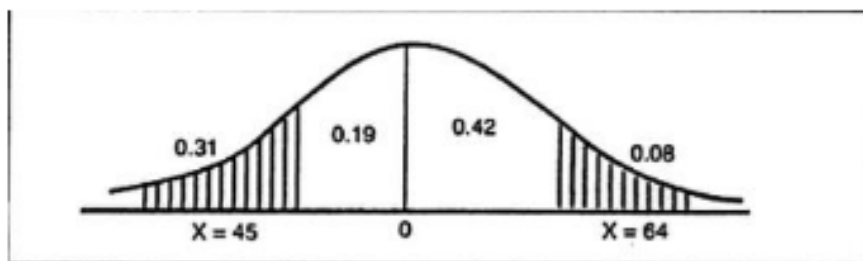In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution

Solution

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

Value of Z, corresponding to $0.50 - 0.31 = 0.19$ area, is equal to -0.5 (from table).

$$-0.5 = \frac{45 - \bar{X}}{\sigma} \rightarrow -0.5\sigma = 45 - \bar{X} \rightarrow \bar{X} - 0.5\sigma = 45$$

Value of Z, corresponding to $0.5 - 0.08 = 0.42$ area, is equal to $+1.41$ (from table).

$$1.41 = \frac{64 - \bar{X}}{\sigma} \rightarrow 1.41\sigma = 64 - \bar{X} \rightarrow \bar{X} + 1.41\sigma = 64$$

Solving the system of equations

$$\begin{cases} \bar{X} - 0.5\sigma = 45 \\ \bar{X} + 1.41\sigma = 64 \end{cases} \rightarrow -1.91\sigma = -19 \rightarrow \sigma = 10 \; approx.$$

Substituting the value of σ in the first equation

$$\bar{X} - 0.5 \cdot 10 = 45 \rightarrow \bar{X} = 50$$

Answer: $\bar{X} = 50$, $\sigma = 10$.