

Question :- A sample of 100 dry battery cells tested to find the length of life produced the following results.

$$\bar{x} = 12 \text{ hours, } \sigma = 3 \text{ hours.}$$

Assuming the data to be normally distributed, what Percentage of battery cells are expected to have life.

- (i) more than 15 hours (ii) Less than 6 hours
(iii) between 10 and 14 hours?

Sol :- Here x denotes the length of life of dry battery cells.

Also,

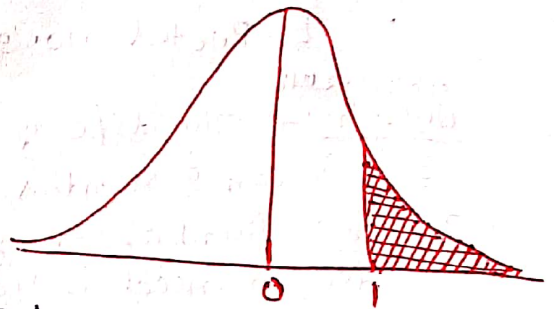
$$Z = \frac{x - \bar{x}}{\sigma} = \frac{x - 12}{3}$$

(i) when $x = 15$, $Z = 1$

$$\therefore P(x > 15) = P(Z > 1)$$

$$= P(0 < Z < \infty) - P(0 < Z < 1)$$

$$= 0.5 - 0.3413 = 0.1587 = 15.87\%$$

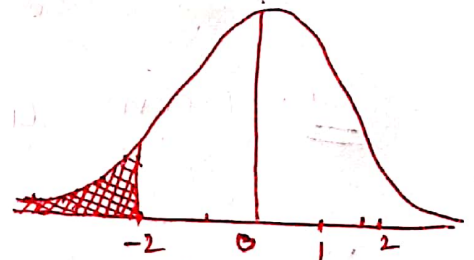


(ii) when $x = 6$, $Z = \frac{6 - 12}{3} = -2$

$$\therefore P(x < 6) = P(Z < -2) = P(Z > 2)$$

$$= P(0 < Z < \infty) - P(0 < Z < 2)$$

$$= 0.5 - 0.4772 = 0.0228 = 2.28\%$$



(iii) when $x = 10$, $Z = \frac{10 - 12}{3} = -\frac{2}{3}$

$$= -0.67$$

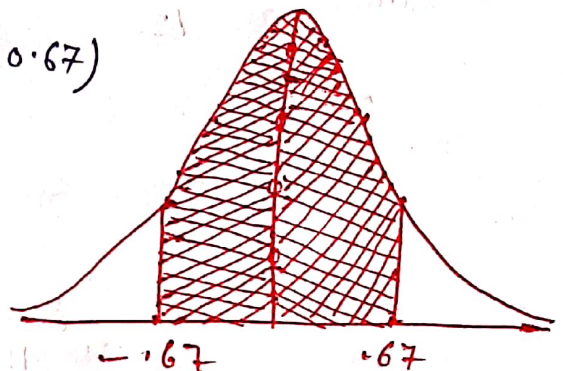
When $x = 14$, $Z = \frac{14 - 12}{3} = 0.67$

$$P(10 < x < 14) = P(-0.67 < Z < 0.67)$$

$$= 2P(0 < Z < 0.67)$$

$$= 2 \times 0.2485$$

$$= 0.4970 = 49.70\%$$



28

GBTU 2018

Question :- Assume mean height of soldiers to be 68.22 inches with a variance of 10.8 inches square. How many soldiers in a regiment of 1000 would you expect to be over 6 feet tall, given that the area under the standard normal curve between $z=0$ and $z=0.35$ is 0.1368 and between $z=0$ and $z=1.15$ is 0.3746.

Solution :- $x = 6 \text{ feet} = 72 \text{ inches}$.

$$z = \frac{x - \mu}{\sigma} = \frac{72 - 68.22}{\sqrt{10.8}} = 1.15$$

$$P(x > 72) = P(z > 1.15) = 0.5 - P(0 \leq z \leq 1.15) \\ = 0.5 - 0.3746 = 0.1254$$

\therefore Expected no. of soldiers = $1000 \times 0.1254 = 125.4 = \underline{\underline{125 \text{ App.}}}$

AKTU 2018

Question :- The life of army shoes is normally distributed with mean 8 months and standard deviation 2 months. If 5000 pairs are insured, how many pairs would be expected to need replacement after 12 months?

[Given that $P(z > 2) = 0.0228$ and $z = \frac{x - \mu}{\sigma}$]

Sol. Mean $\mu = 8$,

Standard Deviation (σ) = 2

Number of Pairs of Shoes = 5000

Total months (x) = 12

When $x = 12$, $z = \frac{x - \mu}{\sigma} = \frac{12 - 8}{2} = 2$

Area ($z > 2$) = 0.0228

Number of Pairs whose life is more than 12 months = $5000 \times 0.0228 = 114$

Pair of shoes needing replacement after 12 months = $5000 - 114 = \underline{\underline{4886}}$.