

Answer on Question #59250 – Math – Statistics and Probability

Question

The pharmaceutical company buys 400 batteries for running some specialist equipment. These batteries have a mean life of 120 hours and a standard deviation of 30 hours. Assume the battery life follows a normal distribution. [Use the Standard Normal table given in the Annexe for this task]

a) Use the standard normal table provided to calculate:

- (i) the probability that a battery may work for less than 200 hours.
- (ii) the probability that a battery may work for more than 200 hours.
- (iii) the probability that a battery may work for less than 90 hours.

b) Find the number of batteries which have a life between 120 hours and 145 hours.

Solution

a)

$$(i) Z = \frac{X - \mu}{\sigma} = \frac{200 - 120}{30} = 2.67;$$

$$P(X < 200) = P(Z < 2.67) = 0.9962.$$

$$(ii) P(X > 200) = 1 - P(X < 200) = 1 - 0.9962 = 0.0038.$$

$$(iii) Z = \frac{X - \mu}{\sigma} = \frac{90 - 120}{30} = -1;$$

$$P(X < 90) = P(Z < -1) = 0.1587.$$

$$b) Z_1 = \frac{X_1 - \mu}{\sigma} = \frac{120 - 120}{30} = 0, Z_2 = \frac{X_2 - \mu}{\sigma} = \frac{145 - 120}{30} = 0.83;$$

$$P(120 < X < 145) = P(0 < Z < 0.83) = P(Z < 0.83) - P(Z < 0) = \\ = 0.7967 - 0.5 = 0.2967.$$

Answer: a) (i) 0.9962; (ii) 0.0038; (iii) 0.1587; b) 0.2967.