Answer on Question #79230 – Math – Statistics and Probability

Question

The average lifetime of a particular brand of car battery is 3 years with a standard deviation of 6 months. Assuming these lifetimes are normally distributed, calculate the:
1. percentage of these batteries that last more than 4 years.

Solution

Let's denote the lifetime of battery as $X, X \sim N(3, (1/2)^2)$. Then the probability That a battery will last more than 4 years is represented by $P(X \geq 4)$

$$z = \frac{x - \mu}{\sigma} = \frac{4 - 3}{\frac{1}{2}} = 2$$

$$P(X \geq 4) = P(z \geq 2) = 1 - P(z < 2) = 1 - 0.9772 = 0.0228$$

Answer: There are 2.28% of the batteries that last more than 4 years.

Question

2. Maximum lifetime of a battery to be in the 10% of batteries with the shortest lifetime.

Solution

$$P(X < L) = P(z < z_L) = 0.1$$

$$z_L \approx -1.28155 = \frac{x - \mu}{\sigma} = \frac{x - 3}{\frac{1}{2}} => x \approx 2.359$$

Answer: Maximum lifetime of a battery is approximately 2.359 years.