Answer on Question #84645 – Math – Statistics and Probability

Question

Suppose the diameter x of a rod has normal distribution $N(2, 0.16)$.
If the diameter x satisfies $1.8 \leq x \leq 2.1$, then it is non-defective.
Find the probability that the rod is non-defective.

Solution

We first convert the problem into an equivalent one dealing with a normal variable measured in standardized deviation units, called a standardized normal variable. To do this, if $X \sim N(\mu, \sigma^2)$, then

$$Z = \frac{X - \mu}{\sigma} \sim N(0, 1)$$

$$Z_1 = \frac{1.8 - 2.0}{\sqrt{0.16}} = -0.5$$

$$Z_2 = \frac{2.1 - 2.0}{\sqrt{0.16}} = 0.25$$

Then

$$P(non - defective) = P(1.8 \leq X \leq 2.1) = P(-0.5 \leq Z \leq 0.25) =$$

$$= P(Z \leq 0.25) - P(Z \leq -0.5) = 0.5987 - 0.3085 = 0.2902$$

Answer: the probability that the rod is non-defective is 0.2902.