Answer on Question #80502 – Math – Statistics and Probability

Question

In an industrial process, the diameter of a ball bearing is an important measurement. The buyer sets specifications for the diameter to be 3.00.01 cm. The implication is that no part falling outside these specifications will be accepted. It is known that in the process the diameter of a ball bearing has a normal distribution with mean μ = 3.0 and standard deviation σ = 0.005. On average, how many manufactured ball bearings will be scrapped?

Solution

x_1 = 3-0.01 = 2.99
x_2 = 3+0.01 = 3.01
It will be scrapped:

$$1 - P(2.99 < Z < 3.01) = 1 - P\left(\frac{2.99 - 3}{0.005} < Z < \frac{2.99 + 3}{0.005}\right) =$$
$$= 1 - P\left(\frac{2.99 - 3}{0.005} < Z < \frac{2.99 + 3}{0.005}\right) = 1 - P(-2 < Z < 2) =$$
$$= 1 - (P(Z < 2.0) - (P(Z > -2.0)) = (P(Z > 2.0) + (P(Z < -2.0) = 2 * 0.0228 = 0.0456$$

Answer: 4.56% manufactured ball bearings will be scrapped.