

### Answer on Question #41626 - Math - Statistics and Probability

The diameter of a ball bearings produced by a machine is random variable having a normal distribution with mean 6.00 mm and standard deviation 0.025 mm. If the diameter tolerance  $\pm 1\%$ , find the proportion of ball bearings produced that are out of tolerance.

#### Solution

$$X_{min} = 0.99\mu = 0.99 \cdot 6.00 = 5.94 \text{ mm.}$$

$$X_{max} = 1.01\mu = 6.06 \text{ mm.}$$

$$P(X > X_{max}) = 1 - P(X < 6.06) = 1 - \Phi\left(\frac{6.06 - 6.00}{0.025}\right) = 1 - \Phi(2.4) = 1 - 0.9918 = 0.0082.$$

$$P(X < X_{min}) = P(X < 5.94) = \Phi\left(\frac{5.94 - 6.00}{0.025}\right) = \Phi(-2.4) = 0.0082.$$

The proportion of ball bearings produced that are out of tolerance is

$$P(X < X_{min}) + P(X > X_{max}) = 0.0082 + 0.0082 = 0.0164 = 1.64\%.$$

**Answer: 1.64%.**