Answer on Question #46547 – Math – Statistics and Probability

Question.

The time required to assemble a piece of machinery is a random variable having a normal distribution with mean 11 minutes and variance 9 minutes. Find the probability that assembly of a piece of this kind will take any where between 9 to 16 minutes.

Solution.

Let ξ be this random variable. Then we have $E\xi = 11, Var\xi = 9$. Note that random variable $\eta = \frac{\xi - E\xi}{\sqrt{Var\xi}} = \frac{\xi - 11}{3}$ has a standard normal distribution with mean 0 and variance 1. Also we shall use the tabulated function of Laplace: $\Phi(x) = \frac{1}{\sqrt{2\pi}} \int_0^x e^{-\frac{u^2}{2}} du$. The required probability is equal to:

$$P(9 < \xi < 16) = P\left(\frac{9-11}{3} < \frac{\xi - 11}{3} < \frac{16-11}{3}\right) = P\left(-\frac{2}{3} < \frac{\xi - 11}{3} < \frac{5}{3}\right) = \Phi\left(\frac{2}{3}\right) + \Phi\left(\frac{5}{3}\right) \approx$$

$$\approx \Phi(0.67) + \Phi(1.67) = 0.24857 + 0.45254 = 0.70111$$

Answer. 0.70111