Answer on Question #43457 – Math - Statistics and Probability

A random variable X is distributed normally with E(X) = 8 and σ(X) =3 . Find P(9≤X<11).

Solution

X is normally distributed with parameters $\mu =$E(X) = 8, $\sigma = \sigma(X) = 3$.

If X is distributed normally $N(\mu, \sigma^2)$, then $P(a \le X < b) = P\left(\frac{a-\mu}{\sigma} \le Z < \frac{b-\mu}{\sigma}\right)$, where Z has the standard normal distribution.

The standardized variable is $Z = \frac{X-\mu}{\sigma} = \frac{X-8}{3}$.

In particular,

x=9 gives $z = \frac{x-\mu}{\sigma} = \frac{9-8}{3} = \frac{1}{3} \approx 0.33$,

x=11 gives $z = \frac{x-\mu}{\sigma} = \frac{11-8}{3} = 1$.

To find $P(Z < 1) = 0.8413$ and $P(Z < 0.33) = 0.6293$, we use statistical tables or software.

Therefore, the required probability is

P(9≤X<11)= $P(0.33 \le Z < 1) = P(Z < 1) - P(Z < 0.33) = 0.8413 - 0.6293 = 0.212.$