CSE 312: Foundations of Computing II

QuickCheck: Variance, Linearity Solutions

0. Weather Norms

A citys temperature is modeled as a random variable with mean and standard deviation both equal to 10 degrees Celsius. A day is described as normal if the temperature during that day ranges within one standard deviation from the mean. What would be the temperature range for a typical day if temperature were expressed in degrees Fahrenheit? Note: $F = \frac{9}{5}C + 32$.

Solution:

Let C be the temperature r.v. in Celsius. Let F be the temp r.v. in Farenheit. By linearity of expectation: $E[F] = \frac{9}{5}E[C] + 32 = 18 + 32 = 50$. So the avg. temp is 50 degrees F.

By linearity of variance:
$Var(F) = a^2 Var(C) = (\frac{9}{5})^2(10^2) = 324$
$\sigma = \sqrt{Var(F)} = \sqrt{324} = 18$

Hence a normal day in Fahrenheit is one for which the temperature is in the range [32,68].