The time it takes to hand carve a guitar neck is uniformly distributed between 110 and 190 minutes.

a. Compute the variance.

Solution

First case (continuous uniform distribution)

Assume that the time is continuous random variable

If the time it takes to hand carve a guitar neck is uniformly distributed between 110 and 190 minutes, then the probability density function is given by

$$f(x) = \begin{cases} 0 \ for \ x < a \\ \frac{1}{b-a} \ for \ a \le x \le b \\ 0 \ for \ x > b \end{cases} = \begin{cases} 0 \ for \ x < 110 \\ \frac{1}{190-110} \ for \ 110 \le x \le 190 \\ 0 \ for \ x > 190 \end{cases} = \begin{cases} 0 \quad\quad for \ x < 110 \\ \frac{1}{80} \ \ for \ 110 \le x \le 190 \\ 0 \quad\quad for \ x > 190 \end{cases}$$

the mean is given by m = (110+190)/2 = 150

the variance is given by

$$Var(X) = \frac{(b-a)^2}{12} = \frac{(190-110)^2}{12} = \frac{80^2}{12} = \frac{6400}{12} = 533.333$$

Second case (discrete uniform distribution)

Assume that the time is discrete random variable.

X=x   110   190

P(X=x)   0.5   0.5

If the time it takes to hand carve a guitar neck is uniformly distributed between 110 and 190 minutes, then first we need to find

the mean m = (110+190)/2 = 150

and finally compute

the variance Var(X) $=0.5(110-150)^2 + 0.5(190-150)^2 = 1600$