Example #1   1/1

One hundred small bolts are packed into a (weightless) box. Each bolt weighs 1 ounce, with a standard deviation of 0.1 ounce. Find the probability that a box weighs more than 102 ounces

$\mu_{bolt} = 1$ ounce

$\sigma^2_{bolt} = (0.1)^2$ } each bolt has these moments

There are 100 bolts.

We know that the mean weight of the box is the sum of the mean weight of each bolt, the same goes for the variance:

$$\mu_{box} = 100 \mu_{bolt} = 100 \text{ ounces}$$

$$\sigma^2_{box} = 100 \sigma^2_{bolt} = 1.0$$

We actually don't know anything about the distribution of the weight of the <u>individual bolts</u>, but due to the central limit theorem we know that the weight of the <u>box of bolts</u> $\sim N(100, 1)$

$$P(\text{weight of box} > 102 \text{ ounces})$$

$$= P\left(Z > \frac{102 - 100}{\sqrt{1}} \right)$$

$$\boxed{= 0.022750}$$

$$\frac{102 - 100}{\sqrt{1}}$$