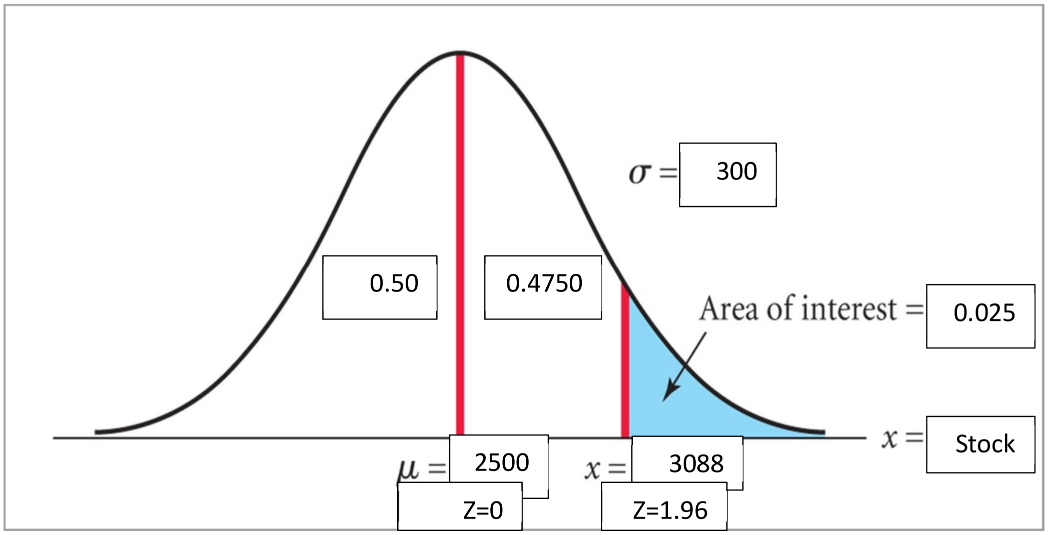
An Internet retailer stocks a popular electronic toy at a central warehouse that supplies the eastern United States. Every week the retailer makes a decision about how many units of the toy to stock. Suppose that weekly demand for the toy is approximately normally distributed with a mean of 2,500 units and a standard deviation of 300 units.

a. Suppose that the retailer wants the central warehouse to stock 3088 electronic toy at the beginning of the week, what is the probability of being out of stock?

<u>Answer a.</u> $z = \frac{x-\mu}{\sigma} = \frac{3088-2500}{300} = 1.96$. If we go to Z table we see that for z = 1.96 the probability is 0.4750. The probability that demand will exceed 3088 electronic toy is 0.50 ï 0.4750 = 0.025 (2.5%). So the probability of being out of stock in this case is 2.5%.



b. If the retailer wants to limit the probability of being out of stock of the electronic toy to no more than 2.5% in a week, how many units should the central warehouse stock?

<u>Answer b.</u> 2.5% = 0.025, 0.50 ï 0.025 = 0.4750. If we go to Z table we see that for 0.4750 z = 1.96. $z = \frac{x-\mu}{\sigma} \Rightarrow x = z\sigma + \mu = 1.96(300) + 2500 = 3088$. The central warehouse should stock 3088 electronic toy.

c. If the retailer has 2,750 units on hand at the start of the week, what is the probability that weekly demand will be greater than inventory?

<u>Answer c.</u> $z = \frac{x-\mu}{\sigma} = \frac{2750-2500}{300} = 0.83$. If we go to Z table we see that for z = 0.83 the probability is 0.2967. The probability that demand will exceed 2750 electronic toy is 0.50 ï 0.2967 = 0.2033 (20.33%). So the probability of being out of stock in this case is 20.33%.

d. Suppose that the standard deviation of weekly demand for the toy increases from 300 units to 500 units and that the retailer wants the central warehouse to stock 3480 electronic toy at the beginning of the week, what is the probability of being out of stock?

Answer d. $z = \frac{x - \mu}{\sigma} = \frac{3480 - 2500}{500} = 1.96$. If we go to Z table we see that for z = 1.96 the probability is 0.4750. The probability that demand will exceed 3480 electronic toy is 0.50 ï 0.4750 = 0.025 (2.5%). So the probability of being out of stock in this case is 2.5%.

e. If the standard deviation of weekly demand for the toy increases from 300 units to 500 units. How many more toys would have to be stocked to ensure that the probability of weekly demand exceeding inventory is no more than 2.5%?

Answer e. 2.5% = 0.025, 0.50 ï 0.025 = 0.4750. If we go to Z table we see that for 0.4750 z = 1.96. $z = \frac{x - \mu}{\sigma} \Rightarrow x = z\sigma + \mu = 1.96(500) + 2500 = 3480$. The central warehouse should stock 3480 electronic toy.