

Answer on Question #76814 – Math – Financial Math

Question

Shoe Company orders men's shoes at a buyer's meeting in New York City. Because the shoe is designed for spring and summer months, it cannot be expected to sell in the fall. Johnson plans to hold a special August clearance sale in an attempt to sell all shoes not sold by July 31. The shoes cost \$40 a pair and retail for \$60 a pair. At the sale price of \$30 a pair, all surplus shoes can be expected to sell during the August sale. If you were the buyer for the Johnson Shoe Company, how many pairs of the shoe would you order? Assume that the demand for these shoes are normally distributed with a mean of 500 and a standard deviation of 20.

Solution

Overage cost = \$40 per pair - \$30 per pair = \$10 per pair

Underage cost = \$60 per pair - \$40 per pair = \$20 per pair

We choose the first Q such that

$$\Pr[\text{sell } Q+1^{\text{st}} \text{ unit}] < \frac{\text{overage_cost}}{\text{underage_cost} + \text{overage_cost}} = \frac{\$10}{\$20 + \$10} = 0.333$$

Since demand is normally distributed with a mean of 500 units and a standard deviation of 20 units/season.

We then want to find the first value of Q such that $1-F(Q) < 0.33$. That is, we need to find the z-score such that 1/3 of the area under the curve is beyond z.

Equivalently we find z such that $\Phi(z) = 0.67$ where $\Phi()$ is the cumulative distribution function for a standard normal distribution.

Looking up $\Phi(z) = 0.67$, $F(z)$ yields the z of 0.44.

$Q = \text{mean} + (0.44) * (\text{standard deviation}) = 500 + (0.44) * 20 = 509$ units.

Answer: 509 units.