

Question 10.13.3.36

A carton of 24 bulbs contain 6 defective bulbs. One bulb is drawn at random. What is the probability that the bulb is not defective? If the bulb selected is defective and it is not replaced and a second bulb is selected at random from the rest, what is the probability that the second bulb is defective?

Solution: Let

$$X = \begin{cases} 1, & \text{if bulb is not defective} \\ 0, & \text{if bulb is defective} \end{cases} \quad (1)$$

Then

$$p_X(0) = \frac{6}{24} \quad (2)$$

$$= \frac{1}{4} \quad (3)$$

$$p_X(1) = 1 - p_X(0) \quad (4)$$

$$= 1 - \frac{1}{4} \quad (5)$$

$$= \frac{3}{4} \quad (6)$$

When a defective bulb is selected and not replaced

$$Y = \begin{cases} 1, & \text{if bulb is not defective} \\ 0, & \text{if bulb is defective} \end{cases} \quad (7)$$

Then

$$p_Y(0) = \frac{6-1}{24-1} \quad (8)$$

$$= \frac{5}{23} \quad (9)$$