

Name: \_\_\_\_\_ Student ID: \_\_\_\_\_

1. (5 marks) Box 1 contains 3 white balls and 7 black balls, and box 2 contains 6 white balls and 4 black balls. We randomly picked the first ball from box 1. If the first ball is white, we then randomly pick the second ball from box 1. If the first ball is black, we then randomly pick the second ball from box 2.

Find: a) what is the probability that the second ball is white? b) Given that the second ball is white, what is the probability that the second ball is picked from box 2?

**Solution:**

Define the events:  $W1 = \{\text{the first ball is white}\}$ ,  $B1 = \{\text{the first ball is black}\}$ ,  $W2 = \{\text{the second ball is white}\}$ ,  $D2 = \{\text{pick the second ball from box 2}\}$

$$a) P(W2) = P(W2|W1)P(W1) + P(W2|B1)P(B1) = \frac{3}{10} \times \frac{2}{9} + \frac{7}{10} \times \frac{6}{10} = 0.4867$$

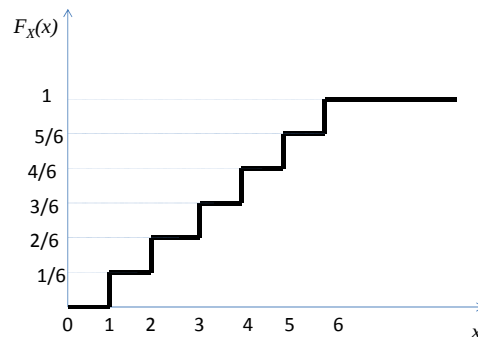
$$b) P(D2|W2) = P(B1|W2) = \frac{P(B1W2)}{P(W2)} = \frac{\frac{7}{10} \times \frac{6}{10}}{0.4867} = 0.8630$$

2. (5 marks) A dice is tossed once. Let  $X$  denote the outcome.

a) find the cumulative distribution function (CDF) of  $X$ , and draw the graph of the CDF, b) find the probability  $P(3 \leq X < 5)$ .

**Solution:**

a)



$$b) P(3 \leq X < 5) = P(X = 3) + P(X = 4) = 1/3$$