

## 1 Box of Marbles

You are given two boxes: one of them containing 900 red marbles and 100 blue marbles, the other one contains 500 red marbles and 500 blue marbles.

- (a) If we pick one of the boxes randomly, and pick a marble what is the probability that it is blue?
- (b) If we see that the marble is blue, what is the probability that it is chosen from box 1?
- (c) Suppose we pick one marble from box 1 and without looking at its color we put it aside. Then we pick another marble from box 1. What is the probability that the second marble is blue?

## 2 Mario's Coins

Mario owns three identical-looking coins. One coin shows heads with probability  $1/4$ , another shows heads with probability  $1/2$ , and the last shows heads with probability  $3/4$ .

- (a) Mario randomly picks a coin and flips it. He then picks one of the other two coins and flips it. Let  $X_1$

and  $X_2$  be the events of the 1st and 2nd flips showing heads, respectively. Are  $X_1$  and  $X_2$  independent? Please prove your answer.

(b) Mario randomly picks a single coin and flips it twice. Let  $Y_1$  and  $Y_2$  be the events of the 1st and 2nd flips showing heads, respectively. Are  $Y_1$  and  $Y_2$  independent? Please prove your answer.

(c) Mario arranges his three coins in a row. He flips the coin on the left, which shows heads. He then flips the coin in the middle, which shows heads. Finally, he flips the coin on the right. What is the probability that it also shows heads?

