

1. 2 players  $A$  and  $B$  play a game turn-by-turn. In this game, each of them alternatively take out a ball from a bag of  $k$  black and 1 red ball without replacement. The one who picks the red ball is the winner. If  $A$  starts the game:

- (a) if  $k = 50$ ,  $A$  is more likely to win the game.
- (b) if  $k = 50$ ,  $B$  is more likely to win the game.
- (c) if  $k = 25$ ,  $A$  is more likely to win the game.
- (d) if  $k = 25$ ,  $B$  is more likely to win the game.

**Answer: (a)**

2.  $P$  and  $Q$  are two real numbers chosen uniformly and randomly between 0 and 1. What is the probability that the ratio  $\frac{P}{Q}$  lies between  $\frac{1}{2}$  and 3?

- (a)  $\frac{7}{12}$
- (b)  $\frac{5}{12}$
- (c)  $\frac{2}{3}$
- (d)  $\frac{1}{3}$

**Answer: (a)**

3. A certain town has two groups of people  $A$  and  $B$ , where  $A$  makes up 99% of the population. In a court hearing, an eyewitness claims that a person belonging to group  $B$  committed the crime. However, it is seen that due to poor lighting at the crime scene, the eyewitness sees people  $B$  as  $B$  99% of the time and people  $A$  as  $A$  98% of the time. Which of the following statements is/are correct? (Assume that a claim is likely to be correct if its probability  $\geq \frac{1}{2}$ )

- (a) The eyewitness claim is likely to be correct.
- (b) The eyewitness claim is likely to be incorrect.
- (c) The probability of  $B$  having committed the crime is  $\frac{1}{3}$
- (d) The probability of  $B$  having committed the crime is  $\frac{2}{3}$

**Answer: (b), (c)**

4. Let  $a, b, c$  be three real numbers. Let  $c > 0$ . Let  $A$  be the event  $\{|a| > \frac{c}{2}\}$ ,  $B$  be the event  $\{|b| > \frac{c}{2}\}$ ,  $C$  be the event  $\{|a + b| > c\}$ , and  $D$  be the event  $\{|a| + |b| > c\}$ . Which of the following is/are incorrect?

- (a)  $P(C) > P(A) + P(B)$
- (b)  $P(D) \geq P(C)$
- (c)  $P(D) > P(A) + P(B) - P(A \cap B)$
- (d)  $P(D) < P(A \cup B)$

**Answer:** (a), (c)

5. What is the probability of getting a sum greater than 8 upon rolling 2 dice?

- (a)  $\frac{13}{18}$
- (b)  $\frac{5}{12}$
- (c)  $\frac{7}{12}$
- (d)  $\frac{5}{18}$

**Answer:** (d)