

Math 10B with Professor Stankova

Quiz 5; Tuesday, 2/20/2018

Section #211; Time: 11 AM

GSI name: Roy Zhao

Name: _____

Circle True or False or leave blank. (1 point for correct answer, -1 for incorrect answer, 0 if left blank)

1. **TRUE** False If A, B are mutual exclusive events that are independent, then $P(A) = 0$ or $P(B) = 0$.

Solution: If A, B are mutually exclusive, then $A \cap B = \emptyset$. Then if they are independent, then $P(A \cap B) = 0 = P(A)P(B)$ so $P(A) = 0$ or $P(B) = 0$.

2. True **FALSE** If A, B are independent events and B, C are independent, then A, C are independent.

Solution: We can take A and C to be the same event.

Show your work and justify your answers. Please circle or box your final answer.

3. (10 points) (a) (5 points) When rolling a fair 6-sided die, are the events A that the number rolled is greater than or equal to 3, and B that the number rolled is odd, independent?

Solution: We just need to check $P(A \cap B) = P(A)P(B)$. On the left side, the probability is $\frac{2}{6}$ from having 3, 5, and $P(A) = \frac{2}{3}$ and $P(B) = \frac{1}{2}$ so indeed $P(A \cap B) = P(A)P(B)$. So they are independent.

- (b) (5 points) There are 10 red and 10 blue balls in a bag. Someone randomly picks out a ball and then places it back and puts 10 more balls of that color into the bag. Then you draw a ball. What is the probability that the 10 balls added were red, given that you drew out a red ball?

Solution: We use Bayes Theorem to get

$$\begin{aligned} P(\text{AddRed}|\text{DrawRed}) &= \frac{1}{1 + \frac{P(\text{DrawRed}|\text{AddBlue})P(\text{AddBlue})}{P(\text{DrawRed}|\text{AddRed})P(\text{AddRed})}} \\ &= \frac{1}{1 + \frac{10/30 \cdot 1/2}{20/30 \cdot 1/2}} = \frac{1}{1 + 1/2} = \frac{2}{3}. \end{aligned}$$