

STA 4321

Spring 2019

Quiz 2

Full Name: _____

On my honor, I have neither given nor received unauthorized aid on this quiz

Signature: _____

This is a 10 minute quiz. There are 5 multiple choice problems, each having EXACTLY ONE correct answer. You may *not* use any books, other references, or text-capable electronic devices.

1. If B_1 and B_2 are mutually exclusive and exhaustive events, then which of the following always holds?

- (a) $P(B_1 \cup B_2) = 0$.
(b) $P(B_1 \cap B_2) = 0$.
(c) $P(B_1) = P(B_2)$.
(d) $P(B_1) \neq P(B_2)$.

$$B_1 \cap B_2 = \emptyset \\ \Rightarrow P(B_1 \cap B_2) = 0$$

2. If $P(A) = \frac{5}{8}$, $P(B) = \frac{2}{8}$, and $P(A \cap B) = \frac{1}{8}$, then

- (a) $P(A \cup B) = \frac{2}{8}$.
(b) $P(A \cup B) = \frac{4}{8}$.
(c) $P(A \cup B) = \frac{6}{8}$.
(d) $P(A \cup B) = \frac{1}{8}$.

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) \\ = \frac{5}{8} + \frac{2}{8} - \frac{1}{8} = \frac{6}{8}$$

3. Let B_1, B_2 be mutually exclusive and exhaustive events, with $P(B_1) = P(B_2) = \frac{1}{2}$. Then for any event A with $P(A | B_1) = \frac{1}{4}$ and $P(A | B_2) = \frac{3}{4}$, we have

- (a) $P(A) = \frac{1}{2}$.
(b) $P(A) = \frac{1}{4}$.
(c) $P(A) = \frac{3}{4}$.
(d) $P(A) = \frac{1}{5}$.

$$P(A) = P(A | B_1) P(B_1) + P(A | B_2) P(B_2) \\ = \frac{1}{4} \times \frac{1}{2} + \frac{3}{4} \times \frac{1}{2} = \frac{1}{2}$$

4. In the previous problem

- (a) $P(B_1 | A) = \frac{1}{2}$.
(b) $P(B_1 | A) = \frac{3}{4}$.
(c) $P(B_1 | A) = \frac{1}{4}$.
(d) $P(B_1 | A) = 0$.

$$P(B_1 | A) = \frac{P(A | B_1) P(B_1)}{P(A)} = \frac{\frac{1}{4} \times \frac{1}{2}}{\frac{1}{2}} = \frac{1}{4}$$

5. For any positive integer n , we have

$$\sum_{i=0}^n \binom{n}{i} = 2^n.$$

This statement is

- (a) True.
(b) False.

See lecture notes.