Stat 50 - Elementary Statistics — Winter 2020

Quiz 4: Ch 4: 4.1, 4.2 — Dr. Jorge Basilio

NAME (PRINT): _Solutions_   SCORE: _30 / 30_

SIGNATURE: _____

Directions

- YOU ARE ALLOWED TO USE A CALCULATOR ON THIS EXAM. (Ti83/Ti83+/Ti84/Ti84+/Ti84+CE-T, or scientific calculator)

- Handwriting should be neat and legible. If I cannot read your writing, zero points will be given.

- Make sure to ALWAYS SHOW YOUR WORK; you will not receive any partial credits unless work is clearly shown. *If in doubt, ask for clarification.*

- Leave answers in exact form (as simplified as possible), unless told otherwise.

- Put a box around your final answer where applicable.

Quiz (30 points)

Problem 1: 7 pts (1 pts each)

TRUE or **FALSE** (please spell out/write the entire word for credit).

(Hint: you might find it helpful to use Venn Diagrams to help you arrive at an answer)

(a) _TRUE_   For any event, $P(A) = 1$ means it is certain to occur.

(b) _FALSE_   If A and B are mutually exclusive then $P(A \text{ and } B) = 0$.

(c) _TRUE_   If $P(A \text{ and } B) = 0$, then A and B are mutually exclusive.

(d) _TRUE_   If $P(A) < P(B)$ then event B is more likely to occur than event A.   B greater probability

(e) _TRUE_   If $P(A) = 0.025$, then event A is an unusual event. $2.5\% < 5\%$

(f) _TRUE_   If $P(A \mid B) = P(A)$, then A and B are independent.

A given B says prob. of A is uneffected by B

(g) _FALSE_   If $P(B \mid A) = P(A)$, then A and B are independent.

not independent

A

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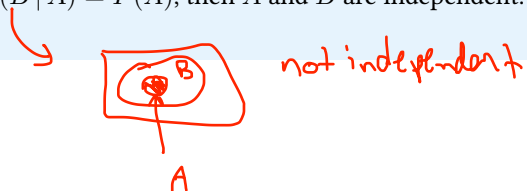
Problem 2: 20 pts

A fair, 14-sided die is rolled.

(a) (2 pts) What is the **sample space**? Use **set notation** to write S.

$\{\cdots\}$

$$S = \{1, 2, 3, \ldots, 13, 14\}$$

(b) (2 pts) Let O denote the event of rolling an odd number. List the outcomes in O using set notation and calculate $P(O)$.

$$O = \{1, 3, 5, 7, 9, 11, 13\} \qquad P(O) = 7/14 = 0.5$$

(c) (2 pts) Let F denote the event of rolling a number greater than 5. List the outcomes in F using set notation and calculate $P(F)$.

$$F = \{6, 7, 8, 9, 10, 11, 12, 13, 14\} \qquad P(F) = 9/14 = 0.643$$

(d) (2 pts) What is $\bar{F}$? Find $P(\bar{F})$.

$$\bar{F} = \text{not } F = \{1, 2, 3, 4, 5\} \qquad P(\bar{F}) = 5/14 = 0.357$$

(e) (2 pts) Calculate $P(O \text{ and } F)$.

$$O \text{ and } F = \{7, 9, 11, 13\} \qquad P(O \text{ and } F) = 4/14 = 0.286$$

(f) (2 pts) Calculate $P(O \text{ or } F)$.

$$O \text{ or } F = \{1, 3, 5, 6 - 14\} \qquad P(O \text{ or } F) = 12/14 = 0.857$$

(g) (2 pts) Calculate $P(O \mid F)$.

$$P(O \mid F) = \frac{P(O \text{ and } F)}{P(F)} = \frac{4/14}{9/14} = \frac{4}{9} = 0.444 \qquad 7, 9, 11, 13$$

(h) (2 pts) Calculate $P(F \mid O)$.

$$P(F \mid O) = \frac{P(F \text{ and } O)}{P(O)} = \frac{4/14}{7/14} = \frac{4}{7} = 0.571 \qquad 7, 9, 11, 13 \leftarrow O \text{ after } F \text{ true}$$

(i) (2 pts) Calculate $P(O \text{ or } \bar{F})$.

$$P(O \text{ or } \bar{F}) = P(O) + P(\bar{F}) - P(O \text{ and } \bar{F}) = 7/14 + 5/14 - 4/14 = 8/14 = 0.571$$

(j) (2 pts) Calculate $P(O \text{ and } \bar{F})$.

$$P(O \text{ and } \bar{F}) = 3/14 = 0.214$$

$$1, 3, 5$$

Problem 3: 3 pts

(a) (1.5 pts) Assume E and F are mutually exclusive events, $P(E) = 0.4$ and $P(F) = 0.5$. Find $P(E \text{ and } F)$.

disjoint

$$P(E \text{ and } F) = 0$$

(b) (1.5 pts) Assume A and B are independent events, $P(A) = 0.8$ and $P(A \text{ and } B) = 0.2$. Find $P(B)$.

$$P(A \text{ and } B) = P(A) * P(B \mid A) = P(A) \cdot P(B) \Rightarrow 0.2 = 0.8 \cdot P(B)$$
$$\text{so } P(B) = 0.2/0.8 = 0.25$$

(c) (Bonus -1 pts) Suppose that 60% of your friends are Star Wars fans and 30% of your friends like the Star Wars AND Harry Potter. Suppose you are given a Star Wars loving fan, what is the probability that friend likes Harry Potter?

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