STAT 5700 — Quiz 2
Date: September 11, 2025
SOLUTIONS

1. (1pt) There are 20 students in this class. For group work, you split into 5 groups of 4 students each. How many group compositions are possible? Write out the formula, you do not need to complete the calculation.

$$\binom{20}{4\ 4\ 4\ 4\ 4} = \frac{20!}{4!4!4!4!4!}$$

2. (4pts) Let A and B be two events such that $P(A) = 0.4$, $P(B) = 0.3$, and $P(A \cap B) = 0.2$.

   a. Find $P(A|B)$
   b. Find $P(A|A \cup B)$
   c. Find $P(A|A \cap B)$
   d. Are A and B independent? Justify your answer.

Part a solution

$P(A \mid B) = \frac{P(A \cap B)}{P(B)} = \frac{0.2}{0.3} = \frac{2}{3}$

Part b solution

$P(A \mid A \cup B) = \frac{P(A \cap (A \cup B))}{P(A \cup B)} = \frac{P(A)}{P(A \cup B)}$

$P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.4 + 0.3 - 0.2 = 0.5$

Therfore: $P(A \mid A \cup B) = \frac{0.4}{0.5} = 0.8$

Part c solution

$P(A \mid A \cap B) = \frac{P(A \cap (A \cap B))}{P(A \cap B)} = \frac{P(A \cap B)}{P(A \cap B)} = 1$

Part d solution

Two events are independent if and only if $P(A \cap B) = P(A) \cdot P(B)$.

Here $P(A) \cdot P(B) = (0.4)(0.3) = 0.12$, but $P(A \cap B) = 0.2$, so the events **are not independent**.