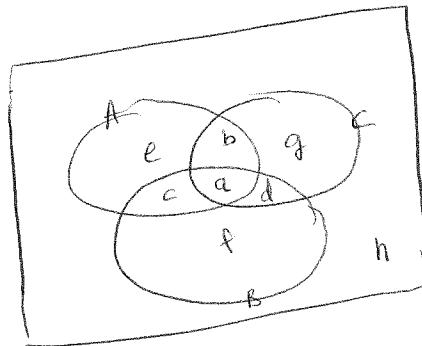


## Quiz 2

February 12, 2015

1. Consider the Venn's Diagram:



(a) Use this Venn's Diagram to show that

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C)$$

by writing both sides as the summation of the quantities  $a, b, c, d, \dots$  and simplify the computation.

$$\begin{aligned} a+b+c+e + c+a+d+f + a+b+g+d - a-c - a-b \\ - a-d + a = a+b+c+d+e+f+g \end{aligned}$$

(b) Write each of the three probability  $P(A \cup (B \cap C))$ ,  $P(A \cap (B \cup C))$ , and  $P((A' \cap B') \cup C)$  as the summation of the quantities  $a, b, c, \dots$

$$P(A \cup (B \cap C)) = a+b+c+d+e$$

$$P(A \cap (B \cup C)) = a+b+c$$

$$P((A' \cap B') \cup C) = g+h + a+b+d$$

2. Five students come to my office. Some of them ask for help in Stat 290 and some of them ask for help in Math 461 but none of them ask for help on both. An outcome may be  $(3, 2)$  where 3 of them ask for help in Stat 290 and 2 of them ask for help in Math 461. The outcomes in this sample space are not equally likely.

(a) List all the possible outcomes in the sample space.

$(0, 5)$   $(1, 4)$   $(2, 3)$   $(3, 2)$   $(4, 1)$   $(5, 0)$

- (b) If the probability that at most one of them ask for help in Stat 290 is 0.4, what is the probability that at least two of them ask for help in Stat 290?

$$1 - 0.4 = 0.6$$

- (c) If the probability that an even number of students ask for help in Stat 290 is 0.2, what is the probability that an odd number of students ask for help in Math 461?

It is still 0.2 because the two events have the same set of outcomes.