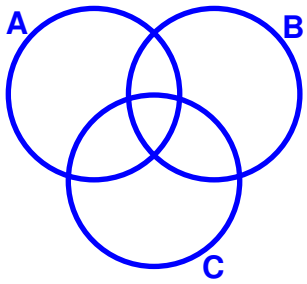
ECI114: Probabilistic Systems Analysis for Engineers

HW # 1, Due: 21Apr2023, by midnight on Canvas.

Problem:

1. Provide a reasonable description of the sample space for each of the random experiments in examples below. There can be more than one acceptable interpretation of each experiment. Describe any assumptions you make.

   - Each of four transmitted bits is classified as either in error or not in error. Let e and o denote a bit in error and not in error (o denotes okay), respectively.
   - An ammeter (ampmeter) that displays three digits is used to measure current in milliamperes. A vector with three components can describe the three digits of the ammeter. Each digit can be 0,1,2,...,9.
   - Calls are repeatedly placed to a busy phone line until a connection is achieved. Let c and b denote connect and busy, respectively.
   - Three events are shown on the Venn diagram in the following figure:



   Reproduce the figure and shade the region that corresponds to each of the following events: (a) A'; (b) $A \cap B$; (c) $(A \cap B) \cup C$; (d) $(B \cup C)'$; (e) $(A \cap B)' \cup C$;

2. A digital scale that provides weights to the nearest gram is used.

   - (a) What is the sample space for this experiment? Let A denote the event that a weight exceeds 11 grams, let B denote the event that a weight is less than or equal to 15 grams, and let C denote the event that a weight is greater than or equal to 8 grams and less than 12 grams.

     Describe the following events: (b) $A \cup B$; (c) $A \cap B$; (d) A'; (e) $A \cup B \cup C$; (f) $(A \cup C)'$; (g) $A \cap B \cap C$; (h) $B' \cap C$; (i) $A \cup (B \cap C)$;