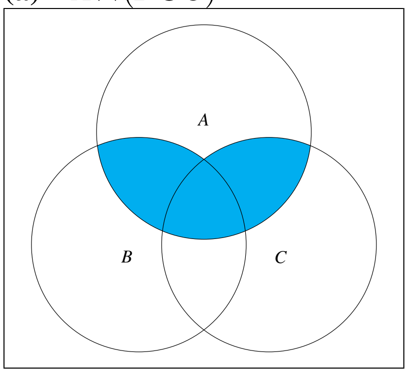
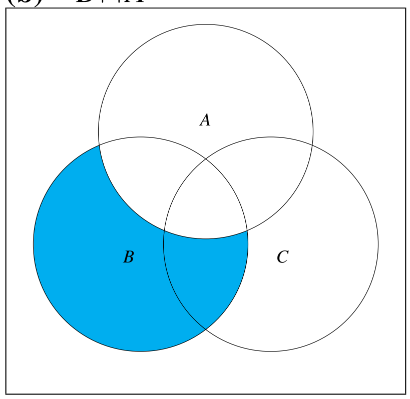
Kaleb Burris
STAT F300 Statistics, Dr. Short
Worksheet 3, due Monday January 25, 4:15pm

1. Shade the following events on the Venn diagrams below.

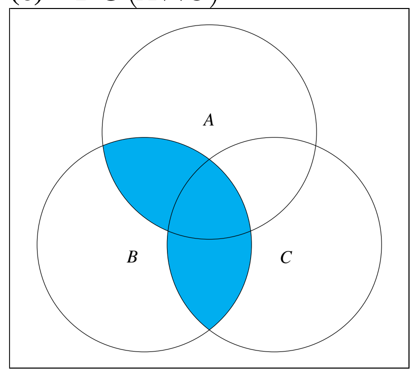
(a) $A \cap (B \cup C)$



(b) $B \cap A^C$



(c) $B \cup (A \cap C)$



2. A local Cormac McCarthy club has just voted by secret ballot for the next novel the club members will read. The ballot box contains three slips with votes for book A ("The Road") and two slips for book B ("No Country For Old Men"). The slips are removed from the box one by one.

(a) List all possible outcomes. How many outcomes are there? (For example, one outcome is AABAB.)

$$\text{10 Possible outcomes: } \left\{ \begin{array}{ccccc} \{A & A & A & B & B\}, \\ \{A & A & B & A & B\}, \\ \{A & A & B & B & A\}, \\ \{A & B & A & A & B\}, \\ \{A & B & A & B & A\}, \\ \{A & B & B & A & A\}, \\ \{B & A & A & A & B\}, \\ \{B & A & A & B & A\}, \\ \{B & A & B & A & A\}, \\ \{B & B & A & A & A\} \end{array} \right\}$$

(b) Suppose a running tally is kept as slips are removed. Let C be the event that A remains ahead of B throughout the tally. List the outcomes in C.

$$C = \left\{ \begin{array}{ccccc} \{A & A & A & B & B\}, \\ \{A & A & B & A & B\}, \\ \{A & A & B & B & A\}, \\ \{A & B & A & A & B\}, \\ \{A & B & A & B & A\} \end{array} \right\} \text{Assuming } A \text{ can tie } B$$

3. Consider an experiment in which we roll two 4-sided dice, one red, one green. Let A be the event that the red die is 2; let B be the event that the sum is a prime number (the number 1 is not prime), and let C be the event that the product is odd.

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(a) List the elements in B. (This a set, so make sure you use set notation, $B = \{\}$.)

$$B = \left\{ \begin{array}{ll} \{1, & 1\}, \\ \{1, & 2\}, \\ \{2, & 1\}, \\ \{2, & 3\}, \\ \{3, & 2\}, \\ \{2, & 5\}, \\ \{5, & 2\}, \\ \{6, & 5\}, \\ \{5, & 6\} \end{array} \right\} \tag{1}$$

(b) List the elements in C.

$$C = \left\{ \begin{array}{ll} \{1, & 1\}, \\ \{1, & 3\}, \\ \{3, & 1\}, \\ \{3, & 3\} \end{array} \right\} \tag{2}$$

(c) $A \cup B = \{\quad\}$? What about the cardinality?

$$A \cup B = \left\{ \begin{array}{ll} \{1, & 3\}, \\ \{3, & 1\}, \\ \{3, & 3\}, \\ \{1, & 1\}, \\ \{1, & 2\}, \\ \{2, & 1\}, \\ \{2, & 2\}, \\ \{2, & 3\}, \\ \{2, & 4\}, \\ \{2, & 5\}, \\ \{2, & 6\}, \\ \{3, & 2\}, \\ \{5, & 2\}, \\ \{6, & 5\}, \\ \{5, & 6\} \end{array} \right\} \text{Cardinality} = 15 \tag{3}$$

(d) $B \cap C = \{\quad\}$? What about the cardinality?

$$B \cap C = \{1, 1\} \quad \text{Cardinality} = 1 \tag{4}$$

(e) Explain how you know that events A and C are mutually exclusive, just by considering how they are defined (i.e. without parsing the lists of outcomes they contain).

C has to be made up of results that multiply to be odd. A must contain at least one 2. No product of any integer N and 2 will ever be odd, thus no element in set A can be in set C.