weekly worksheet (from textbook)

Probability and Statistics 1, Math 440.

February 2, 2025

section 2.2.

1. Three dice are tossed, one red, one blue, and one green. What outcomes make up the event A that the sum of the three faces showing equals 5?

2. Let P be the set of right triangles with a 5" hypotenuse and whose height and length are a and b, respectively. Characterize the outcomes in P.

3. Find A ∩ B ∩ C if $A = \{x : 0 \leq x \leq 4\}$, $B = \{x : 2 \leq x \leq 6\}$, and $C = \{x : x = 0, 1, 2, ...\}$.

4. Let $A_1, A_2, \ldots, A_k$ be any set of events defined on a sample space S. What outcomes belong to the event $(A_1 \cup A_2 \cup \ldots \cup A_k) \cup (A_1{}^c \cap A_k{}^c)$.

5. Let A and B be any two events. Use Venn diagrams to show that

   (a) the complement of their intersection is the union of their complements: $(A \cap B)^C = A^C \cup B^C$

   (b) the complement of their union is the intersection of their complements: $(A \cup B)^C = A^C \cap B^C$

   (These two results are known as DeMorgan's laws.)

section 2.3

1. Let A and B be any two events defined on S. Suppose that $P(A) = 0.4, P(B) = 0.5$, and $P(A \cap B) = 0.1$. What is the probability that A or B but not both occur?

2. Draw the Venn diagrams that would correspond to the equations (a) $P(A \cap B) = P(B)$ and (b) $P(A \cup B) = P(B)$.

3. Two dice are tossed. Assume that each possible outcome has a $\frac{1}{36}$ probability. Let A be the event that the sum of the faces showing is 6, and let B be the event that the face showing on one die is twice the face showing on the other. Calculate $P(A \cap B^C)$.

Rather than reflecting on each problem separately, try to reflect on growth mindset, productive failure, and grit, in general.

1. Three dice are tossed, one red, one blue, and one green. What outcomes make up the event A that the sum of the three faces showing equals 5?

$(1,1,3)$
$(1,2,2)$
$(2,1,2)$
$(1,3,1)$
$(3,1,1)$
$(2,2,1)$

2. Let P be the set of right triangles with a 5" hypotenuse and whose height and length are a and b, respectively. Characterize the outcomes in P.

$$a^2 + b^2 = 5^2$$
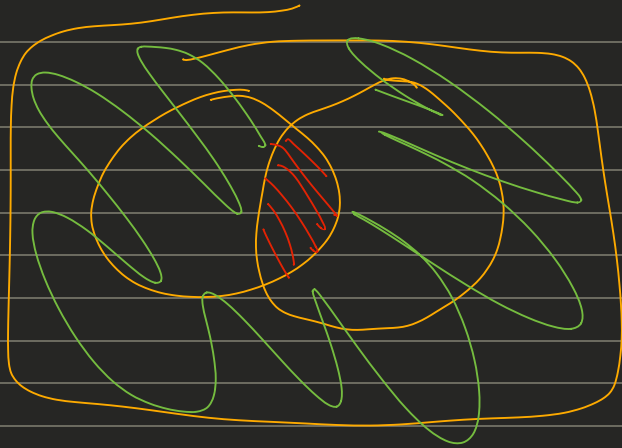$$a^2 + b^2 = 25$$
$$a,b \mid a^2 + b^2 = 25, a > 0, b > 0$$

3. Find $A \cap B \cap C$ if $A = \{x : 0 \leq x \leq 4\}$, $B = \{x : 2 \leq x \leq 6\}$, and $C = \{x : x = 0, 1, 2, ...\}$.
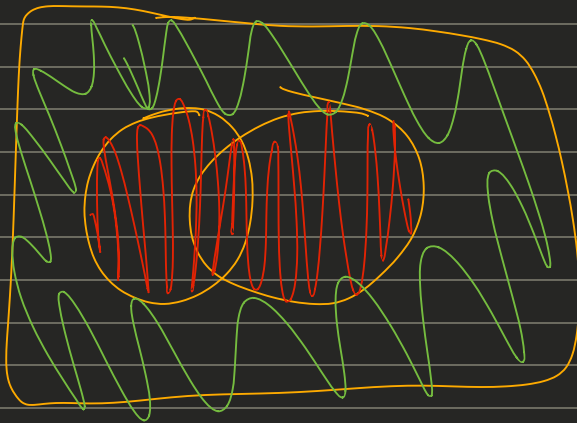
$$A \cap b = \{X : 2 \leq X \leq 4\}$$

$$A \cap b \cap C = \{2, 3, 4\}$$

4) $A_1 \cup A_2 ... \cup A_k \cup (A_1^C ... \cap A_k^C) = \boxed{A_1^C \cap A_k^C}$

5) a $(A \cap B)^c = A^c \cup B^c$

b $(A \cup B)^c = A^c \cup B^c$
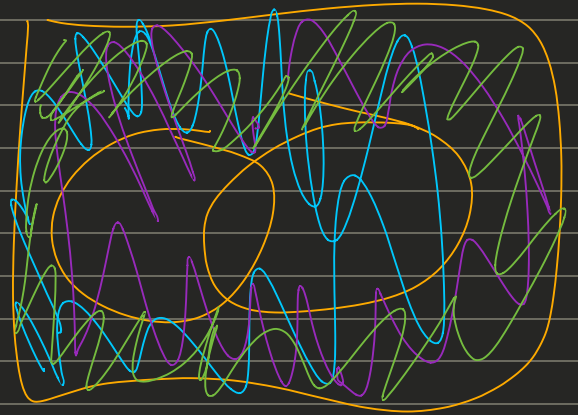
2.3

1) $P(A) = 0.4$, $P(B) = 0.5$,
$P(A \cap B) = 0.1$

$P(A \cup B) = P(A) + P(B) - P(A \cup B) = 0.4 + 0.5 - 0.1$
$\qquad\qquad\qquad\qquad\qquad\qquad 0.8$

$P(A \cup B) - P(A \cap B) = \boxed{0.7}$

A: $a+b=6$

B: $2a=b$

$$1, 5$$
$$2, 4$$
$$3, 3$$
$$4, 2$$
$$5, 1$$

$$\frac{3}{36}$$