

- Let A, B , and C denote sets. Prove the following:
 - $A \times (B \cup C) = (A \times B) \cup (A \times C)$
 - $A \times (B \cap C) = (A \times B) \cap (A \times C)$
- Given sets $B = \{t, u, r, k, e, y\}$ and $A = \{b, r, u, t, e\}$, compute $|2^B - 2^A|$.
- Let $A = \{6x + 9y + 20z \mid x, y, z \in \mathbb{N}\}$. Find $|\mathbb{N} - A|$.
- How many positive integers less than 1000 are either a perfect square or a perfect cube?
- How many 4 digit numbers satisfy the following conditions:
 - Only have even digits.
 - Contain a 7.
 - Is divisible by 3 or 11.
 - All digits are unique.
 - (Hard!) Digits increase, decrease, then increase when reading from left to right (i.e. 1919).
- You roll 3 fair 6-sided dice. Compute the following probabilities:
 - All 3 numbers are unique
 - All 3 numbers are even
 - A 2 is rolled at least once
 - Sum of the numbers is 10
 - Sum of the rolls is odd
 - Each number is higher than the previously rolled number
- How many ways can $A = \{1, 2, 3, 4\}$ be partitioned? How about $A \cup \{5\}$? Develop an algorithm to compute the number of possible partitions when $|A| = n$.
- A poker hand contains 5 unique cards from a 52 card deck. Calculate the amount of ways to form the following hands:
 - 4 of a kind
 - Full house
 - Triple
 - Two pairs
 - (Hard!) Pair
- Consider the sets $A = \{0, 2, 4, 6, 8\}$ and $B = \{1, 3, 5, 7, 9\}$. Construct the following relations from A to B :
 - $R = \{(x, y) : x < y\}$
 - $R = \{(x, y) : y \mid x\}$
 - Do these relations have any special properties?
- (Challenging!) Each 1×1 square of a 3×3 square (9 total such squares) is to be colored either blue or red. For each square, either color is equally likely to be used. Find the probability of obtaining a grid that does not have a 2-by-2 red square.

PILOT Learning - Tip of the Week

Looking for an adventure? Do you want to get off of campus and into the fresh air? The JHU Outdoors Club (JHOC) has an adventure waiting for you. Trips include backpacking, canoeing, caving, mountain biking and hiking! The best part is trips are free. Check out their website for a schedule of upcoming trips: <http://outdoors.johnshopkins.edu>