Math Team Meeting Activity: Shape Maze

Combination and Permutation

24 April 2026

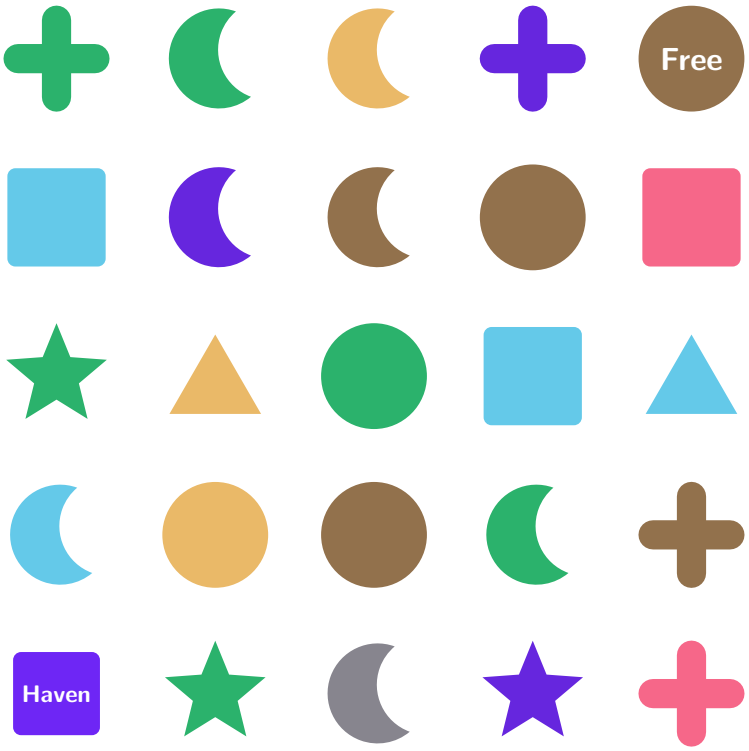
§ Introduction

Haven the raven loves shapes and colors. Every morning, Haven leaves her house to find foods. Knowing that Haven loves shapes and colors, a notorious farmer made a trap with different shapes and colors. Please help Haven arrive safely to her haven!!

Below are the rules proposed by the farmer.

- Only horizontal and vertical movements are allowed
- Move to the desired shape with either same color or shape
- Solve the combinatorics problems
- Move left if A, right if B, down if C, and up if D

§ Shape Maze Trap



Shape Maze Inspired By Julia Robinson Mathematics Festival

§ Farmer's Problems

1. What is the number of possible words that can form with the letters H, A, V, E, N?

   (A) 60 **(B)** 120 **(C)** 25 **(D)** 5

2. Possible words with B, A, N, A, N, A??

   (A) 36 **(B)** 120 **(C)** 720 **(D)** 60

3. The notorious farmer needs some help with counting! How many integers between 1000 and 9999 have four distinct digits?

   (A) 4536 **(B)** 3024 **(C)** 5040 **(D)** 6480

4. This time, the farmer wants to know the probability that a randomly chosen integer between 1000 and 9999 is an odd integer whose digits are all distinct!

   (A) $\frac{107}{400}$ **(B)** $\frac{14}{75}$ **(C)** $\frac{56}{225}$ **(D)** $\frac{7}{25}$

5. The farm animals love the number 2. Therefore, the farmer decided to count the number of integers between 100 and 400 that contains the number 2. Can you help him with the counting?

   (A) 100 **(B)** 138 **(C)** 140 **(D)** 148

6. Swanky the donkey had a beef with the farmer due to low compensation for work. Swanky, being a swanky donkey, offered a mathematical game to the farmer to demand an increase in "celery". The rule is simple. The farmer is given a fair coin where he flips the coin in every turn. If the coin lands on tails, the farmer moves one step to the left. Where as if the coin lands on heads, the farmer moves one step to the right.

   The farm has a fence at position $x = 0$ and a garden of nuggets at position $x = 10$. If the farmer ever hits the fence, he loses, and Swanky receives the raise. On the other hand, Swanky loses if the farmer reaches the nugget garden.

   What is the probability that the farmer loses if he starts from position $x = 4$?

   (A) $\frac{1}{2}$ **(B)** $\frac{1}{3}$ **(C)** $\frac{2}{5}$ **(D)** $\frac{9}{25}$

7. Hmmm... Swanky is still not satisfied with the probability. This time, Swanky decided to give the farmer an unfair coin with $p = 0.6$ as the probability of landing on tails. Swanky being swanky, he decided to move the garden of nuggets to $x = 1000$.

   If the farmer start from the position $x = 600$, what is the probability that Swanky receives the raise?

   (A) 0.6 **(B)** $1 - \epsilon$ **(C)** 0.36 **(D)** 1

8. After losing the game with Swanky, the notorious farmer decided to study probability. Can you help him find the probability of rolling a fair die six times and getting at least a five at least five times?

   (A) $\frac{2}{729}$ **(B)** $\frac{3}{729}$ **(C)** $\frac{12}{729}$ **(D)** $\frac{13}{729}$

§ Solutions

Solutions available here!!

§ Resources Consulted

- Shape Maze Motivation: Julia Robinson Mathematics Festival
- Problem 3: 2015 AMC 8 Problem 10
- Problem 4: 2017 AMC 8 Problem 20
- Problem 5: 1985 AJHSME Problem 15
- Problem 8: 1974 AHSME Problem 24