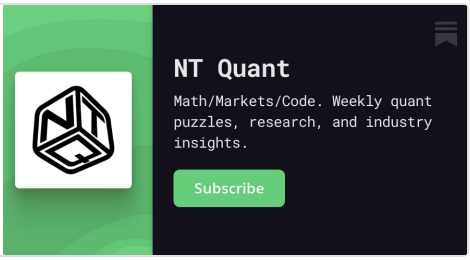
Quant Puzzles 5 - Rapid Fire Probability [NT Quant]



Problem 1: Trials To Heads [Easy]

You are flipping a coin with probability 3/4 of landing on heads. What is the expected number of trials to get the first heads?

Solution:

This is a geometric distribution.

$$P(X = n) = (1/4)^{n-1}(3/4)$$

$$\implies E[X] = 1/(3/4) = 4/3$$

Problem 2: Trailing Zeros [Medium]

Given some factorial n!, write a program in python to find the number of trailing zeros.

Solution:

```
def trailingZeroes(self, n: int) -> int:
  power = 5
  zeros = 0
  while power <= n:
      zeros+= n//power
      power = power*5
  return zeros
```

Problem 3: Grid Walking [Hard]

How many unique paths are there from the coordinate point (0,0,0) to (3,3,3) assuming one can only increase an axis by 1 move at each step?

Solution:

Every path will have 9 possible moves. Let X denote a move in the X-direction, Y denote a move in the Y-direction, and Z denote a move in the Z-direction.

An example path is: XXXYYYZZZ,

since this is a string of length 9, there are 9! permutations,

But for each direction, there will be 3! redundant permutations

- XXX creates a factor of 3! redundant permutations
- YYY creates a factor of 3! redundant permutations
- ZZZ creates a factor of 3! redundant permutations

$$\frac{9!}{3!3!3!} = 1680$$