Graph Theory

* [Terms, all the terms](https://quizlet.com/_5meiea)
* Dijkstra’s Algorithm
  + Find the shortest path from one node to the next. Not every node will be visited.
* Prim’s Algorithm
  + Given a graph, pick a starting point and find the path that costs the least. Once a node is reached, evaluate recursively all the other nodes, making sure no node is visited twice. It is possible for multiple spanning trees to exist in one graph.
* Hamiltonian Cycle
  + Visit one node only once
  + You can use Ore’s Theorem to determine if one exists in a given graph
* Directed Graph
  + Indegree/Outdegree: How many edges feed in and out of a given vertex
  + Strongly Connected: All vertices are accessible via any path taken on the graph
  + Weakly Connected: Not all vertices are accessible via any path taken on the graph

Combinatorics

* Combinations: All the possible outcomes of a given set of data where the order in which it is recited does not matter
  + Example → The amount of bit strings possible given a set of criteria
* Permutations: All the possible outcomes of a given set of data where the order picked does matter
  + Example → A locker code
* Sequences : an enumerated collection of objects in which repetitions are allowed
  + Arithmetic (Adding/Subtracting)
  + Geometric (Multiply/Divide)
* Pigeonhole Principle: Given the cardinality of a set as n, there will be n-1 amount of places to place this data. Therefore two chunks of data will be placed in one cell. Chaining in hash tables follow this same principle.
* Binomial Theorem: Find a given coefficient by the index of the exponent given along with multiplying the coefficient of x/y raised to the appropriate power
* Bit String: A sequence of 1s and 0s
  + Weight is calculated from the amount of 1s there are in a given string
  + This is a combination where the order in which the 1s and 0s are ordered does not matter
  + An example of a string where order does matter is a string where there cannot be any repeating characters
  + Here you are given A, B, C, D and the possible permutations cannot have any repeating letters, the amount of possible permutations is 4! (factorial) or 24.
  + 

Recurrence Relations

* Given a recurrence relation, find the equation that satisfies the conditions
  + Recurrence relation
  + Two terms
  + Use system of equations to solve for the given values of A and B

Probability

* 4 step method
  + Tree diagrams
    - These can be created by branching out from the original condition
  + Poker hands
    - Order matters sometimes
      * In the case of picking a starting card for a sequence of cards such as royal flush
    - Order does not matter
      * In the case of picking a pair of cards solely based on the suit the share in common
* Conditional
  + Picking marbles from a bag
    - Given a bag that has 6 marbles, 2 of which are red and 4 are blue, what is the probability of choosing a blue, then a red and then a blue.
      * Since I have used **and** statements, the probability is inherently lower as the number gets smaller and smaller.
      * Initially there is a ⅓ chance of it being pulled, then a ⅘ chance and then lastly a ⅕ chance. Multiply them up and you have your answer.
      * 4/75 chance of being pulled
* N Card Riddle
  + Given N=5 cards
    - Two are all red
    - Two are red/blue
    - One is all blue
  + Find the probability in which I place a red facing card and the other side is red

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| --- | --- |
| R1 | R2 |
| R3 | R4 |
| R5 | B1 |
| R6 | B2 |
| B3 | B4 |

* + Cardinality of all possible outcomes : 10
  + Cardinality of possible red occurrences : 6
  + 6/10 == 2/3 chance of the other side being red