Discrete Applications

Graph Theory:

A **graph** is a set of points, called nodes or vertices, which are interconnected by a set of lines called edges. The study of **graphs**, or **graph theory** is an important part of a number of disciplines in the fields of mathematics, engineering and computer science.
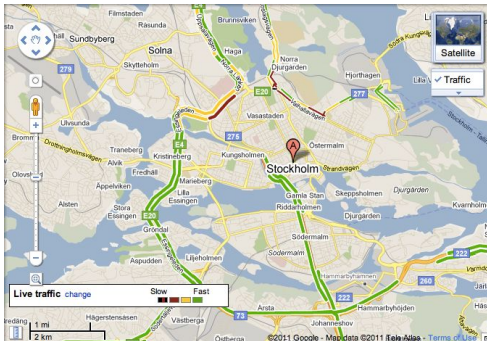
Example:

Road Maps:

Effective Maps can be created using different laws of Graph theory.

It can be applied to solve the following common cases:

- The shortest path from one point to another (using Dijkstra's algorithm)
- The busiest path (most connected vertex)
- Find near me (All locations nearby can be found too)

Railway System:

Graph theory rules can be used to choose the most on-time routes for train trips.
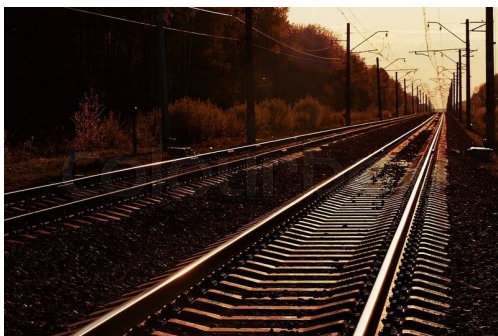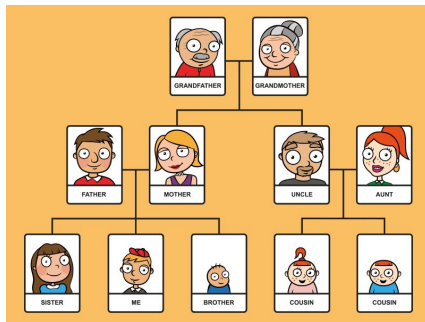

Trees:

Trees are collections of nodes, called a graph. The nodes are connected by lines called edges. A **tree** can manifest itself in many forms such as a spanning **tree**, a **tree** with loops, or a non-spanning **tree.**
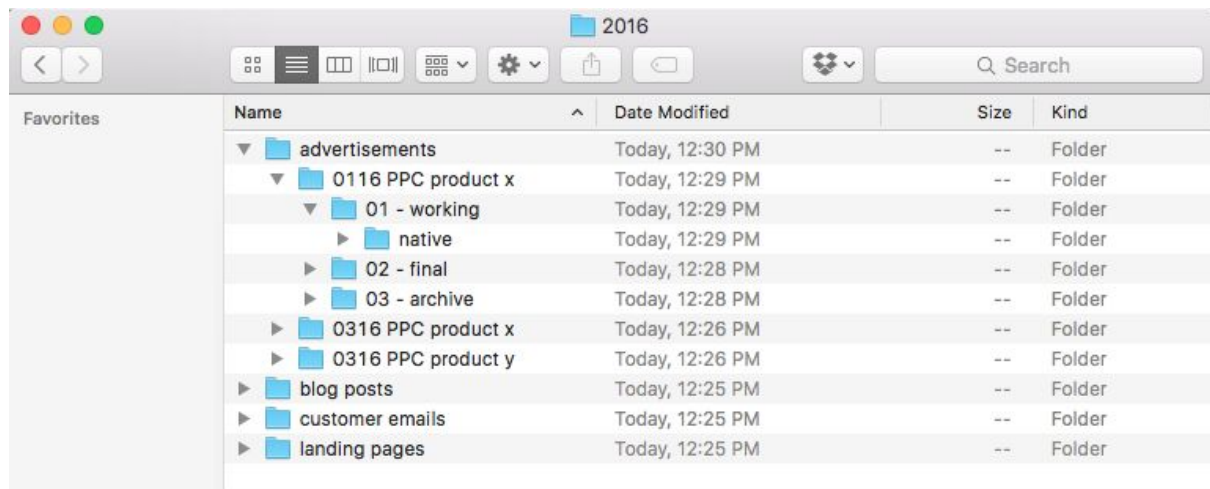
Example:

Family Tree:

Family Tree is the most basic example of Discrete Trees.

Folders:

Nested computer folder heirarchy is one of the examples of Trees.

Combinatorics:

Combinatorics is an area of mathematics primarily concerned with counting, both as a means and an end in obtaining results, and certain properties of finite structures.

Example:

Factorials:

Combinatorics can help us count the number of orders in which something can happen. Consider the following example:

In a classroom there are 3 pupils and 3 chairs standing in a row. In how many different orders can the pupils sit on these chairs?

Let us list the possibilities – in this example the 3 different pupils are represented by 3 different colours of the chairs.

Permutation (Phone Number):

In a phone number there are a total 11 digits in which first 2 represent the area code and next 2 digits represent the network code so the first 4 digits are fixed, next 7 digits are permuted to form a new number.
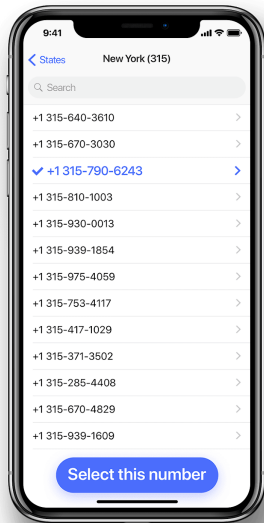
Discrete Probability:

HyperGeometric Distribution:
Hypergeometric distribution, which models the drawing of different coloured marbles from a bag without replacement.

Poisson distribution:
Poisson distribution is related to many real life phenomena:
- Number of accidents occurring in a fixed time.
- Number of natural disasters in a given time period.

Proofs:

Your books are full of proof-equation.
A real-life application you can find is a Lawyer.
Like when in mathematics we use laws to prove equations, the same way lawyers have to make arguments and present them in courts. It is very similar to constructing proofs in maths.