# Graph Theory

Vertex – Intersection pt.

Edge - Lines that connect vertices

Degree of a vertex = # of edges connected to the vertex

Parallel edges - connect the same 2 vertices

Edges can only cross at a vertex!


What vertices are adjacent to the Commons?

Lib, Main gym, Kitchen

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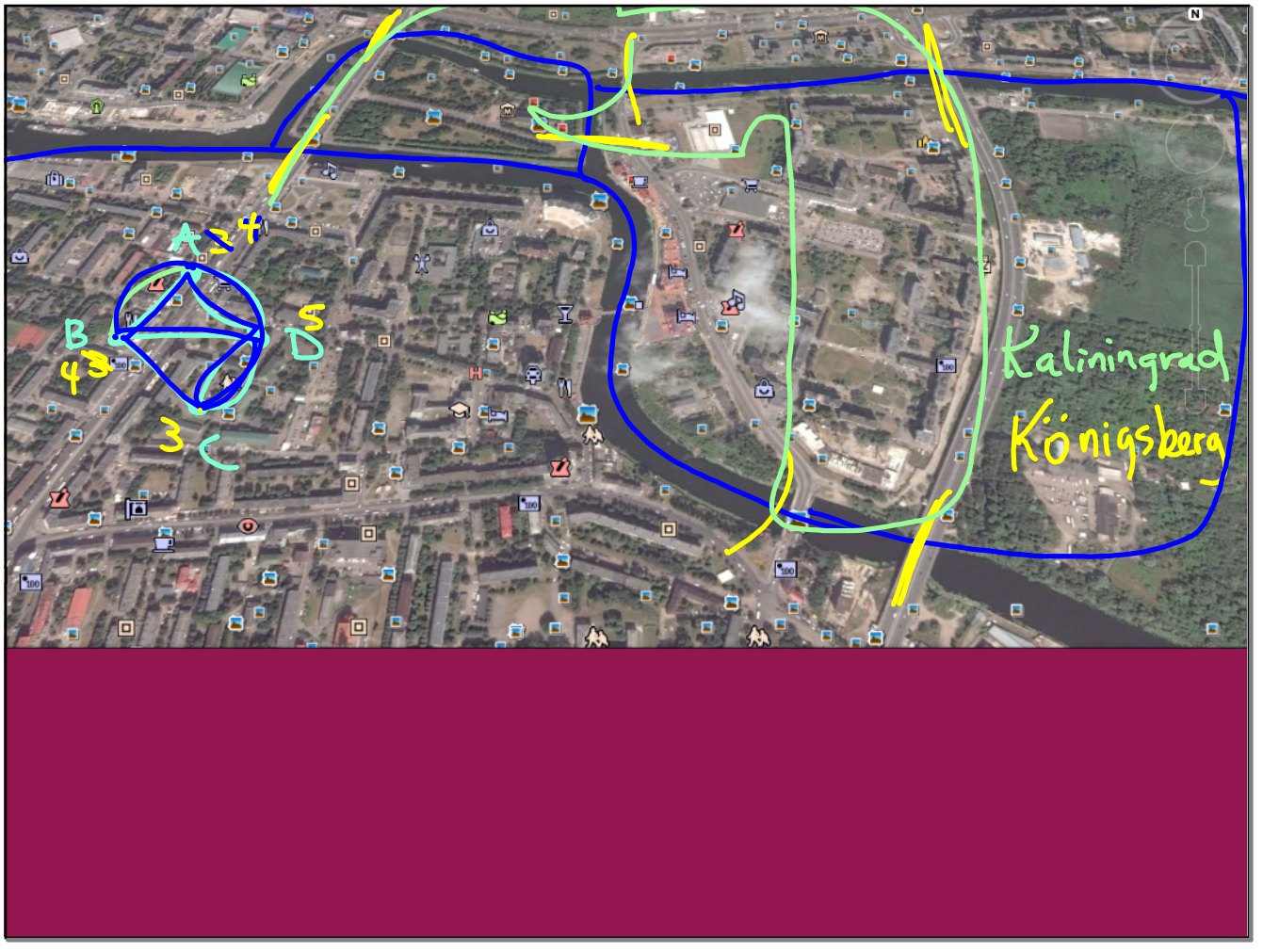

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# Paths + Circuits

## Euler Path

* cross every edge once
* different start + end

Possible = all even vertices except for start/end

## Euler circuit

* cross every edge once
* Same start + end point

Possible = All even degrees

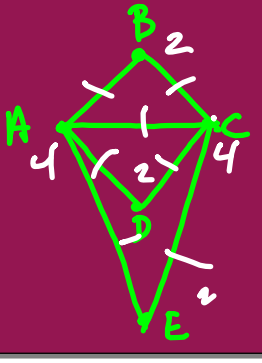
## Hamilton Path

* pass through every vertex once
* different start/end

No known method to determine if its possible

## Hamilton Circuit

* pass through every vertex once
* Same start + end point




Euler path = No

Euler circuit = yes

A, B, C, D, A, C, E, A

Ham path = yes

D, A, B, C, E

Ham circuit = No

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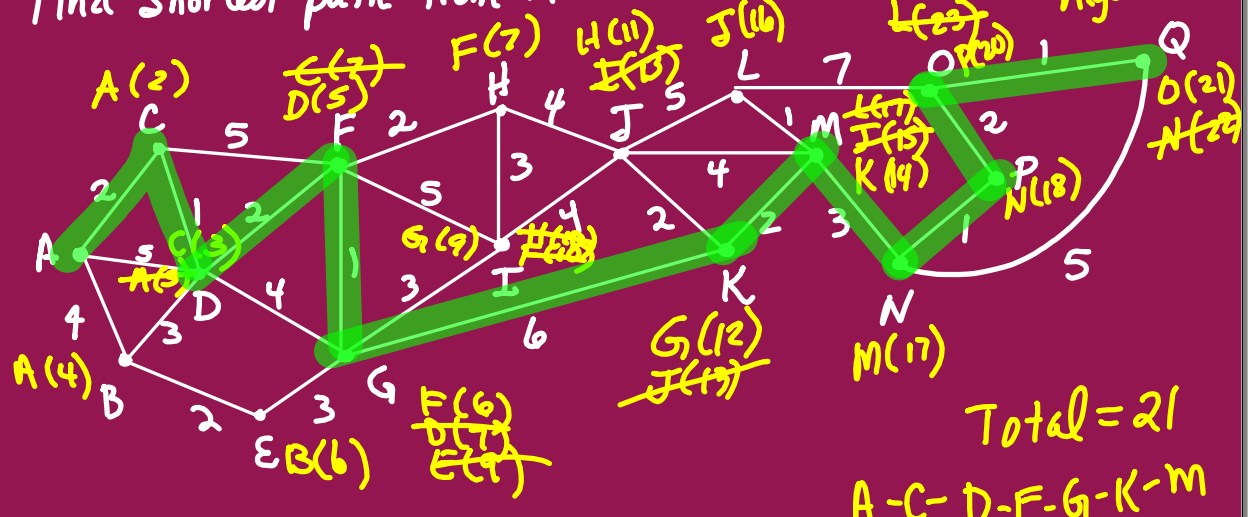
# SHORTEST PATHS

* Weighted graph – edges have a numerical value
* Must use algorithm to find shortest path

Find shortest path from A to Q. Breadth First Search Algorithm




Total = 21

A-C-D-F-G-K-M-N-P-O-Q

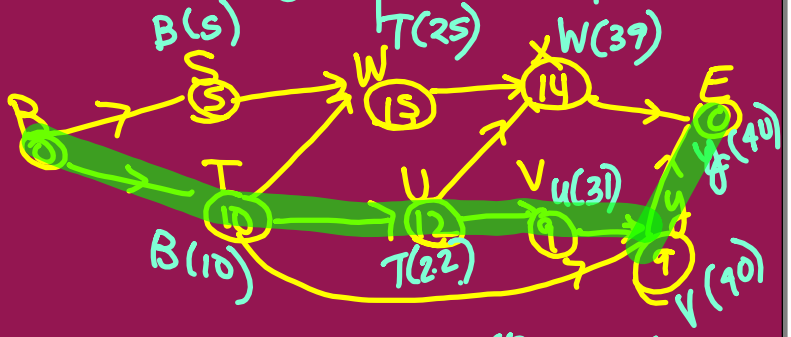
# CRITICAL PATHS

* directed graph
* the longest path between 2 vertices
* try to find the minimum time to complete a task

Foundation = 10
Frame = 4
Roof = 5
Electrical = 4
Plumbing = 3
HVAC = 2

## Manufacturing a CD

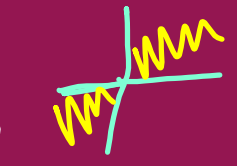
| Task | Time Required | Prerequisite Tasks |
|---|---|---|
| S | 5 min | none |
| T | 10 | none |
| U | 12 | T |
| V | 9 | U |
| W | 15 | T, S |
| X | 14 | U, W |
| y | 9 | T, V |




B - T - U - V - y - E

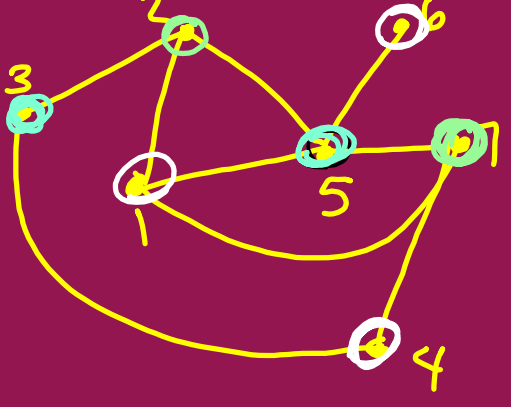
# Coloring Vertices

Key: Connect the vertices you are actually trying to separate!



4.

| Chemical | Cannot be stored with |
|---|---|
| 1 | 2, 5, 7 |
| 2 | 1, 3, 5 |
| 3 | 2, 4 |
| 4 | 3, 7 |
| 5 | 1, 2, 6, 7 |
| 6 | 5 |
| 7 | 1, 4, 5 |




3 cabinets
Cab 1: 3, 5
Cab 2: 2, 7
Cab 3: 1, 4, 6