

GRAPH THEORY

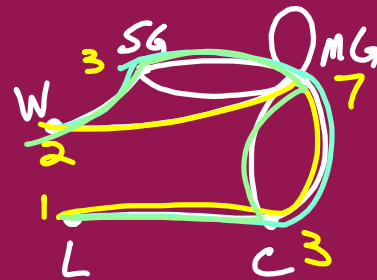
Vertex — Intersection pt.

Edge — Lines that connect vertices

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

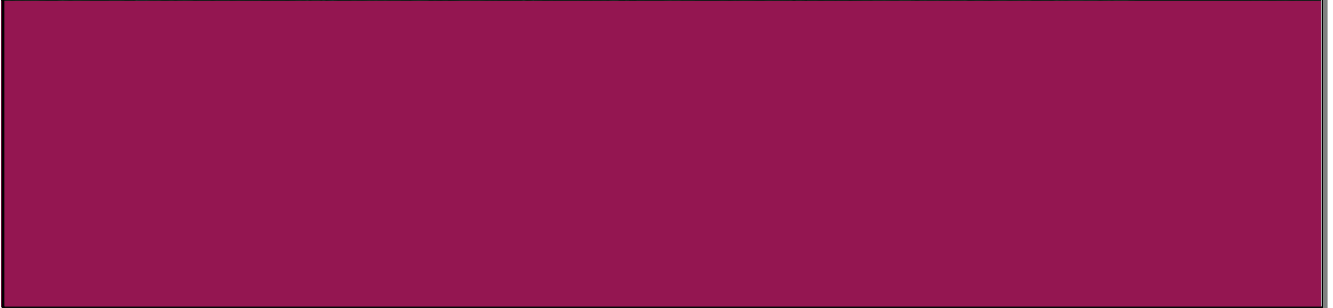
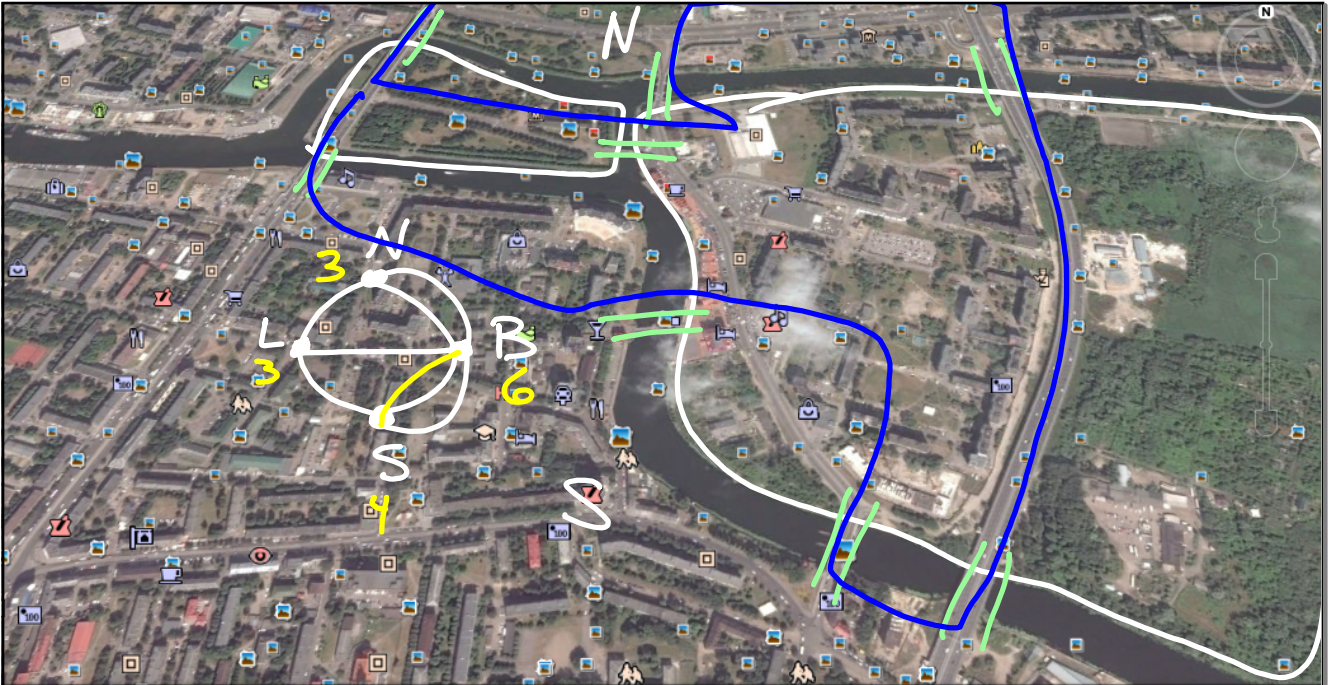
Parallel edges — connect the same 2 vertices

Edges can only cross at a vertex!



Leonard Euler

Königsburg
Kalinin grad



PATHS + CIRCUITS

Euler Path

- * cross every edge once
- * different start + end
- * All even degrees except 2

Euler circuit

- * cross every edge once
- * Same start + end point
- * All even degrees

Euler Path - No

Euler Circuit - yes
all even degrees

A-E-C-B-A-C-D-A

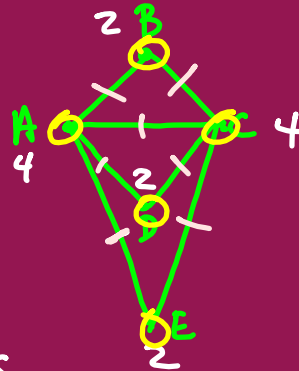
Hamilton Path

- * pass through every vertex ^{once}
- * different start/end

Use Trial + Error

Hamilton Circuit

- * pass through every vertex ^{once}
- * Same start + end point



Ham. Path

B-A-D-
C-E

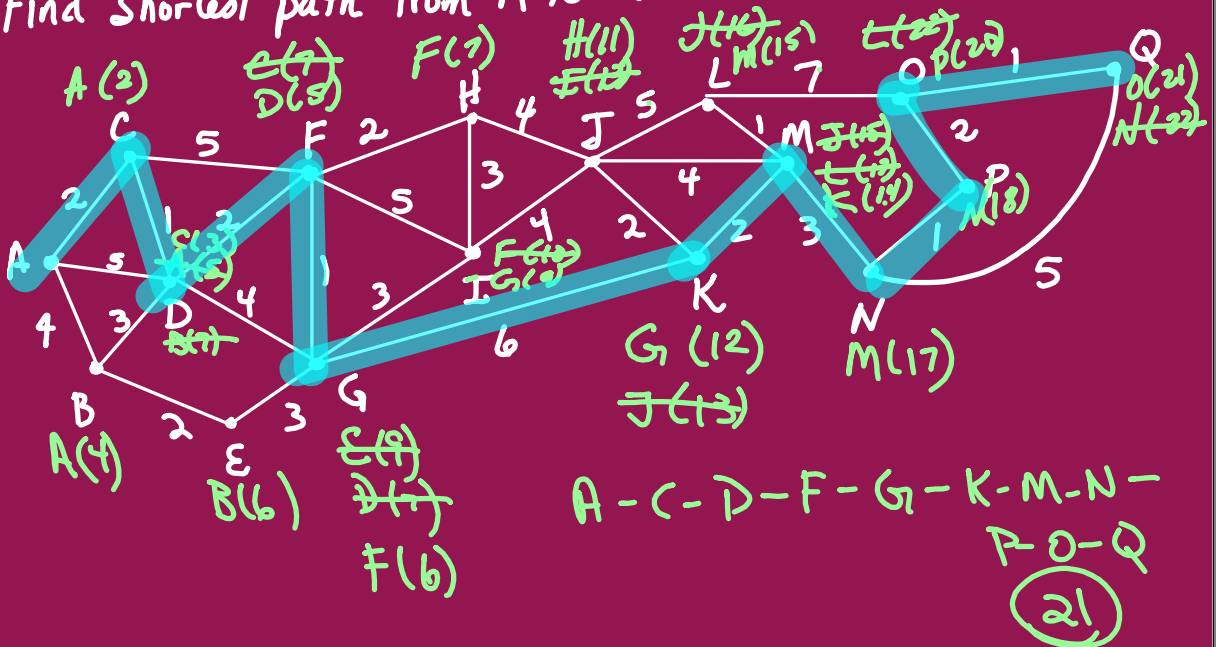
Ham. Circuit

No.

SHORTEST PATHS

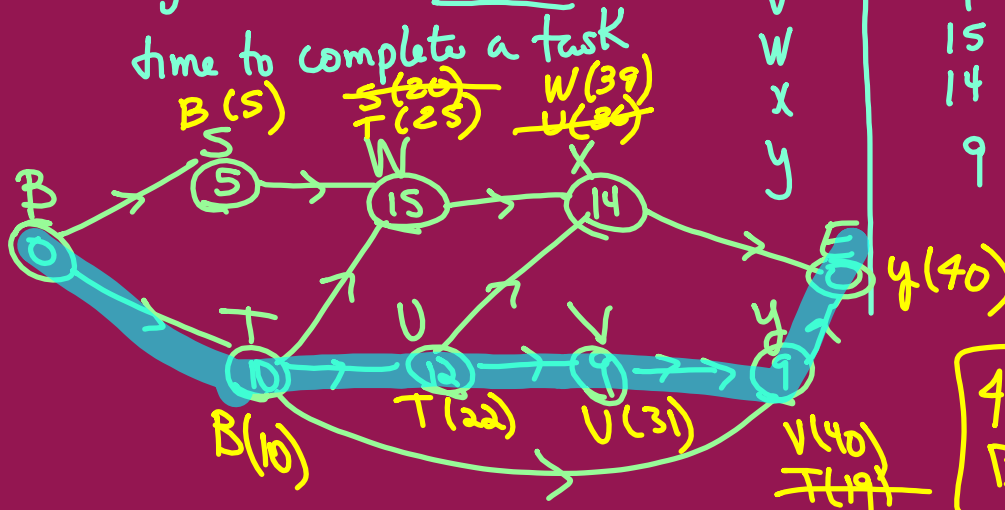
- * Weighted graph - edges have a numerical value
- * Must use algorithm to find shortest path

Find shortest path from A to Q.



CRITICAL PATHS

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



Manufacturing a Cell Phone

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

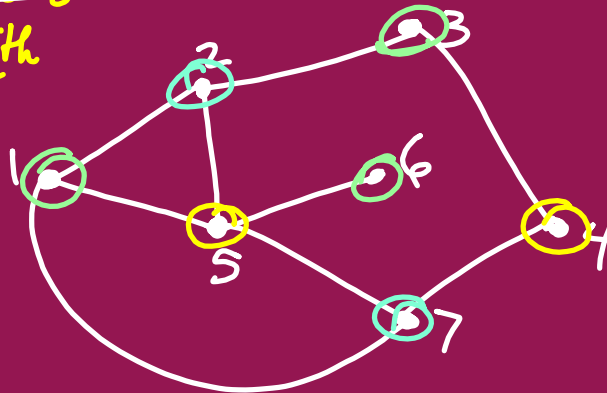
40 min
B-T-U-V-Y-E

COLORING VERTICES

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

yel	Blue
Blue	yel

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 = 1, 3, 6

Cab 2 = 4, 5

Cab 3 = 2, 7