Most examples involve minimizing some type of cost (money or material resources). Some examples specifically require a path or circuit.

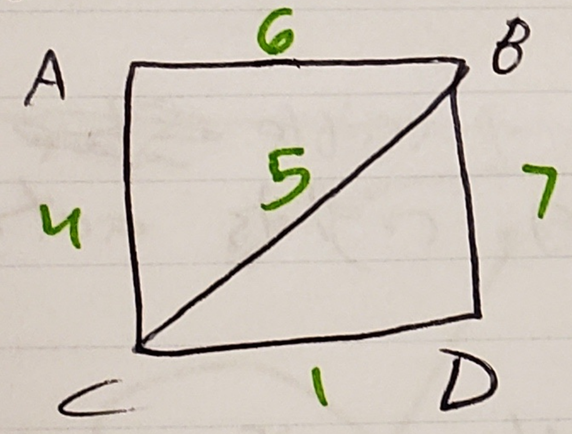
If there are less edges, there are less situations to check (less edges give a sparser graph; more edges give a denser graph)

Fact) On a weighted graph, all Euler Circuits and Euler paths have the same cost. Prompt students for definitions.

Why?

They all go through all edges once, just in a different order.

Demonstration:



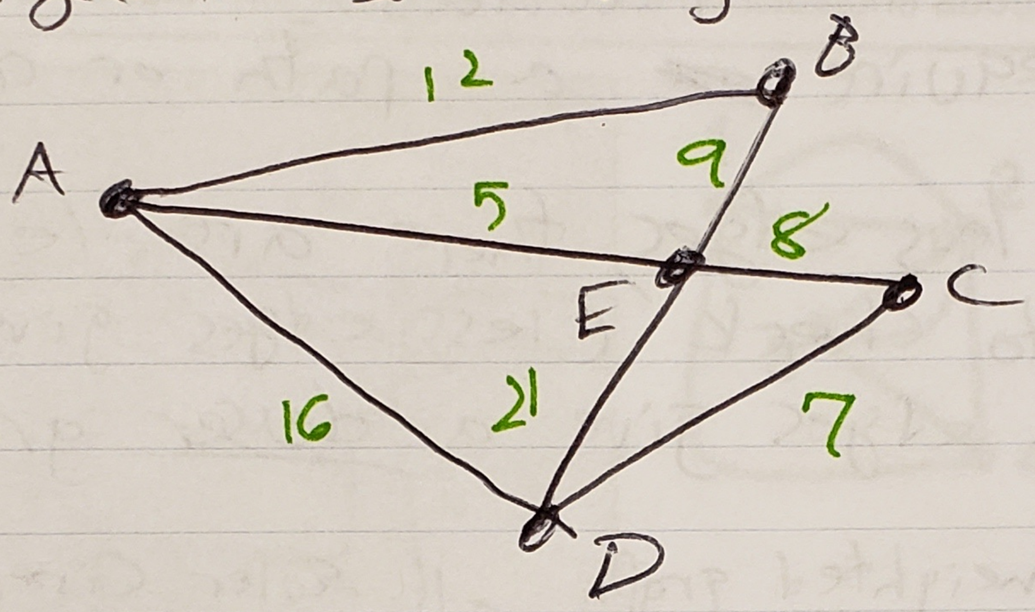
A few Euler paths: (can ask students to give more)

C→A→B→D→C→B:
4+6+7+1+5 = 23

B→C→A→B→D→C:
5+4+6+7+1 = 23

MATH 113 Special Topic – ~ Traveling Salesman and Weighted Graphs

A <u>graph</u> is a collection of edges and vertices arranged in some way.



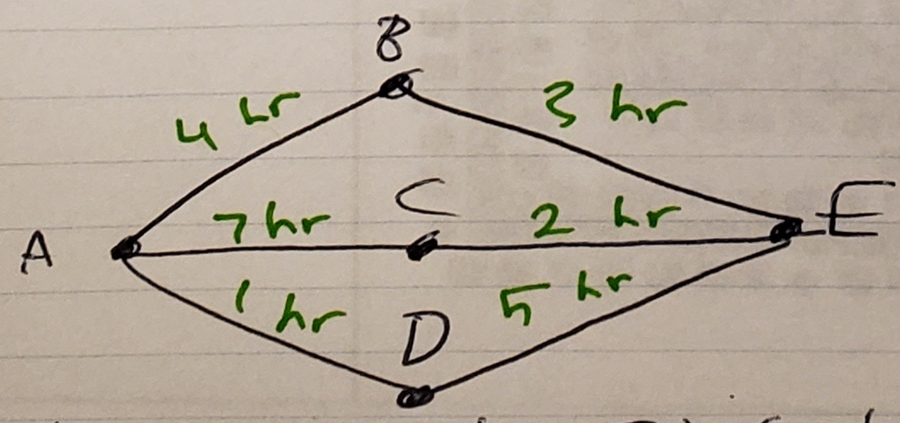
A <u>weighted graph</u> is a graph with a weight, or cost, on each edge.

Why weighted graphs? The weights give new meaning (ask students for examples). They include:

- Distance to travel
- Cost to travel
- Resources gained/lost (eg possible ~~states~~ places for rallies for an environmental rights activist group) between major cities)

The <u>Traveling Salesman Problem</u> is about visiting a series of cities for as low a cost as possible. For <u>lots</u> of edges, not even computers can solve this quickly, but we can look at small examples.

<u>Example:</u>



Fastest route from A to E? Go through D, 6 hr.
Check each path.