**Dotabout**

# The interface layout

New Stage

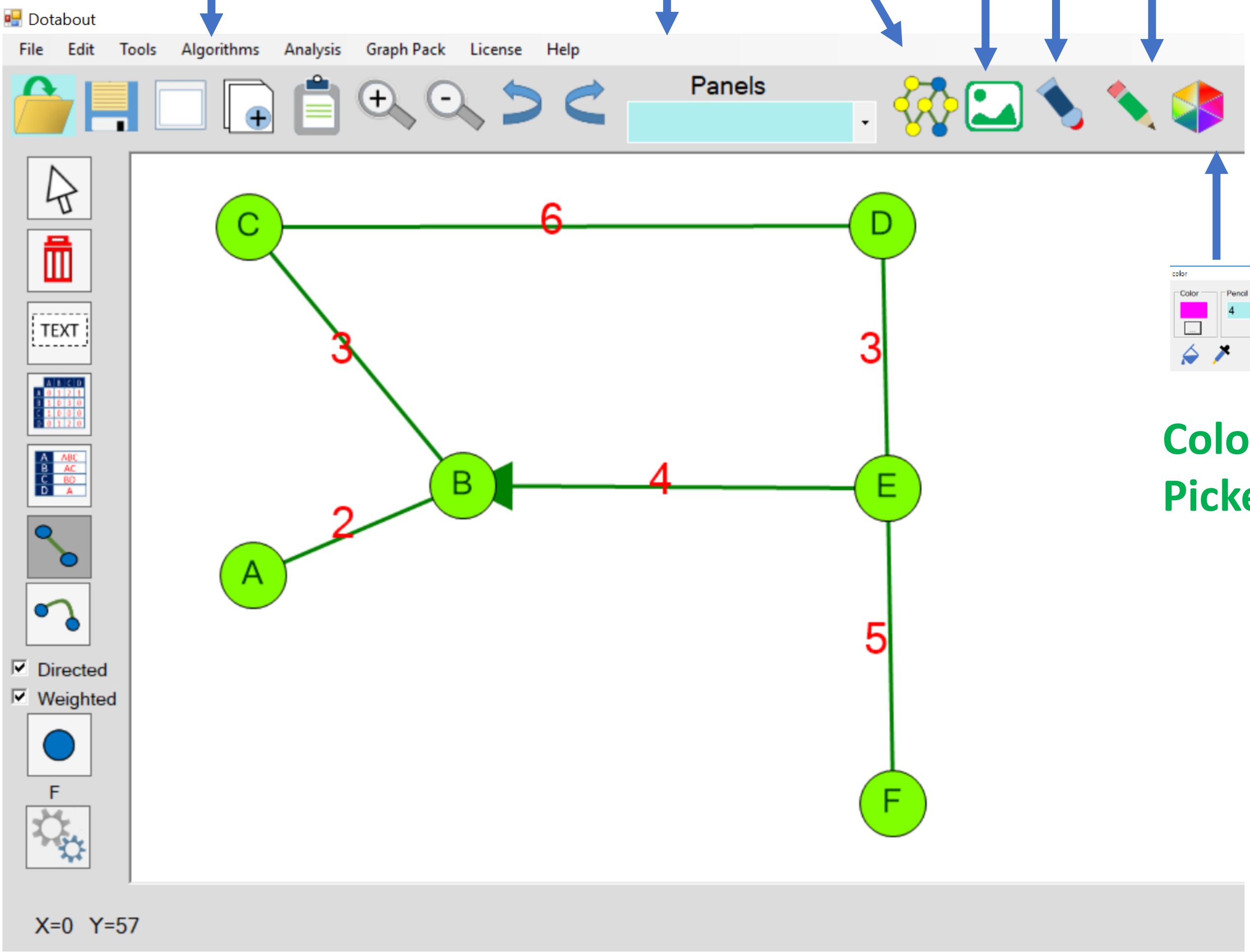
Algorithm Panel

Graph Templates

Image Library

Manual Trace

Pencil



☑ Directed

☑ Weighted

X=0 Y=57

Select

Delete

Add Text

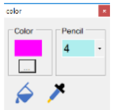
Adjacency List

Adjacency Matrix

Add Edge

Add Node

Settings



Color Picker

# Eulers Algorithm

## Euler path & cycle

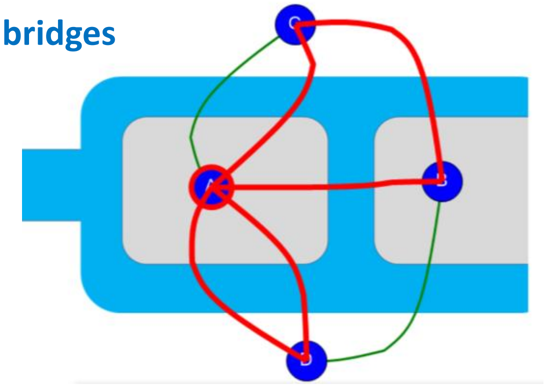
An Euler path or circuit is a path that uses every edge of a graph exactly once.  An Euler path starts and ends at a different node. An Euler circuit starts and ends at the same node. For a graph to have an eulerian path it must have exactly 2 odd connecting edges.

## Leonhard Euler

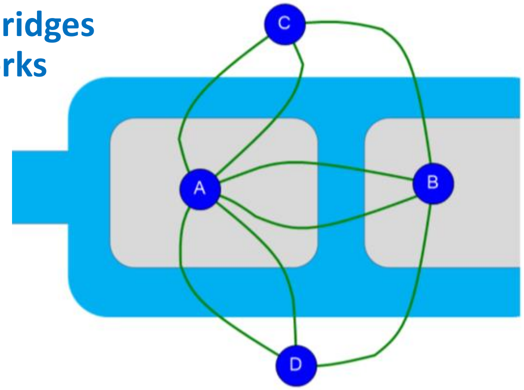
The swiss mathematician was the first to make an important discovery in the mathematical field of graph theory. In 1736 he looked at the problem of the 7 bridges of Königsberg. The problem was this

**Königsberg was built on the banks of the Pregel river with four separate landmasses that the residents accessed via seven different bridges. Is it possible to cross each bridge exactly once to get through the town?**

**7 bridges**



**8 bridges works**



## Eulers findings

**First consider this**

- Every bridge which is crossed must have another to return unless it is the first bridge or last bridge

**Conclusion**

- Land masses must have an **even number of connecting bridges**
- If the number of connecting bridges is **odd** it must be **exactly 2** these are for the start and finish of the walk. An Euler path
- If all land masses have an even number of connecting bridges, a walk can be taken and will start and end at the same land mass. An Euler cycle

**Answer to the puzzle**

All 4 land masses have an odd number of connecting bridges so the walk cannot be taken for the 7 bridges. An 8th bridge in the centre makes it possible

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# Graph Exercises

## Tasks

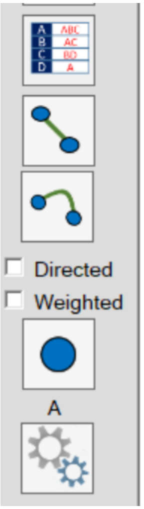
***Create the graph in figure 1***

1. How many nodes does the graph have?___________
2. How many connections does node **B** have?________
3. How many connections does node **C** have?________

***Update the graph with weight as figure 2***

4. What is the lowest weight from **A** to **D**?___________
5. What is the total weight of the graph?___________
6. Complete the Adjacency list below

| NODE | ADJACENT NODES |
|---|---|
| | |
| | |
| | |
| | |



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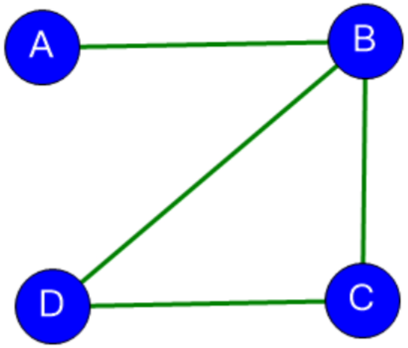
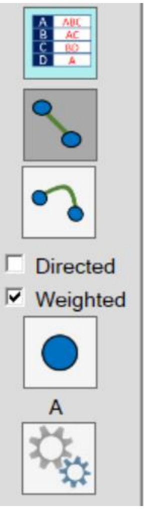


Figure 1



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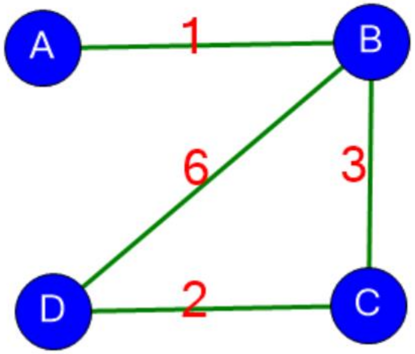

Figure 2

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# Graph Exercises

**ANSWERS**

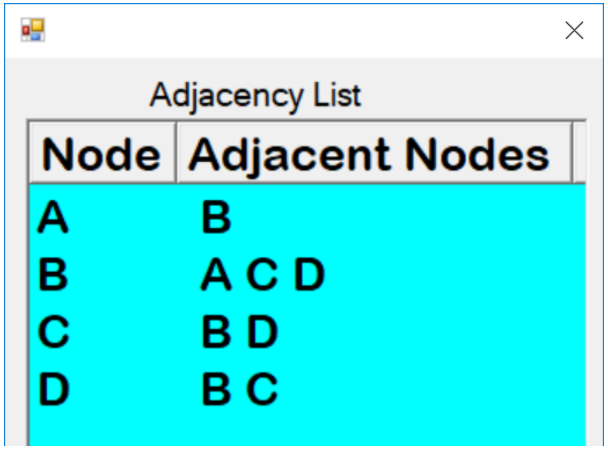
## Tasks

***Create the graph in figure 1***

1. How many nodes does the graph have? 4
2. How many connections doers node **B** have? 3
3. How many connections doers node **C** have? 2

***Update the graph like figure 2***

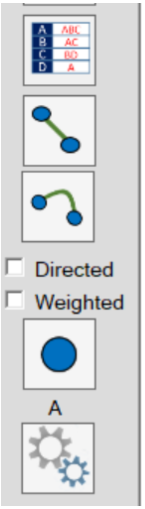
4. What is the lowest weight from **A** to **D**? 6
5. What is the total weight of the graph? 12
6. Complete the Adjacency list below



Adjacency List

| Node | Adjacent Nodes |
|---|---|
| A | B |
| B | A C D |
| C | B D |
| D | B C |

*click*



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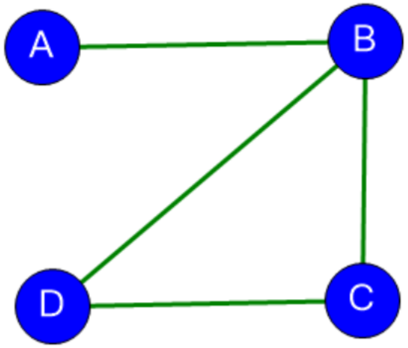
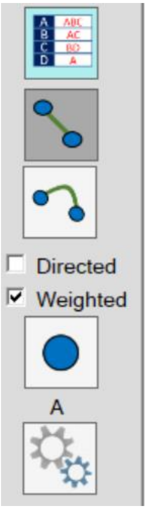


Figure 1



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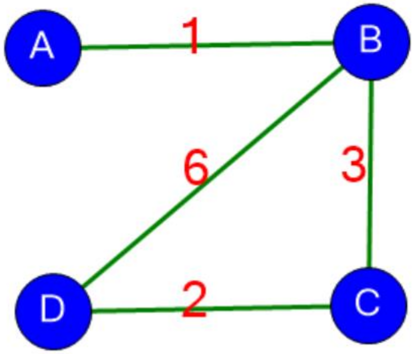

Figure 2