**Example: Prospecting**

A mining company wants to set up 7 mines in a region, each connected by a network of roads. Because the mines are located in mountainous terrain, some roads are more difficult and expensive to build than others. The company engineers constructed a network that shows the cost of building each road in millions of dollars.

Undertow

Wave

Ebb Tide

Swell

Tide

Ripple

The Deep

5

3

15

1

7

2

3

6

4

6

**Give the total cost of building all the roads shown in this graph**   
The Company cannot finance an undertaking of this scope. The project must be scaled down.  
**What is the least expensive path for connecting**:

* 1. **Wave & Swell?**
  2. **The Deep & Tide?**
  3. **Undertow & Tide?**

The company nonetheless wants access to all the sites from any one site.  **What characteristic must the desired layout have to meet this criterion?**

To reduce costs even further, the company wants to eliminate any unnecessary roads. **How can unnecessary roads be identified?**

**The company appears to want a connected graph without a simple circuit. What is this kind of graph called?**

**Construct a graph that meets the needs of the Company (A tree of minimum value)**

It is not always easy to find the tree with the smallest sum of the weights of the edges.

J.B. Kruskal proposed a method (also called an algorithm) for making the task easier:

1. Select the edge with the lowest (or highest) value
2. Of the remaining edges, select the one with the lowest (or highest) value.
3. Repeat the preceding step until all the vertices are connected without obtaining a simple circuit.

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A month after their initial presentation, the engineers modified the project. They presented the graph on the right.

Undertow

Wave

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Do these modifications change:

1. The layout of the tree?
2. The cost?