Concept – Spanning Trees and Prims Algorithm:

Trees are subgraphs that meet some certain criteria.
Simply a tree is a connected subgraph. In a tree the number of _____
This means there can be;

No Loops: 

No multiple edges: 

No cycles: 

A spanning tree follows these rules and also connects every _____ of the original network. In weighted graphs there are two types of spanning trees.

Minimum Spanning Tree:

_____

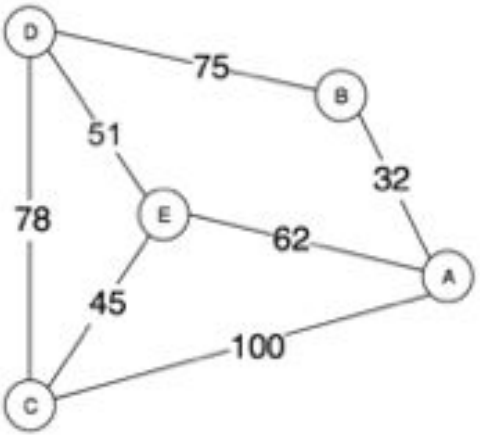
_____

Maximum Spanning Tree:

_____

_____

How to – Find a Minimum Spanning Tree using Prim's Algorithm:



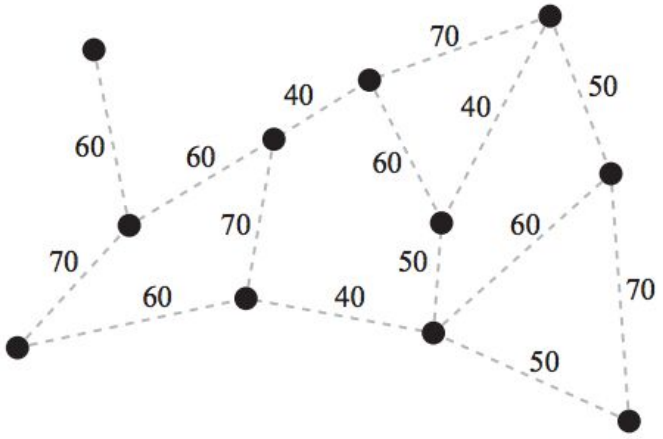
Step 1 – Choose the edge with the **Lowest** value (if there is more than one, any can be chosen).
Step 2 – Now we have 2 vertices attached, from either of these we select the next edge of the lowest value.
Step 3 - Now we have 3 Vertices attached, from any of these we select the next edge of the lowest value.
Step 4 – Repeat until all vertices are connected to the tree by an edge.
Step 5 – We have reached every **vertex**, add up (Sum) all of the edges visited.

You can use the method to find the Maximum Spanning Tree, the only difference being

always choosing _____

Example:
Often these types of questions are referred to as connector problems. For example

At the Farnham showgrounds, eleven locations require access to water. These locations are represented by vertices on the network diagram shown below. The dashed lines on the network diagram represent possible water pipe connections between adjacent locations. The numbers on the dashed lines show the minimum length of pipe required to connect these locations in metres.



All locations are to be connected using the smallest total length of water pipe possible.

a. On the diagram, show where these water pipes will be placed.

1 mark

b. Calculate the total length, in metres, of water pipe that is required.

_____

_____

1 mark

Worked Example

Find or draw a weighted graph. Identify the minimum spanning tree for your graph and calculate its weight.