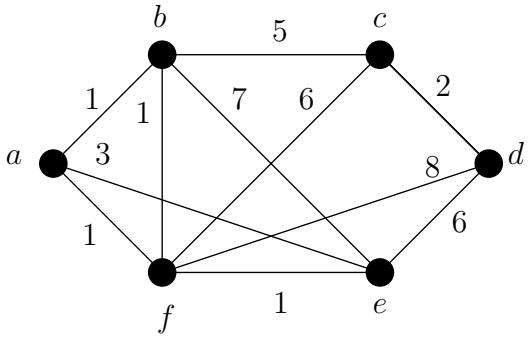
COMP108 Algorithmic Foundations
Tutorial 10
w/c 28th April 2014

Name: _____

Hand this in to the demonstrator at the end of the tutorial even if you haven't finished it. You will get feedback in the next tutorial. Tutorial participation contributes to 5% of overall marks.

1. Consider the following graph G. The label of an edge is the cost (weight) of the edge.

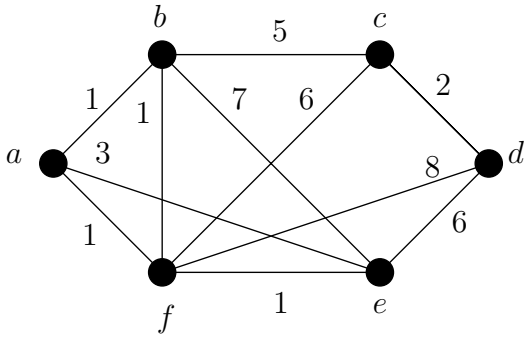


(a) Give a table listing all the edges in ascending order of the costs.
Table:

(b) Using Kruskal's algorithm, draw a minimum spanning tree (MST) of the graph. Write down the **order of the edges selected**.
If there is more than one solution, you only need to give one of the solutions.
MST:

Order of selection:

2. Consider the following graph G. The label of an edge is the cost (weight) of the edge.



Using Dijkstra's algorithm, find the shortest paths from the vertex a to all the other vertices. Show the **changes of the labels** of the vertices step by step and also the **order of selection of vertices/edges**.
If there is more than one solution, you only need to give one of the solutions.

Changes of labels & Shortest paths found:

Order of selection:

3. Consider the Knapsack problem with a knapsack of capacity 10. Suppose we have four items I_1, I_2, I_3, I_4. The following table lists the value and weight of each item.

Item	Weight	Value
I_1	2	20
I_2	4	30
I_3	6	35
I_4	8	40

(a) Fill in the following table to find the value and weight of all possible subsets of items.

Subset	Weight	Value	Subset	Weight	Value
$\{I_1\}$					
$\{I_2\}$					
$\{I_3\}$					
$\{I_4\}$					
$\{I_1, I_2\}$					

(b) Which is the subset with maximum value such that the weight does not exceed the knapsack capacity?

(c) Consider the following greedy method. *Start from the item with the largest value, select the item if adding this item to the selected set does not exceed the knapsack capacity.* Which subset of items is found by the above greedy method? Is the subset found the best solution?

4. **[Puzzle]** Consider the following flower with 13 petals. Two players take turns to remove one petal or two adjacent petals. (Note that the second player can take petal from anywhere as long as s/he take either one petal or two adjacent petals.) The player who removes the last petal wins. Design a winning strategy for the second player.