Problems

1. A music promoter wishes to arrange a tour for one of their music bands in Botswana. The driving distance between places they want to visit is given in the following table.

	Gaborone	Francistown	Molepolole	Maun	Selebi-Phikwe	Serowe	Kanye	Mahalapye	Palapye
Gaborone									
Francistown	435km								
Molepolole	55km	484km							
Maun	856km	491km							
Selebi-Phikwe	402km	146km	454km						
Serowe	315km	211km	319km	700km	177km				
Kanye	93km		84km	874km		406km			
Mahalapye	203km	245km	254km		201km	113km	293km		
Palapye	275km	171km	327km	591km	138km	50km	362km	82km	
Lobatse	74km	510km	121km	924km	476km	386km	50km	283km	344km
Jwaneng	161km	592km	151km	797km	560km	472km	80km	364km	433km
Orapa	526km	235km	542km	402km	388km	217km	626km	333km	261km

   (a) Draw a graph representation of the information in the table. You may number your locations.

   (b) Find a tour starting at Gaborone using the *nearest neighbor* algorithm.

   (c) Explain why using the brute force algorithm is futile.

   (d) A *complete* graph is a graph in which all possible edges are present. Give an example of a graph (not complete) in which the nearest algorithm can not create a complete tour, even though a tour exists.

2. Write an algorithm (in pseudocode) that will return the index of the last occurrence of largest element in the array $A[0:n-1]$.

3. Write an algorithm that reverses the array $A[0:n-1]$.

4. Write an algorithm whose input is an array $A[0:n-1]$. Each array element is either 0 or 1. Your algorithm should rearrange the array so that all of the 0s precede all of the 1s.

5. Write a RAM program to compute the function $f(n) = n!$ for $n > 0$.

6. Write a RAM program to compute the maximum of two positive integers.

7. Write a RAM program to sort three positive integers.