Problem 1

ID	X	y	Cluster
1	3	4	Cluster 1
2	5	3	Cluster 1
3	6	4	Cluster 1
4	4	5	Cluster 2
5	4	7	Cluster 2
6	7	6	Cluster 2
7	8	4	Cluster 2

Run 1 more k means iteration

use manhattan distance

Cluster 1 centroid: $\left(\frac{3+5+6}{3}, \frac{4+3+4}{3}\right) = \left(\frac{14}{3}, \frac{11}{3}\right) = (4.66, 3.66)$

Cluster 2 centroid: $\left(\frac{4+4+7+8}{4}, \frac{5+7+6+4}{4}\right) = \left(\frac{23}{4}, \frac{11}{2}\right) = (5.75, 5.5)$

Manhattan distance = $|x_1 - x_2| + |y_1 - y_2|$

ID 1

Cluster 1: 2 Cluster 2: 4.25

ID 2

Cluster 1: 1 Cluster 2: 3.25

ID 3

Cluster 1: 1.68 Cluster 2: 1.75

ID 4

Cluster 1: 2 Cluster 2: 2.25

ID 5

Cluster 1: 4 Cluster 2: 3.25

ID 6

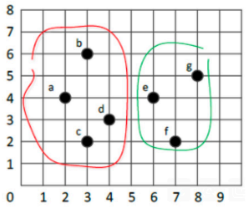
Cluster 1: 4.68 Cluster 2: 1.75

ID 7

Cluster 1: 3.68 Cluster 2: 3.75

Cluster 1: 1, 2, 3, 4, 7
Cluster 2: 5, 6

Problem 2



Red:
- a -> (2,4)
- b -> (3,6)
- c -> (3,2)
- d -> (4,3)

Green:
- e -> (6,4)
- f -> (7,2)
- g -> (8,5)

Manhattan distance = $|x_1 - x_2| + |y_1 - y_2|$

1) Maximum Distance

* I didn't calculate any points that were clearly closer together

bg = 6
cg = 8
bf = 8
ag = 7
af = 7

max distance = 8

2) Centroid Distance

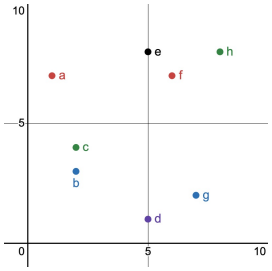
Red centroid = $\left(\frac{2+3+3+4}{4}, \frac{4+6+2+3}{4}\right) = (3, 3.75)$

Green centroid = $\left(\frac{6+7+8}{3}, \frac{4+2+5}{3}\right) = (7, 3.66)$

Centroid distance = 4.09

Problem 4

Object	x	y
a	1	7
b	2	3
c	2	4
d	5	1
e	5	8
f	6	7
g	7	2
h	8	8



Agglomerative heirarchical -> until you can't continue

Minimum manhattan distance

$\overline{bc} = 1$
$\overline{ef} = 2$
$\overline{fh}$ and $\overline{eh} = 3$
$\overline{dg} = 3$
$\overline{ae} = 5$
$\overline{ac} = 4$
$\overline{bd} = 5$

tie for joining abc to efh or dg

Dendrogram