1 Question 2

1.1 a)

The more ants involved in the system. the faster the food was consumed. This is probably because there were more ants to carry the food back to the nest, but also because it gave more ants on a path so that there was less opportunity for the path to evaporate. As the diffusion rate increases the ants take less direct routes to the food because pheromones are more spread out. In a way this helps good paths persist, but it also allows bad paths to persist. More ants found their way to the known path since it was much wider. Evaporation rate increasing made paths disappear more quickly (by definition of evaporation) which helps get rid of bad paths but it also makes good paths disappear. This made getting a stream of ants going to the food source much harder. As would fit common sense the closer the food sources were to the nest the faster the ants found them.

1.2 b)

Population	α	β	ρ	**Online Update**	**Results**
14	0.2	0.2	0.4	False	18337.63
14	0.2	0.2	0.4	True	16566.19
29	0.2	0.2	0.4	False	19574.39
29	0.2	0.2	0.4	True	15670.41
58	0.2	0.2	0.4	False	16408.03
58	0.2	0.2	0.4	True	16954.42
14	0.2	0.2	0.5	False	20262.68
14	0.2	0.2	0.5	True	16921.04
29	0.2	0.2	0.5	False	17396.13
29	0.2	0.2	0.5	True	17678.07
58	0.2	0.2	0.5	False	20376.50
58	0.2	0.2	0.5	True	16337.20
14	0.2	0.2	0.6	False	20854.07
14	0.2	0.2	0.6	True	17297.23
29	0.2	0.2	0.6	False	20970.87
29	0.2	0.2	0.6	True	16659.96
58	0.2	0.2	0.6	False	21007.90
58	0.2	0.2	0.6	True	15541.35
14	0.2	0.5	0.4	False	19534.24
14	0.2	0.5	0.4	True	13927.10
29	0.2	0.5	0.4	False	18592.71
29	0.2	0.5	0.4	True	13989.73
58	0.2	0.5	0.4	False	15891.49
58	0.2	0.5	0.4	True	12662.90
14	0.2	0.5	0.5	False	19940.38
14	0.2	0.5	0.5	True	14633.21
29	0.2	0.5	0.5	False	17087.16
29	0.2	0.5	0.5	True	13715.43
58	0.2	0.5	0.5	False	17522.22
58	0.2	0.5	0.5	True	12616.42
14	0.2	0.5	0.6	False	19410.93
14	0.2	0.5	0.6	True	12480.44
29	0.2	0.5	0.6	False	19022.73
29	0.2	0.5	0.6	True	14195.76
58	0.2	0.5	0.6	False	17474.86
58	0.2	0.5	0.6	True	13606.47

Population	α	β	ρ	**Online Update**	**Results**
14	0.2	1	0.4	False	15031.67
14	0.2	1	0.4	True	11363.22
29	0.2	1	0.4	False	15537.26
29	0.2	1	0.4	True	10992.08
58	0.2	1	0.4	False	15423.03
58	0.2	1	0.4	True	11767.54
14	0.2	1	0.5	False	14692.25
14	0.2	1	0.5	True	11853.55
29	0.2	1	0.5	False	15852.97
29	0.2	1	0.5	True	10895.31
58	0.2	1	0.5	False	14471.73
58	0.2	1	0.5	True	10972.35
14	0.2	1	0.6	False	17601.23
14	0.2	1	0.6	True	11764.21
29	0.2	1	0.6	False	14922.29
29	0.2	1	0.6	True	11209.51
58	0.2	1	0.6	False	17107.36
58	0.2	1	0.6	True	10233.41
14	0.5	0.2	0.4	False	19392.16
14	0.5	0.2	0.4	True	17163.70
29	0.5	0.2	0.4	False	20670.55
29	0.5	0.2	0.4	True	16474.81
58	0.5	0.2	0.4	False	18566.24
58	0.5	0.2	0.4	True	15605.49
14	0.5	0.2	0.5	False	22466.62
14	0.5	0.2	0.5	True	17504.21
29	0.5	0.2	0.5	False	21304.09
29	0.5	0.2	0.5	True	15911.41
58	0.5	0.2	0.5	False	20048.64
58	0.5	0.2	0.5	True	15285.49
14	0.5	0.2	0.6	False	22375.40
14	0.5	0.2	0.6	True	17099.74
29	0.5	0.2	0.6	False	20992.87

Population	α	β	ρ	**Online Update**	**Results**
29	0.5	0.2	0.6	True	16029.04
58	0.5	0.2	0.6	False	21335.11
58	0.5	0.2	0.6	True	15367.47
14	0.5	0.5	0.4	False	20943.39
14	0.5	0.5	0.4	True	13677.20
29	0.5	0.5	0.4	False	21299.74
29	0.5	0.5	0.4	True	12905.51
58	0.5	0.5	0.4	False	18758.41
58	0.5	0.5	0.4	True	12687.44
14	0.5	0.5	0.5	False	20836.13
14	0.5	0.5	0.5	True	13967.00
29	0.5	0.5	0.5	False	19406.14
29	0.5	0.5	0.5	True	13443.38
58	0.5	0.5	0.5	False	17404.35
58	0.5	0.5	0.5	True	12795.15
14	0.5	0.5	0.6	False	20219.60
14	0.5	0.5	0.6	True	14422.00
29	0.5	0.5	0.6	False	21767.44
29	0.5	0.5	0.6	True	13973.77
58	0.5	0.5	0.6	False	17162.62
58	0.5	0.5	0.6	True	12169.47
14	0.5	1	0.4	False	15411.45
14	0.5	1	0.4	True	10985.88
29	0.5	1	0.4	False	16624.10
29	0.5	1	0.4	True	10561.25
58	0.5	1	0.4	False	15884.95
58	0.5	1	0.4	True	10632.56
14	0.5	1	0.5	False	20789.21
14	0.5	1	0.5	True	10274.18
29	0.5	1	0.5	False	18778.58
29	0.5	1	0.5	True	10629.98
58	0.5	1	0.5	False	17271.67
58	0.5	1	0.5	True	10312.21
14	0.5	1	0.6	False	18980.60
14	0.5	1	0.6	True	12221.63

Population	α	β	ρ	**Online Update**	**Results**
29	0.5	1	0.6	False	17826.65
29	0.5	1	0.6	True	10399.40
58	0.5	1	0.6	False	17759.04
58	0.5	1	0.6	True	9828.38
14	1	0.2	0.4	False	23579.55
14	1	0.2	0.4	True	12416.16
29	1	0.2	0.4	False	21902.39
29	1	0.2	0.4	True	13568.60
58	1	0.2	0.4	False	19702.01
58	1	0.2	0.4	True	13318.36
14	1	0.2	0.5	False	21915.70
14	1	0.2	0.5	True	15779.26
29	1	0.2	0.5	False	20766.72
29	1	0.2	0.5	True	14827.21
58	1	0.2	0.5	False	20717.86
58	1	0.2	0.5	True	13126.70
14	1	0.2	0.6	False	23306.44
14	1	0.2	0.6	True	15177.89
29	1	0.2	0.6	False	20721.19
29	1	0.2	0.6	True	14991.20
58	1	0.2	0.6	False	20968.91
58	1	0.2	0.6	True	14118.81
14	1	0.5	0.4	False	21165.24
14	1	0.5	0.4	True	12999.67
29	1	0.5	0.4	False	20737.04
29	1	0.5	0.4	True	12655.52
58	1	0.5	0.4	False	18531.51
58	1	0.5	0.4	True	10570.19
14	1	0.5	0.5	False	20279.46
14	1	0.5	0.5	True	13297.68
29	1	0.5	0.5	False	19027.07
29	1	0.5	0.5	True	12623.29
58	1	0.5	0.5	False	18996.70
58	1	0.5	0.5	True	10830.24

Population	α	β	ρ	**Online Update**	**Results**
14	1	0.5	0.6	False	20555.52
14	1	0.5	0.6	True	14694.90
29	1	0.5	0.6	False	19880.49
29	1	0.5	0.6	True	12730.41
58	1	0.5	0.6	False	20191.40
58	1	0.5	0.6	True	10523.57
14	1	1	0.4	False	19025.60
14	1	1	0.4	True	12189.47
29	1	1	0.4	False	16947.01
29	1	1	0.4	True	10596.86
58	1	1	0.4	False	17674.81
58	1	1	0.4	True	9550.16
14	1	1	0.5	False	18754.49
14	1	1	0.5	True	12786.51
29	1	1	0.5	False	16884.34
29	1	1	0.5	True	10682.14
58	1	1	0.5	False	17434.08
58	1	1	0.5	True	9482.06
14	1	1	0.6	False	18089.12
14	1	1	0.6	True	13643.01
29	1	1	0.6	False	18114.10
29	1	1	0.6	True	10752.34
58	1	1	0.6	False	17920.17
58	1	1	0.6	True	9236.25