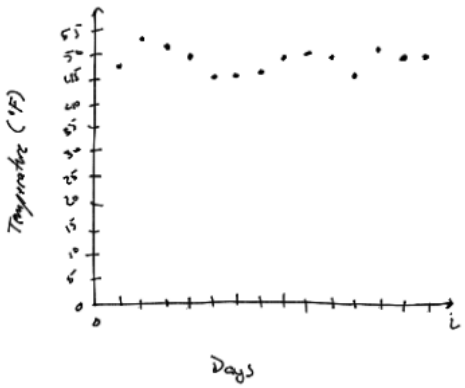
1) Yes almost a sinusoid



2) $\bar{x}_1 = \frac{47+58+53+50}{4} = 51$

$\bar{x}_2 = \frac{47+58+53+50+46}{5} = 50$

$\bar{x}_3 = \frac{47+54+53+50+46+46}{6} = 49.33$

$\bar{x}_4 = \frac{47+54+53+50+46+46+47}{7} = 49$

$\bar{x}_5 = \frac{54+53+50+46+46+47+55}{7} = 49.42286$

$\bar{x}_6 = \frac{53+50+46+46+47+50+51}{7} = 49$

$\bar{x}_7 = \frac{50+58+46+46+47+50+51+50}{8} = 48.87714$

$\bar{x}_8 = \frac{46+46+47+50+51+50+46+52}{8} = 48$

$\bar{x}_9 = \frac{46+47+53+51+50+46+52+50}{8} = 48.85714$

$\bar{x}_{10} = \frac{47+50+51+50+46+52+50+55}{8} = 49.37286$

$\bar{x}_{11} = \frac{50+51+50+46+52+50+50+55}{8} = 49.8571$

$\bar{x}_{12} = \frac{51+50+46+52+50+50+55+49}{8} = 50.375$

$\bar{x}_{13} = \frac{50+46+52+50+50+55+49+46}{8} = 49.75$

$\bar{x}_{14} = \frac{46+52+50+50+55+49+46+47}{8} = 49.375$

$\bar{x} = [51, 50, 49.33, 49, 49.4286, 49, 48.8714, 48, 48.8571, 49.3786, 49.75, 49.375, 49.5]$

3a) $\bar{x}_t = \alpha x_i + (1-\alpha)\bar{x}_{t-1}$ $\alpha = .1$

$\bar{x}_1 = 47$

$\bar{x}_2 = (.1)(54) + (1-.1)(47) = 47.7$

$\bar{x}_3 = (.1)(53) + (1-.1)(47.7) = 48.23$

$\bar{x}_4 = (.1)(50) + (1-.1)(48.23) = 48.407$

$\bar{x}_5 = (.1)(46) + (1-.1)(48.407) = 48.1663$

$\bar{x}_6 = 47.9497$

$\bar{x}_7 = 47.8547$

$\bar{x}_8 = 48.0692$

$\bar{x}_9 = 47.4623$

$\bar{x}_{10} = 47.7161$

$\bar{x}_{11} = 47.5445$

$\bar{x}_{12} = 47.9901$

$\bar{x}_{13} = 48.1911$

$\bar{x}_{14} = 48.3720$

$\bar{x} = [47, 47.7, 48.23, 48.407, 48.1663, 47.9497, 47.8547, 48.0692, 47.4623, 47.7161, 47.5445, 47.9901, 48.1911, 48.3720]$

3b) $\alpha = .5$

$\bar{x}_1 = 47$

$\bar{x}_2 = .5(54) + (1-.5)(47) = 50.5$

$\bar{x}_3 = 51.75$

$\bar{x}_4 = 50.875$

$\bar{x}_5 = 48.4375$

$\bar{x}_6 = 47.2188$

$\bar{x}_7 = 47.1094$

$\bar{x}_8 = 48.5547$

$\bar{x}_9 = 49.2774$

$\bar{x}_{10} = 49.8887$

$\bar{x}_{11} = 47.9444$

$\bar{x}_{12} = 49.9722$

$\bar{x}_{13} = 49.9861$

$\bar{x}_{14} = 49.9931$

$\bar{x} = [47, 50.5, 51.75, 50.875, 48.4375, 47.2188, 47.1094, 48.5547, 49.2774, 49.8887, 47.9444, 49.9722, 49.9861, 49.9931]$