7.5

a) - see R code.

$\theta_A = 24.20$

$\theta_B = 24.81$

$\sigma^2_A = 4.09$

$\sigma^2_B = 4.69$

$\hat{\rho}$ (correlation) $= 0.62$

b) - see R code - mean for $\theta_A - \theta_B = -0.61$

$t = -3.28$, $df = 57$, p-value $= 0.00177$

95% confidence interval for $\theta_A - \theta_B = (-0.985, -0.238)$

c) - see R code

- posterior mean for $\theta_A - \theta_B = -0.622$

95% posterior CI for $\theta_A - \theta_B = (-0.637, -0.608)$

- Both T-test and Gibbs sampler yield very similar estimates for $\theta_A - \theta_B$. However, the Gibbs sampler approach incorporates prior beliefs which led to a narrower confidence interval. Both evaluations in b) and c) suggest a significant difference in reaction times for stimuli A and B, with stimuli A having a slightly shorter reaction time compared to B.

7.6a) probability that posterior mean is greater for diabetes group than non-diabetes group is near 1 for every variable, suggesting that all variables differ between the two groups.

npreg: 0.9989

glu: 1.0000

bp: 0.9982

skin: 0.9997

bmi: 0.9998

ped: 0.9990

age: 0.9993

7b) The variances are similar for each group except that the variance in glucose levels is significantly higher for the diabetes group than the non diabetes group