Problem 1 : (A)

Problem 2 : (B)

Problem 3 :

a) We should use the t-distribution in this problem because we do not know the population deviation σ. The value of t_c for calculating a 98% confidence interval for the mean time is $t_c = \text{InvT}(1-0.02/2, 101-1) = 2.364$.

b) Construct and interpret a 98% confidence interval

$$\mu = \bar{X} \pm t_c \frac{S}{\sqrt{n}} = 73.2 \pm 2.364 \cdot \frac{39}{\sqrt{101}} = [64.03 , 82.38]$$

∴ The true mean is between 64.03 minutes and 82.38 minutes with 98% confident.

c) Find the sample size

$92\% \longrightarrow z_c = 1.75$

$\sigma = 39$ minutes

$\Delta = 15$ minutes

$$n \geq \left(\frac{z_c \cdot \sigma}{\Delta}\right)^2$$

$$n \geq \left(\frac{1.75 \times 39}{15}\right)^2 = 20.7$$

∴ n need to be at least 21.

Problem 4 :

a) Construct a 95% confidence interval

$\bar{x} = 2.89$ $\bar{y} = 4.2$

$S_x = 1.054$ $S_y = 1.398$

$n_x = 9$ $n_y = 10$

$$\mu_x - \mu_y \approx [-2.515, -0.1048]$$

Since it does not include zero. Therefore, 1:00 pm class knows more computing language than 11:30 am class. Due to 1:00 pm class mean (4.2) is higher than 11:30 am class mean (2.89).

b) Redo (a) but assume the population variance are not equal

$$\mu_x - \mu_y \approx [-2.5, -0.12]$$

Since it does not include zero. Therefore, 1:00 pm class knows more computing language than 11:30 am class. Due to 1:00 pm class mean (4.2) is higher than 11:30 am class mean (2.89).

c) Computed the degrees of freedom in (b)

$$\nu = \frac{\left(\frac{S_x^2}{n_x} + \frac{S_y^2}{n_y}\right)^2}{\frac{S_x^4}{n_x^2(n_x-1)} + \frac{S_y^4}{n_y^2(n_y-1)}} = \frac{\left(\frac{1.054^2}{9} + \frac{1.398^2}{10}\right)^2}{\frac{1.054^4}{9^2(9-1)} + \frac{1.398^4}{10^2(10-1)}} = \boxed{16.54}$$