4.

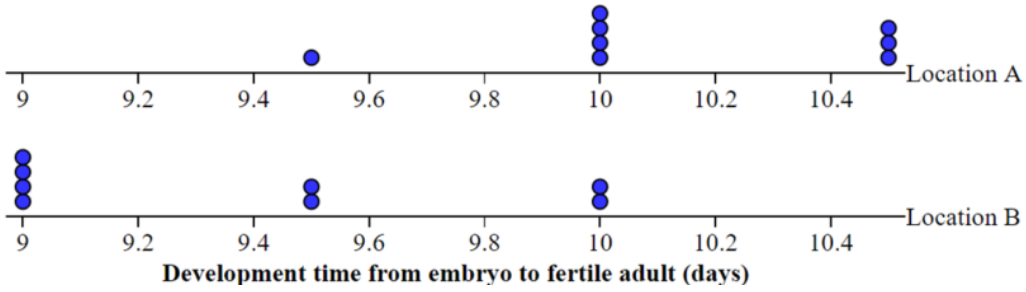
(a) H_0: $\mu_B = \mu_A$

H_a: $\mu_B < \mu_A$

where μ_A = the mean development time from embryo to fertile adult for all fruit flies like those cultivated in Location A and μ_B = the mean development time from embryo to fertile adult for all fruit flies like those cultivated in Location B.

Random? 16 glass bottles of developing fruit flies were randomly assigned to Locations A and B.

Normal/Large Sample? The sample sizes are small ($8 < 30$), but the dotplots show no strong skewness or outliers. Based on these graphs, it is reasonable to believe that the true distributions of development time are normal for fruit flies like these cultivated under these experimental conditions.



Test statistic: $t = \dfrac{(9.375 - 10.125) - 0}{\sqrt{\frac{0.443^2}{8} + \frac{0.354^2}{8}}} = -3.74$

p-value = 0.0012

Degrees of Freedom (from technology) = 13.34

Because the p-value = 0.0012 < α = 0.05, we reject H_0. The experiment provides convincing statistical evidence that changing to location B will result in a faster mean development time from embryo to mature adult fly for fruit flies like these.

(b) A Type II error occurs when we fail to reject H_0 when H_a is true. Since the data led us to reject H_0 in part (a), it is not possible for a Type II error to have been made. Only a Type I error (rejecting H_0 when H_0 is true) would be possible in this case.