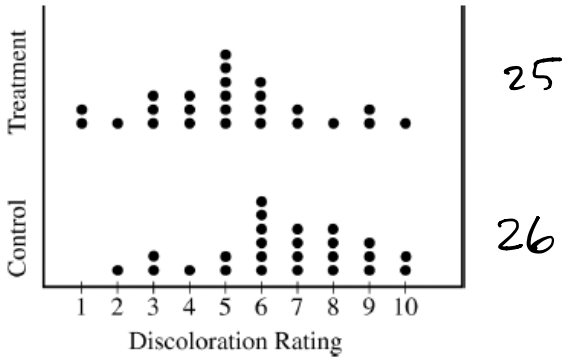
2007 AP Statistics Free Response #1 (Modified)

1. The department of agriculture at a university was interested in determining whether a preservative was effective in reducing discoloration in frozen strawberries. A sample of 50 ripe strawberries was prepared for freezing. Then the sample was randomly divided into two groups of 25 strawberries each. Each strawberry was placed into a small plastic bag.

   The 25 bags in the control group were sealed. The preservative was added to the 25 bags containing strawberries in the treatment group, and then those bags were sealed. All bags were stored at 0°C for a period of 6 months. At the end of this time, after the strawberries were thawed, a technician rated each strawberry's discoloration from 1 to 10, with a low score indicating little discoloration.

   The dotplots below show the distributions of discoloration rating for the control and treatment groups.



   a. The median discoloration value in the control group is equal to 7. If a random strawberry is selected from the treatment group, what is the probability that the discoloration value is LESS than 7 ?

   b. The standard deviation of ratings for the control group is 2.141. Explain how this value summarizes variability in the control group.

   c. Based on the dotplots, comment on the effectiveness of the preservative in lowering the amount of discoloration in strawberries. (No calculations are necessary.)

   d. Researchers at the university decided to calculate a 95 percent confidence interval for the difference in mean discoloration rating between strawberries that were not treated with preservative and those that were treated with preservative. State the conditions and confirm they have been met for this confidence interval.

   e. The confidence interval the researchers obtained was (0.16, 2.72). Based on the confidence interval, comment on whether there would be a difference in the population mean discoloration ratings for the treated and untreated strawberries.

a. The median discoloration value in the control group is equal to 7. If a random strawberry is selected from the treatment group, what is the probability that the discoloration value is LESS than 7 ?

$$P(\text{discoloration} < 7) = \frac{19}{25} = 0.76$$

b. The standard deviation of ratings for the control group is 2.141. Explain how this value summarizes variability in the control group.

The standard deviation of 2.141 Measures the typical distance between the individual discoloration ratings and the mean discoloration ratings for strawberries in the control group.

c. Based on the dotplots, comment on the effectiveness of the preservative in lowering the amount of discoloration in strawberries. (No calculations are necessary.)

It appears that the decoloration rating of the treatment group is generally lower than the control group. The mean/median of the control group appears to be higher than that of the treatment group.

d. Researchers at the university decided to calculate a 95 percent confidence interval for the difference in mean discoloration rating between strawberries that were not treated with preservative and those that were treated with preservative. State the conditions and confirm they have been met for this confidence interval.

Conditions: - we require a simple random sample, this is met.

- we require a sample size of at least 30 strawberries in each group so the C.L.T applies and there is normality in the sampling distribution. we have 50 for each group so this condition is met.
- we require that our sample is smaller than 10% of the population. It seems clear our sample of strawberries is significantly less than 10% of the population.

e. The confidence interval the researchers obtained was (0.16, 2.72). Based on the confidence interval, comment on whether there would be a difference in the population mean discoloration ratings for the treated and untreated strawberries.

Note that a difference of 0 is not contained on the interval (0.16, 2.72), meaning that in future samples it is unplausible to get a difference of zero.

This suggests that there is a significant difference

between the discoloration of the control and treatment group.

As all values in our C.I. $(0.116, 2.72)$ are positive, we expect the mean of the treated strawberries to be higher than the mean of the control berries on average.