Inference and Experiments Quiz

1. A chemist for a paint company conducted an experiment to investigate whether a new outdoor paint will last longer than the older paint. Fifty blocks made from the same wood were randomly assigned to be painted with either the new paint or the old paint. The blocks were placed into a weather-controlled room that simulated extreme weather conditions such as ice, temperature, wind, and sleet. After one month in the room, the blocks were removed, and each block was rated on texture, shine, brightness of color, and chipping. The results showed that the blocks painted with the new paint generally had higher ratings than the blocks painted with the old paint. However, an analysis of the results found that the difference in ratings was not statistically significant. What can be concluded from the experiment?

(A) There is not enough evidence to attribute the higher ratings to the new paint. ✓

(B) The new paint will last longer than the old paint if used on wooden surfaces.

(C) The experiment is inconclusive because blocks from only one type of wood were used.

(D) The experiment is inconclusive because one month is not enough time for paint to weather.

(E) Because the blocks were randomly assigned to the type of paint, there is evidence that the new paint causes better ratings than the old paint.

Answer A

Correct. Results need to be statistically significant to conclude that they were unlikely to occur by chance alone. Because the results are not statistically significant, the chemist cannot rule out that it was chance, or something other than the paint, that caused the difference in ratings.

2. Researchers will use a well-designed experiment to test the effectiveness of a new drug versus a placebo in relieving symptoms of the common cold. Which of the following will provide evidence that the new drug causes relief of symptoms?

(A) The experiment cannot be used to show the new drug causes relief, only that it is related to relief.

(B) Any difference between the responses to the new drug and the placebo provides evidence that the new drug causes relief.

(C) The experiment cannot be used to show the new drug causes relief because the new drug is not being compared to an older drug.

(D) The difference between the responses to the new drug and the placebo must be shown to be statistically significant to provide evidence that the new drug causes relief. ✓

(E) Relief of symptoms would need to occur in all subjects who take the new drug and in none of the subjects who take the placebo to provide evidence that the new drug causes relief.

Answer D

Correct. Because the experiment is well-designed, it can be assumed the treatments were randomly assigned, which allows for a conclusion of a causal relationship if the results are statistically significant.

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3. The owner of a food store conducted a study to investigate whether displaying organic fruit at the front of the store rather than at the back of the store will increase sales of the fruit. At the beginning of each week, the organic fruit display was randomly assigned to either the front or the back of the store, and sales for the week were recorded. At the end of 12 months, the owner determined that the average weekly sales of organic fruit displayed at the front of the store were greater than the average weekly sales of organic fruit displayed at the back of the store. The difference was statistically significant. What can be concluded from the study?

(A) Sales of organic fruit generally increased over the 12-month period.

(B) Shoppers will buy more organic fruit each day if they see it when they first enter the store.

(C) Any conclusion is problematic because the different types of fruit were not taken into account as part of the study.

(D) Placing the display at the front instead of the back of the store causes an increase, on average, of weekly sales of the organic fruit. ✓

(E) Weekly sales of organic fruit will always be greater when the fruit is displayed at the front of the store rather than the back of the store.

Answer D

Correct. The average weekly sales of organic fruit were significantly higher when the fruit was placed at the front of the store rather than at the back of the store. That means the difference in average sales was too large to be explained by chance alone and can be attributed to the randomly assigned location. Also, since it was a well-designed experiment, causation can be concluded.