

Individual Assignment 10:

10.3.1 Conduct a hypothesis test for matched or paired data and interpret the conclusion in context.

Stopping Distance: Is There a Difference?

Set A

- 1) Based on your own driving experience (or experience as a passenger in a car), describe the difference in stopping distance on dry roads versus wet roads.
- 2) Ten cars were randomly selected from a used car lot. The cars were driven at 40 miles per hour on a track and then the brakes were applied. Sometimes the surface was wet and sometimes the surface was dry. The stopping distances in feet are shown below for 10 cars. Why does it make sense the data was gathered as 10 pairs of data rather than using 20 individual cars?

Car	1	2	3	4	5	6	7	8	9	10
Wet	201	220	192	146	182	173	202	180	192	206
Dry	150	147	136	134	130	134	134	128	136	158

- 3) Make a plot of your choice to show the distribution of the difference in stopping distance for all 10 cars. Describe what your plot shows relative to stopping on wet roads versus dry roads.
- 4) Conduct a full hypothesis test for paired differences. Be sure to state your conclusion in context and check that the conditions for performing the inference procedure have been met.
- 5) Conduct a 95% confidence interval for the mean of the paired differences. How does this interval support the conclusion from the hypothesis test? (You may need to reference Module 8.)

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Set B

Decide if the scenario described is a matched pair design or two independent samples and justify your choice.

- 1) A cat food manufacturer wants to see if its new enriched cat food increases vitamin A levels in cats compared to its current food. They use cats that are from the same litter - one cat in each pair is randomly assigned to the new food and the other is randomly assigned to the current food. At the end of 2 months, the vitamin A levels in each pair are compared.
- 2) To see if a new sunscreen works better than the current sunscreen formula, a person has one leg randomly assigned to have the new sunscreen applied and the other leg is treated with the current sunscreen formula. The person is monitored for burning of the skin. The number of minutes it takes for each leg to start to burn is recorded.
- 3) A gardener wants to see if a new fertilizer works better than a current fertilizer. She randomly assigns half of her cucumbers to each type of fertilizer. At the end of the growing season, she compares the mean number of cucumbers produced by plants with each type of fertilizer.
- 4) An advertising agency has a new TV commercial for homeowner's insurance. They think women may respond differently to the ad than men. They randomly select 50 women and 50 men to view the ad.
- 5) To see if a new migraine medication works better than an existing migraine formula, subjects are initially paired based on their tolerance to pain. The two with the highest are paired, the two with the next highest are paired and so on.

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Within each pair one is randomly assigned the new migraine medication and the other receives the existing migraine formula. Pain ratings are compared within each pair after 3 months.

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