

### Matched Pairs: Section 2.2 Practice Problem

Sixteen trees were growing in an orchard. The trees were planted in two rows with eight trees in each row, as illustrated in the rudimentary diagram below.

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T T T T T T T T
T T T T T T T T

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The 16 trees had all been attacked by a bug that damages the trees. Two chemical treatments (A and B) that could slow and eventually stop the damage were available. Researchers wanted to compare the effectiveness of these two treatments. The researchers randomly assigned the treatments to the trees as follows:

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A A B B B A A B
B B A A A B B A

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At the time the chemicals were applied, the trees to the west (left) had sustained the most damage because they were the first trees infected by the bugs. The bugs gradually spread to the east (right) so that the trees on the east had sustained only minor damage at the time the chemicals were applied. Recognizing this, the researchers used a randomization scheme that would guarantee that the two trees lined up in any column running from north to south would receive different treatments.

Three weeks after the initial applications of the chemicals, a score indicating the total damage sustained by each tree was assigned by a team of experts. The team of experts arrived at their scores without any knowledge of the treatment each tree received. The scores, arranged to correspond to the positions of the trees, are provided below. Larger scores mean more damage.

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9 7 4 4 3 5 6 2
8 7 6 5 4 4 3 1

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Is there evidence that one chemical was better than another at preventing damage?

Pair	1	2	3	4	5	6	7	8
A	9	7	6	5	4	5	6	1
B	8	7	4	4	3	4	3	2
Difference								

$$s = \sqrt{\frac{(1-1)^2 + (0-1)^2 + (2-1)^2 + (1-1)^2 + (1-1)^2 + (1-1)^2 + (3-1)^2 + (-1-1)^2}{8-1}}$$