

Braking Distances (in feet) with Ranks						
	Brake Pad A	Rank	Brake Pad B	Rank	Brake Pad C	Rank
	94	2	103	9	96	4
	95	3	127	14	126	13
Rank Sum		21		55		44

The hypotheses for this test can be written as follows.

H_0 : The braking distances for the three pads are the same.

H_a : At least one of the braking distances is different.

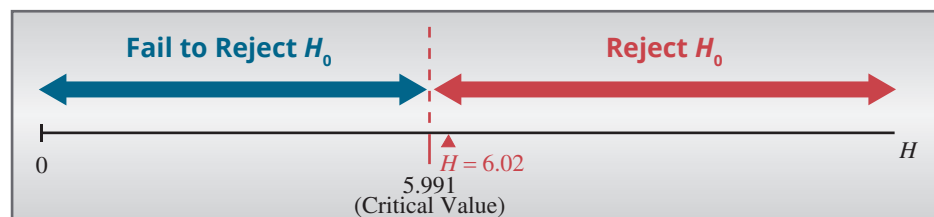
The ranks of the observations are given in the table. The sum of the ranks for each type of brake pad is found in the last row of the table.

$$R_1 = 21 \quad R_2 = 55 \quad R_3 = 44$$

We can now calculate the test statistic,

$$H = \frac{12}{N(N+1)} \sum_{i=1}^k \frac{R_i^2}{n_i} - 3(N+1).$$

We find that $H = \frac{12}{15(15+1)} \left(\frac{21^2}{5} + \frac{55^2}{5} + \frac{44^2}{5} \right) - 3(15+1) = 6.02$.



Referring to Appendix A, Table G, we see that $\chi_{0.05,2}^2 = 5.991$. Because the test statistic exceeds the critical value ($6.02 > 5.991$) we reject the null hypothesis and conclude that at least one of the braking distances is sufficiently different.

17.6 Exercises

Basic Concepts

1. Which parametric test corresponds to the nonparametric Kruskal-Wallis Test?
2. What are the null and alternative hypotheses associated with the Kruskal-Wallis Test?
3. What are the assumptions associated with the Kruskal-Wallis Test?
4. How is the Kruskal-Wallis test similar to the Wilcoxon Rank-Sum Test?
5. What is the test statistic for the Kruskal-Wallis Test? How is it calculated?
6. What is the rejection rule for the Kruskal-Wallis Test?
7. How many populations can be compared using the Kruskal-Wallis Test?

Exercises

8. An Internet service provider is considering four different servers for purchase. Potentially, the company would be purchasing hundreds of these servers, so it wants to make sure it is making the best decision. Initially, five of each type of server are borrowed, and each is randomly assigned to one of the 20 technicians (all technicians are similar in skill). Each server is then put through a series of tasks and rated using a standardized test. The higher the score on the test, the better the performance of the server. The data is as follows.

Server Test Scores			
Server 1	Server 2	Server 3	Server 4
48.5	56.4	52.1	64.3
46.5	68.2	56.3	68.3
52.4	68.5	48.3	72.2
54.1	64.2	52.2	70.6
58.9	60.1	54.8	56.5

Perform a Kruskal-Wallis Test on this data using $\alpha = 0.10$. Are there differences between the servers?

9. The following summary is obtained from an experiment where groups of cows were fed according to one of the four different feeding schedules, and their milk productions were recorded. The data given shows the daily milk production in gallons for each cow. Test at $\alpha = 0.10$ to examine whether or not the milk production for all four schedules is the same.

Milk Production by Schedule (Gallons)					
Schedule 1	11.5	12.7	12.9	10.1	10.5
Schedule 2	9.1	10.7	9.5	10.9	10.4
Schedule 3	12.4	11.9	10.0	11.4	12.1
Schedule 4	12.8	12.6	11.7	11.3	10.9

10. The following data set contains the reading speed (in words per minute) of second grade students.

Reading Speeds (wpm)		
Public School	Private School	Home School
54	66	65
67	55	64
63	62	60
105	69	72
61	71	68

Is there sufficient evidence at the 0.01 level of significance to conclude that the reading speeds vary by school type?