

- III. Darin wants to reexamine the delivery time of 2 suppliers first presented on page 90 and reproduced below. Parametric tests using z or t assume the populations are approximately normal and have equal variances. If these conditions are not met (or unknown) and the shape and dispersion of the distributions are similar, the nonparametric Mann-Whitney test of 2 medians is appropriate. Test at the .05 level of significance whether these samples come from a population with equal medians. For calculation convenience, only the first 11 pieces of data will be used from each data set. **People using statistics software do not need to complete this chart.**

Supplier A: 10, 22, 14, 39, 37, 40, 30, 29, 30, 16, 11 **Supplier B:** 14, 37, 20, 19, 12, 18, 22, 23, 26, 21, 19

Complete this table by: (1) completing an ordered array, (2) assigning an A for supplier A and a B for supplier B to each element of the array, (3) assigning each rank to the appropriate category (supplier A or B), (4) calculating each subtotal, and (5) calculating R_1 , which equals the sum of the 3 subtotals for supplier A or R_2 , which equals the sum of the 3 subtotals for supplier B.

Rank Ordered Array and Supplier			Supplier		Rank Ordered Array and Supplier			Supplier		Rank Ordered Array and Supplier			Supplier	
(1)	(2)		A	B	(1)	(2)		A	B	(1)	(2)		A	B
			(3)	(3)				(3)	(3)				(3)	(3)
1.	10	A	1		8.	19	B		8.5	15.	26	B		15
2.	11	A	2		9.	19	B		8.5	16.	29	A	16	
3.	12	B		3	10.	20	B		10	17.	30	A	17.5	
4.	14	A	4.5		11.	21	B		11	18.	30	A	17.5	
5.	14	B		4.5	12.	22	A	12.5		19.	37	A	19.5	
6.	16	A	6		13.	22	B		12.5	20.	37	B		19.5
7.	18	B		7	14.	23	B		14	21.	39	A	21	
										22.	40	A	22	
(4) Subtotal			13.5	14.5	(4) Subtotal			12.5	64.5	(4) Subtotal			113.5	34.5

$$(5) R_1 = 13.5 + 12.5 + 113.5 = 139.5$$

$$\begin{aligned}
 U_1 &= n_1 n_2 + \frac{n_1(n_1+1)}{2} - R_1 \\
 &= 11(11) + \frac{11(11+1)}{2} - 139.5 \\
 &= 121 + 66 - 139.5 \\
 &= 47.5
 \end{aligned}$$

$$\begin{aligned}
 \sigma_U &= \sqrt{\frac{n_1 n_2 (n_1 + n_2 + 1)}{12}} \\
 &= \sqrt{\frac{11(11)(11+11+1)}{12}} \\
 &= 15.229
 \end{aligned}$$

$$\begin{aligned}
 \mu_U &= \frac{n_1 n_2}{2} \\
 &= \frac{11(11)}{2} \\
 &= 60.5
 \end{aligned}$$

$$\begin{aligned}
 Z &= \frac{U - \mu_U}{\sigma_U} \\
 &= \frac{47.5 - 60.5}{15.229} \\
 &= -.85
 \end{aligned}$$

Z for this two-tail problem at the .05 level of significance is ± 1.96 . Accept H_0 because $-.85$ is not beyond -1.96 . There is not a significant difference between median delivery times.