WILCOXON SIGNED RANK T TEST

This test is used to compare the results of a treatment from a within groups design

A 5th-grade teacher wants to know if a reading reinforcement program will encourage her students to read more books. She tracks the number of books read before and after her students participate in the program:

Student	1	2	3	4	5	6	7	8	9	10	11	12
Before	10	17	19	20	21	22	23	24	29	33	57	35
After	15	23	20	20	28	26	24	29	37	40	50	55

1. **DETERMINE THAT CONDITIONS FOR TEST ARE ACCEPTABLE:**

    - Data can be ranked

    - Distribution is symmetric but nor normal

    - Observations are dependent

2. **STATE NULL AND ALTERNATIVE HYPOTHESES:**

    H_o : Median number of books read before program = Median number of books read after program ($M_B = M_A$)

    H_a : Median number of books read before program < Median number of books read after program ($M_B < M_A$)

3. **COMPUTE THE DIFFERENCE IN SCORES FOR EACH SUBJECT:**

Student	1	2	3	4	5	6	7	8	9	10	11	12
Before	10	17	19	20	21	22	23	24	29	33	57	35
After	15	23	20	20	28	26	24	29	37	40	50	55
Difference	-5	-6	-1	0	-7	-4	-1	-5	-8	-7	7	-20

4. RANK THE ABSOLUTE VALUE OF THE DIFFERENCES (DO NOT INCLUDE "0" IN RANKING):

1	1	} 1.5
2	1	
3	4	
4	5	} 4.5
5	5	
6	6	
7	7	
8	7	} 8.0
9	7	
10	8	
11	20	

Student	1	2	3	4	5	6	7	8	9	10	11	12
Before	10	17	19	20	21	22	23	24	29	33	57	35
After	15	23	20	20	28	26	24	29	37	40	50	55
Difference	-5	-6	-1	0	-7	-4	-1	-5	-8	-7	7	-20
Rank	4.5	6	1.5	---	8	3	1.5	4.5	10	8	8	11

5. TO EACH RANK, ATTACH THE SIGN OF THE PREVIOUSLY CALCULATED DIFFERENCE SCORE:

Student	1	2	3	4	5	6	7	8	9	10	11	12
Before	10	17	19	20	21	22	23	24	29	33	57	35
After	15	23	20	20	28	26	24	29	37	40	50	55
Difference	-5	-6	-1	0	-7	-4	-1	-5	-8	-7	7	-20
Rank	4.5	6	1.5	---	8	3	1.5	4.5	10	8	8	11
Signed Rank	-4.5	-6	-1.5	---	-8	-3	-1.5	-4.5	-10	-8	8	-11

6. **DETERMINE THE SUM OF POSITIVE RANKS AND THE SUM OF NEGATIVE RANKS:**

$\Sigma_{\text{Positive}} = 8$

$\Sigma_{\text{Negative}} = (-4.5) + (-6) + (-1.5) + (-8) + (-3) + (-1.5) + (-4.5) + (-10) + (-11) = 58$

7. **DETERMINE P-VALUE**

a)   Let N = number of paired ranks ($N = 11$)

b)   T-statistic = 8 (since we expect this number to be smaller than the sum of negative ranks based on the hypotheses*)

c)   Using Table A.8, P-value < .025

8. **STATE CONCLUSION:**

There is strong evidence (p < .025) to reject H_0 and conclude that a significantly great number of books were read after the reading program was implemented.

NOTE:
In essence this test determines whether the sum of positive ranks differs significant from the sum of negative ranks