Answer on Question #57326 – Math – Statistics and Probability

Test scores of ten individuals before and after a training program are shown below.

Individual	Score After Program	Score Before Program	Difference	Rank	Sign
1	57	59	-2	3.5	-
2	62	57	5	8	+
3	60	60	0	None	None
4	63	66	-3	5	-
5	69	68	1	1.5	+
6	63	59	4	6.5	+
7	74	72	2	3.5	+
8	56	52	4	6.5	+
9	64	58	6	9	+
10	64	63	1	1.5	+

Question

What is the sum of positive signed ranks (T^+)?

Solution

$$T^+ = 8 + 1.5 + 6.5 + 3.5 + 6.5 + 9 + 1.5 = 36.5$$

Question

The mean μ_T is?

Solution

Using Large Sample Approximation to Signed-Rank Statistic

$$\mu_T = \frac{n(n+1)}{4} = \frac{9(9+1)}{4} = 22.5$$

Question

The value of σ_T is?

Solution

Using Large Sample Approximation to Signed-Rank Statistic

$$\sigma_T = \sqrt{\frac{n(n+1)(2n+1)}{24}} = \sqrt{\frac{9(9+1)(2\cdot 9+1)}{24}} = 8.44$$

Question

At α = 0.05, what can be concluded about the effectiveness of the training program?

Solution

Let H_0 : No difference before and after a training program

H_1: Scores after a training program are better than before

Using Large Sample Approximation to Signed-Rank Statistic

$$z = \frac{T^+ - \mu_T}{\sigma_T} = \frac{36.5 - 22.5}{8.44} = 1.659.$$

The p-value is

$$P(Z > 1.659) = 0.048558.$$

Since p-value is less than alpha, we reject H_0 and we can conclude that the training program was effective.

Question

At α = 0.2, what can be concluded about the effectiveness of the training program?

Solution

Reject H_0, hence the training program was effective.