

# SIGN TEST



**DR. SANGEETA MOHANTY**

**SIGN TEST IS AN ALTERNATIVE TO SAMPLE 'T-TEST' FOR:**

- 1) ONE-SAMPLE T-TEST TO TEST THE NULL HYPOTHESIS THAT THE MEAN OF A DISTRIBUTION IS EQUAL TO SOME SPECIFIED VALUE, (ONE-SAMPLE SIGN TEST)**
- 2) PAIRED T-TEST FOR TESTING THE EQUALITY OF DIFFERENCE OF TWO POPULATION MEANS FOR PAIRED SAMPLE, (TWO-SAMPLE SIGN TEST) WHEN THE DATA DO NOT FOLLOW A NORMAL DISTRIBUTION.**

# SIGN TEST

## INTRODUCTION

SIGN TEST IS AN ALTERNATIVE TO SAMPLE 'T-TEST' FOR:

- I. ONE-SAMPLE T-TEST TO TEST THE NULL HYPOTHESIS THAT THE MEAN OF A DISTRIBUTION IS EQUAL TO SOME SPECIFIED VALUE, (~~ONE- SAMPLE SIGN TEST~~)
- I. PAIRED T-TEST FOR TESTING THE EQUALITY OF DIFFERENCE OF TWO POPULATION MEANS FOR PAIRED SAMPLE, (~~TWO- SAMPLE SIGN TEST~~) WHEN THE DATA DO NOT FOLLOW A NORMAL DISTRIBUTION.

### i) ~~ONE- SAMPLE SIGN TEST~~

## CASE ANALYSIS-1

### PROBLEM

A SURVEY IS CONDUCTED WITH 20 RESPONDENTS TO TEST THE HYPOTHESIS THAT THE MEDIAN VALUE OF THE TIME SPENT IN A MALL IS 130 MINUTES AGAINST THE HYPOTHESIS THAT IT IS MORE THAN 130 MINUTES. THE TIME SPENT BY THE STUDENTS IS AS FOLLOWS.

TABLE-1: SAMPLE DATA

SL. NO	TIME SPENT IN MINUTES	SL. NO	TIME SPENT IN MINUTES
1	121	11	123
2	132	12	122
3	145	13	120
4	162	14	132
5	134	15	135
6	122	16	136
7	132	17	134
8	145	18	138
9	142	19	140
10	122	20	142

THE HYPOTHESES FOR THE ANALYSIS ARE:

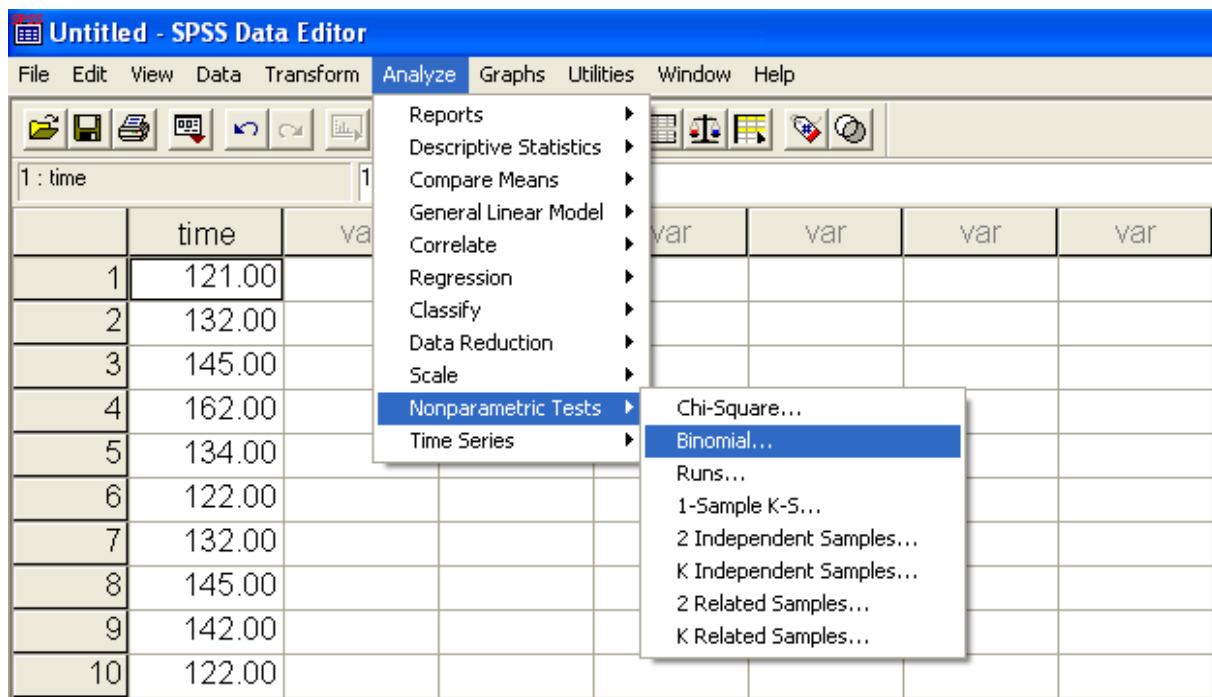
NULL HYPOTHESIS- $H_0$ : THE MEDIAN VALUE IS 130 M.

ALTERNATIVE HYPOTHESIS-  $H_1$ : THE MEDIAN VALUE IS GREATER 130M. (~~ONE TAILED TEST~~)

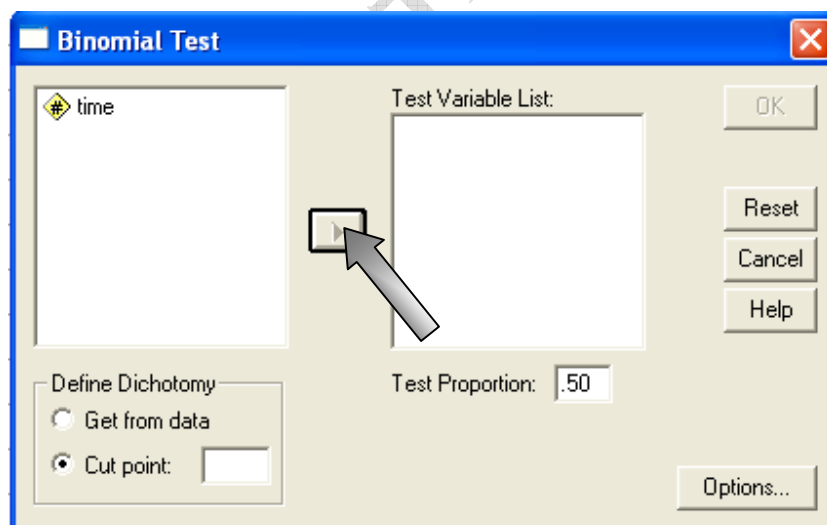
### PERFORMING THE ANALYSIS WITH SPSS

FOR SPSS VERSION 11, CLICK ON **ANALYZE** → **NON PARAMETRIC TESTS** → **BINOMIAL**

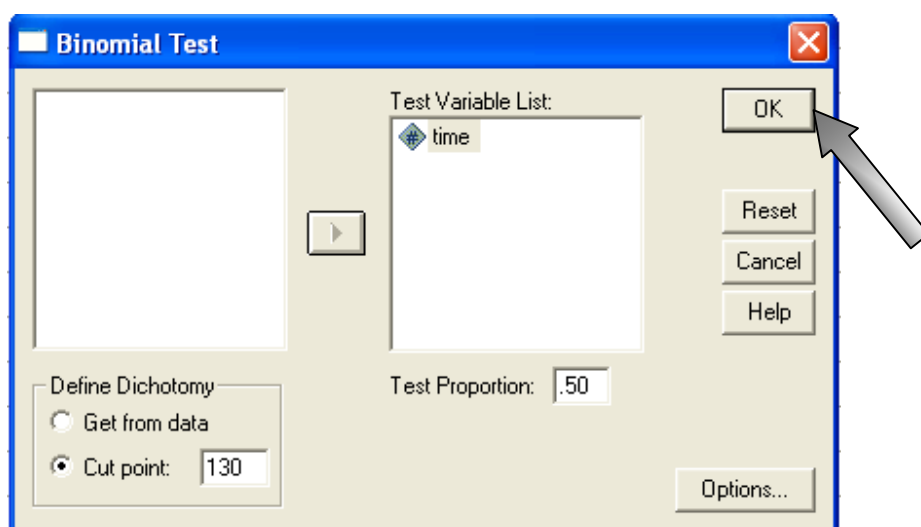
THIS WILL BRING UP THE FOLLOWING SPSS SCREEN DIALOGUE BOX.



AFTER CLICKING **BINOMIAL**, THIS WILL BRING UP THE FOLLOWING SPSS DIALOGUE BOX.



SELECT THE VARIABLE AND MOVE IT TO THE **TEST VARIABLE(S) LIST** BOX.



FILL THE CUT POINT AS 130 AND FINALLY CLICK OK TO GET THE OUTPUT

**SPSS OUTPUT**

THE SPSS OUTPUT ARE ILLUSTRATED UIN FOLLOWING TABLES.

**SIGN TEST**

TABLE-2: BINOMIAL TEST

		CATEGORY	N	OBSERVED PROP.	TEST PROP.	EXACT SIG. (2-TAILED)
TIME	GROUP 1	<= 130	6	.30	.50	.115
	GROUP 2	> 130	14	.70		
	TOTAL		20	1.00		

**DECISION**

REJECT THE NULL HYPOTHESIS IF P-VALUE (SIG. (2-TAILED)) ≤ 0.05

THE P-VALUE FOR ONE-TAILED TEST WOULD BE  $\frac{\text{Sig. (2-tailed)}}{2}$

**INTERPRETATION**

THE P-VALUE IS  $\frac{(0.115)}{2} = 0.0575$  AND IT IS MORE THAN 0.05 (5% LEVEL OF SIGNIFICANCE), SO WE ACCEPT THE NULL HYPOTHESIS AND REJECT THE ALTERNATIVE HYPOTHESIS. THE MEDIAN VALUE OF THE TIME SPENT IN A MALL IS MORE THAN 130 MINUTES.

**ii) TWO-SAMPLE SIGN TEST**

**CASE ANALYSIS-1**

**PROBLEM**

THE FOLLOWING DATA REPRESENTS THE AMOUNT OF MONEY SPENT PER MONTH BY 15 HOUSEWIVES IN FOREIGN BRAND COSMETIC ITEMS AND INDIAN BRAND COSMETIC ITEMS.

**TABLE-1: SAMPLE DATA**

SL. No.	MONEY SPENT IN (RS.) FOREIGN BRAND COSMETIC ITEMS.	SL. No.	MONEY SPENT IN (RS.) INDIAN BRAND COSMETIC ITEMS.
1	856	16	789
2	789	17	489
3	785	18	789
4	865	19	425
5	956	20	425
6	789	21	532
7	745	22	456
8	859	23	568
9	748	24	500
10	562	25	400
11	456	26	436
12	853	27	405
13	1012	28	568
14	789	29	456
15	1116	30	564

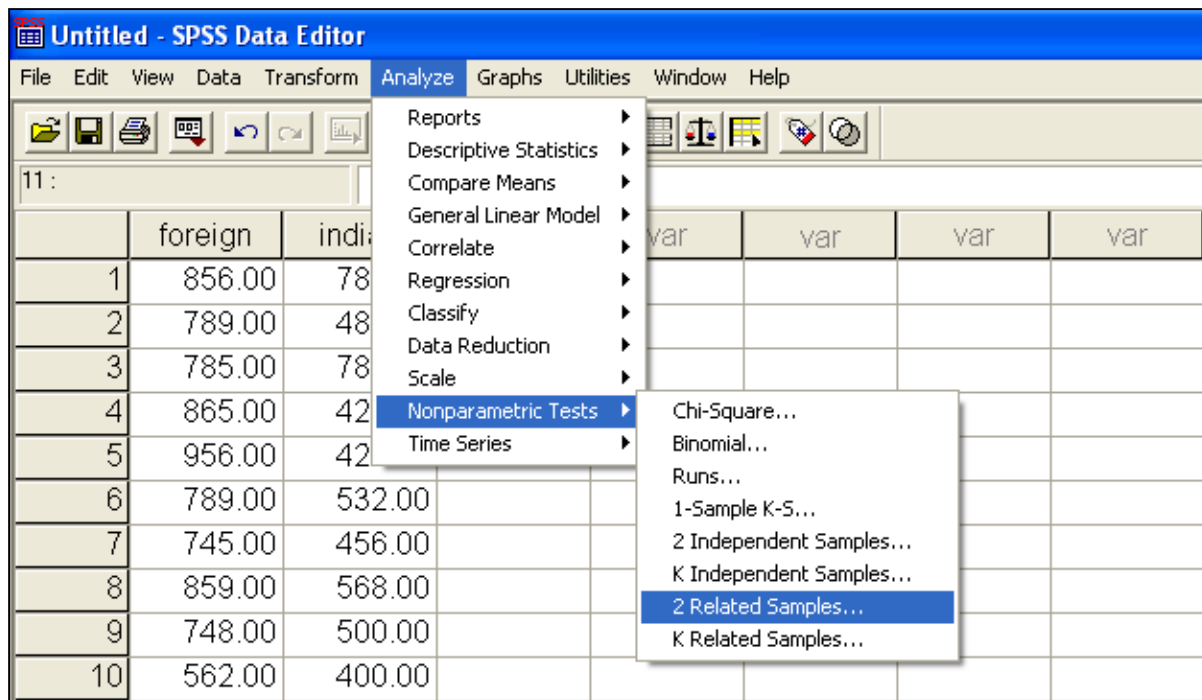
**THE HYPOTHESES FOR THE ANALYSIS ARE:**

**NULL HYPOTHESIS- $H_0$ :** THE AVERAGE AMOUNT SPENT ON FOREIGN BRAND COSMETIC ITEMS AND INDIAN BRAND COSMETIC ITEMS ARE EQUAL.

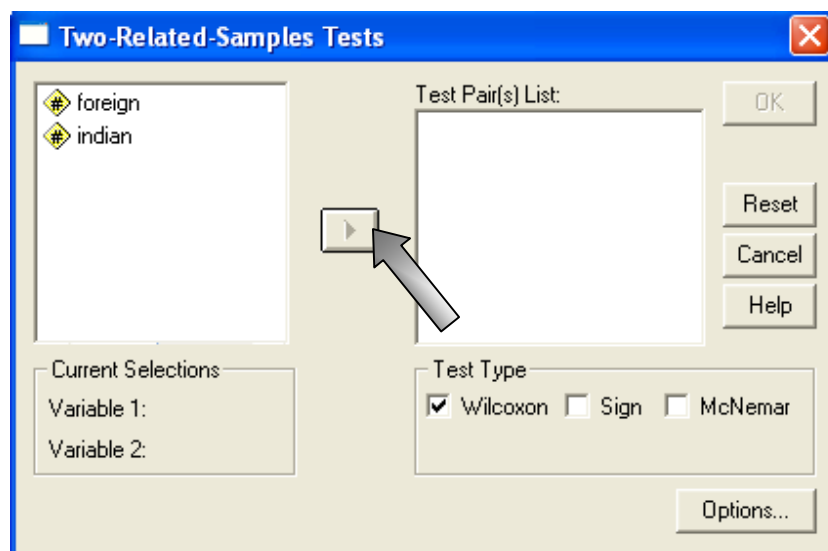
**ALTERNATIVE HYPOTHESIS-  $H_1$ :** THE AVERAGE AMOUNT SPENT ON FOREIGN BRAND COSMETIC ITEMS AND INDIAN BRAND COSMETIC ITEMS ARE NOT EQUAL  
**(TWO TAILED TEST)**

**PERFORMING THE ANALYSIS WITH SPSS**

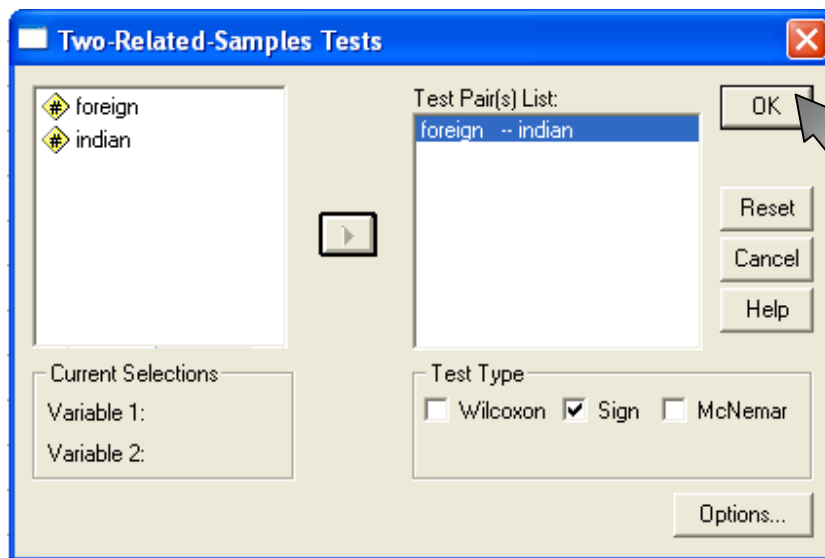
FOR SPSS VERSION 11, CLICK ON **ANALYZE** → **NON PARAMETRIC TESTS** → **2 RELATED SAMPLES**. THIS WILL BRING UP THE FOLLOWING SPSS SCREEN DIALOGUE BOX.



**AFTER CLICKING 2 RELATED SAMPLES, THIS WILL BRING UP THE FOLLOWING SPSS DIALOGUE BOX.**



**SELECT THE VARIABLES AND MOVE THEM TO THE TEST PAIR(S) LIST BOX AND CLICK SIGN.**



FINALLY CLICK OK TO GET THE OUTPUT.

**SPSS OUTPUT**

THE SPSS OUTPUT ARE ILLUSTRATED UIN FOLLOWING TABLES.

**SIGN TEST**

TABLE-2: TEST STATISTICS

<b>EXACT SIG. (2-TAILED)</b>	<b>INDIAN-FOREIGN .001</b>
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*A BINOMIAL DISTRIBUTION USED.*

*B SIGN TEST*

TABLE-3: FREQUENCIES

		<b>N</b>
<b>INDIAN-FOREIGN</b>	<b>NEGATIVE DIFFERENCES</b>	<b>14</b>
	<b>POSITIVE DIFFERENCES</b>	<b>1</b>
	<b>TIES</b>	<b>0</b>
	<b>TOTAL</b>	<b>15</b>

*A INDIAN < FOREIGN*

*B INDIAN > FOREIGN*

*C FOREIGN = INDIAN*

**DECISION**

REJECT THE NULL HYPOTHESIS IF P-VALUE (SIG. (2-TAILED))  $\leq 0.05$

**INTERPRETATION**

THE P-VALUE IS 0.001 AND IT IS LESS THAN 0.05 (5% LEVEL OF SIGNIFICANCE), SO WE REJECT THE NULL HYPOTHESIS AND CONCLUDE THAT THE AVERAGE AMOUNT SPENT ON FOREIGN BRAND COSMETIC ITEMS AND INDIAN BRAND COSMETIC ITEMS ARE NOT EQUAL.

## **SPSS COMMAND**

### **ONE-SIGN TEST**

1. CLICK ON ANALYZE AT THE SPSS MENU BAR (IN OLDER VERSIONS OF SPSS, CLICK ON STATISTICS INSTEAD OF ANALYZE).
2. CLICK ON NON-PARAMETRIC TEST FOLLOWED BY 2 RELATED SAMPLES.
3. SELECT THE CONCERNED VARIABLES AND MOVE THEM TO TEST PAIR(S) LIST BOX.
4. CLICK SIGN.
5. CLICK OK OF THE MAIN DIALOGUE BOX

### **TWO-SIGN TEST**

1. CLICK ON ANALYZE AT THE SPSS MENU BAR (IN OLDER VERSIONS OF SPSS, CLICK ON STATISTICS INSTEAD OF ANALYZE).
2. CLICK ON NON-PARAMETRIC TEST FOLLOWED BY 2 RELATED SAMPLES.
3. SELECT THE CONCERNED VARIABLES AND MOVE THEM TO TEST PAIR(S) LIST BOX.
4. CLICK SIGN.
5. CLICK OK OF THE MAIN DIALOGUE BOX.