SPSS Part 2

Paired-Samples T-Test 4.3 إختبار " ت" لعينتين مرتبطتين

*** الهدف**

يستخدم اختبار " ت" لعينتين مرتبطتين للتحقق من ما إذا كانت هناك فروق معنوية بين متوسطي مجتمعين مرتبطين (اختبار قبل – بعد)

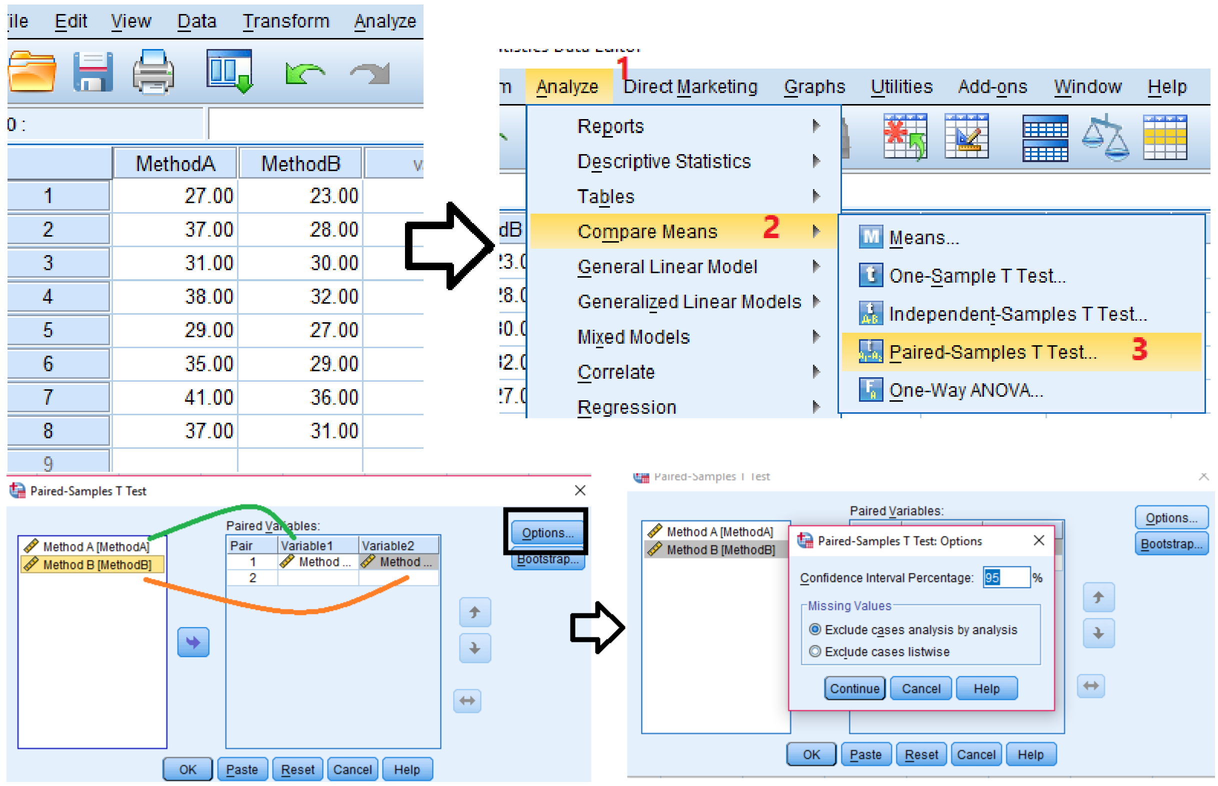
يستخدم الاختبار لدراسة تساوي متوسطي مجتمعين مرتبطين ويعرف باسم الاختبار قبل وبعد. في حالة العينات الصغيرة (اقل من 30 مشاهدة) يشترط لتطبيقه ان تكون البيانات مسحوبة من التوزيع الطبيعي.

(فى حالة العينات الكبيرة (ذات الحجم 30 فأكثر) يمكن الاستغناء عن القيد المذكور، وان الاختبار يعرف إحصائيا باسم اختبار "ص" او Z test).

8- In an experiment comparing 2 feeding methods for caves, eight pairs of twins were used – one twin receiving Method A and other twin receiving Method B. At the end of a given time, the calves were slaughtered and cooked, and the meat was rated for its taste (with a higher number indicating a better taste):

Twin pair	Method A	Method B
1	27	23
2	37	28
3	31	30
4	38	32
5	29	27
6	35	29
7	41	36
8	37	31

Assuming approximate normality, test if the average taste score for calves fed by Method B is less than the average taste foe calves fed by Method A. Use α=0.05.



T-Test

[DataSet0]

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Method A	34.3750	8	4.86790	1.72106
	Method B	29.5000	8	3.81725	1.34960

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Method A & Method B	8	.857	.007

Test hypothesis:

$$H_0: \mu_b \geq \mu_a$$
$$H_1: \mu_b < \mu_a$$

C.I diff. mean

T stat =

p-value=0.001 < α=0.05

we reject the null hypothesis H0

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Method A - Method B	4.87500	2.53194	.89518	2.75825	6.99175	5.446	7	.001

4.4 إختبار تحليل التباين فى اتجاه واحد One-Way-ANOVA

* الهدف

يستخدم إختبار تحليل التباين فى اتجاه واحد او مايعرف باختبار " ف" لعينات مستقلة للتحقق من ما إذا كانت هناك فروق معنوية بين متوسطات اكثر من مجتمعين مستقلين

يعتبر اختبار تحليل التباين (او اختبار "ف") اختبارا معلمياً هاما، يستخدم لدراسة تساوي متوسطات اكثر من مجتمعين مستقلتين. في حالة العينات الصغيرة (اقل من 30 مشاهدة) يشترط لتطبيقه ان تكون:

1. البيانات تتبع التوزيع الطبيعي.
2. بيانات المجتمعات مستقلة عن بعضها البعض.

A firm wishes to compare four programs for training workers to perform a certain manual task. Twenty new employees are randomly assigned to the training programs, with 5 in each program. At the end of the training period, a test is conducted to see how quickly trainees can perform the task. The number of times the task is performed per minute is recorded for each trainee, with the following results:

Observation	*Program 1*	*Program 2*	*Program 3*	*Program 4*
1	9	10	12	9
2	12	6	14	8
3	14	9	11	11
4	11	9	13	7
5	13	10	11	8

<u>Q4)</u> to use the one way ANOVA- test, we need to make sure that

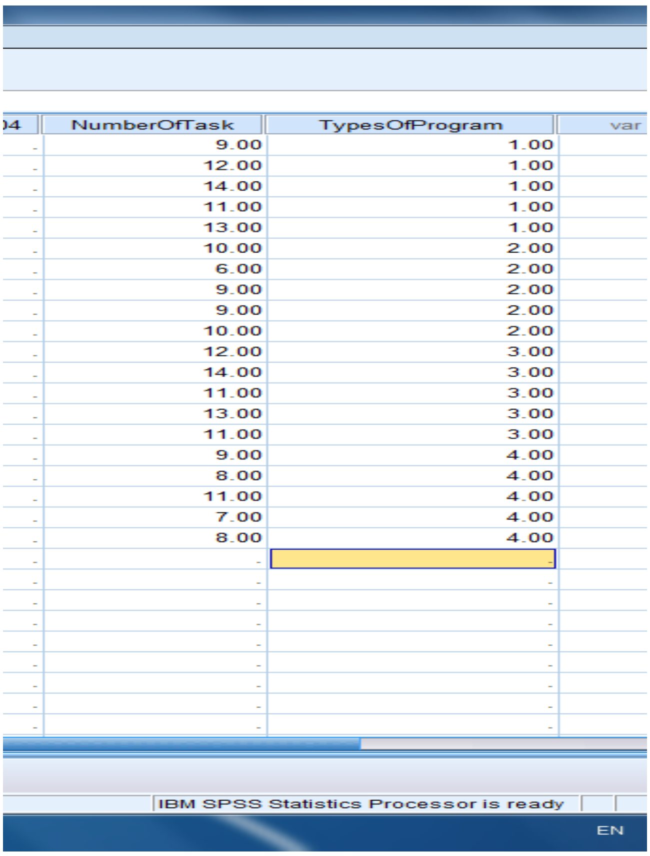
1) The independence of the four samples: It is very clear that there is no correlation between the values of the four samples.

2) The populations follow a normal distribution [redacted] i.e.

$$H_0: the\ four\ populations\ follow \text{ a normal distribution}$$

$$Vs$$

$$H_1: the\ four\ populations\ \ do\ not\ follow \text{ a normal distribution}$$



NumberOfTask	TypesOfProgram
9.00	1.00
12.00	1.00
14.00	1.00
11.00	1.00
13.00	1.00
10.00	2.00
6.00	2.00
9.00	2.00
9.00	2.00
10.00	2.00
12.00	3.00
14.00	3.00
11.00	3.00
13.00	3.00
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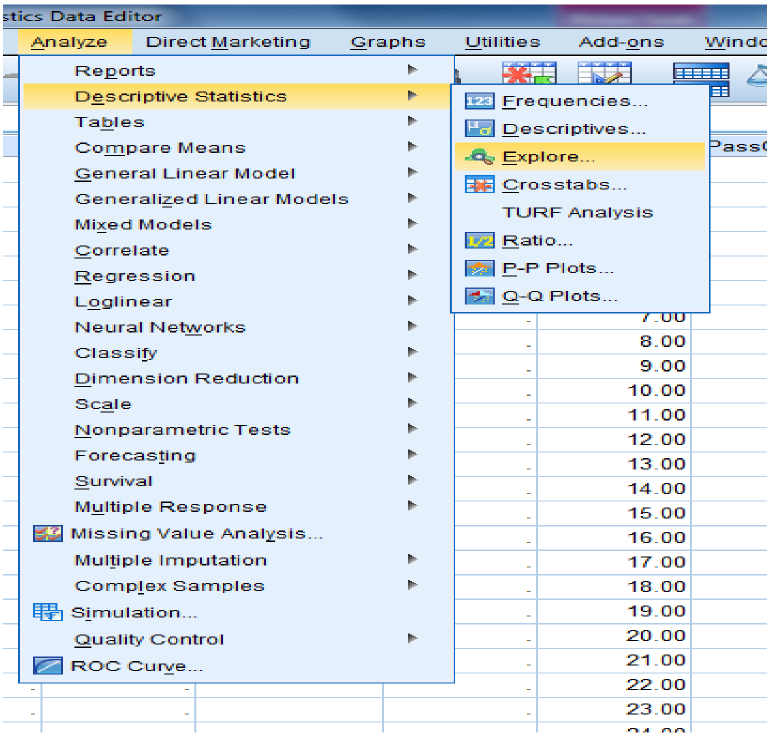
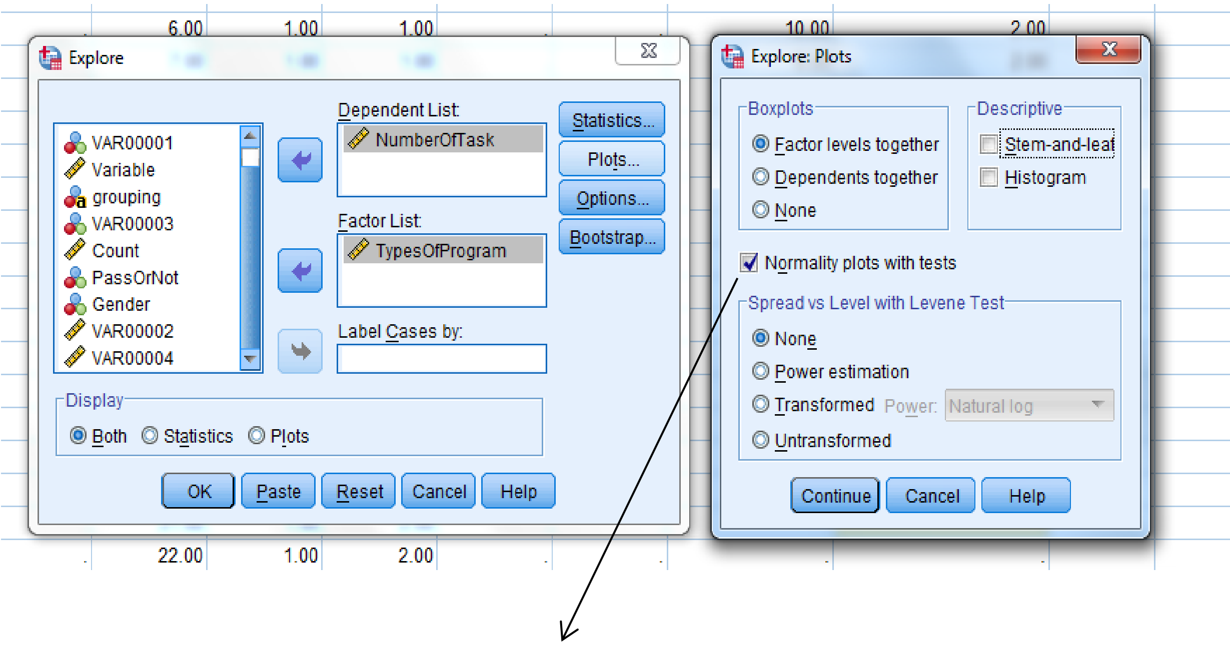
9.00	4.00
8.00	4.00
11.00	4.00
7.00	4.00
8.00	4.00





Helps in the normality test

Explore

[DataSet1] E:\328\7 الدرس\Untitled1.sav

TypesOfProgram

Case Processing Summary

		Cases					
		Valid		Missing		Total	
	TypesOfProgram	N	Percent	N	Percent	N	Percent
NumberOfTask	1.00	5	100.0%	0	0.0%	5	100.0%
	2.00	5	100.0%	0	0.0%	5	100.0%
	3.00	5	100.0%	0	0.0%	5	100.0%
	4.00	5	100.0%	0	0.0%	5	100.0%

Descriptives

	TypesOfProgram			Statistic	Std. Error
NumberOfTask	1.00	Mean		11.8000	.86023
		95% Confidence Interval for Mean	Lower Bound	9.4116	
			Upper Bound	14.1884	
		5% Trimmed Mean		11.8333	
		Median		12.0000	
		Variance		3.700	
		Std. Deviation		1.92354	
		Minimum		9.00	
		Maximum		14.00	
		Range		5.00	
		Interquartile Range		3.50	
		Skewness		-.590	.913
		Kurtosis		-.022	2.000
	2.00	Mean		8.8000	.73485

				Statistic	Std. Error
	2.00	Mean		8.8000	.73485
		95% Confidence Interval for Mean	Lower Bound	6.7597	
			Upper Bound	10.8403	
		5% Trimmed Mean		8.8889	
		Median		9.0000	
		Variance		2.700	
		Std. Deviation		1.64317	
		Minimum		6.00	
		Maximum		10.00	
		Range		4.00	
		Interquartile Range		2.50	
		Skewness		-1.736	.913
		Kurtosis		3.251	2.000
	3.00	Mean		12.2000	.58310
		95% Confidence Interval for Mean	Lower Bound	10.5811	
			Upper Bound	13.8189	
		5% Trimmed Mean		12.1667	
		Median		12.0000	
		Variance		1.700	
		Std. Deviation		1.30384	
		Minimum		11.00	
		Maximum		14.00	
		Range		3.00	
		Interquartile Range		2.50	
		Skewness		.541	.913
		Kurtosis		-1.488	2.000
	4.00	Mean		8.6000	.67823
		95% Confidence Interval for Mean	Lower Bound	6.7169	
			Upper Bound	10.4831	
		5% Trimmed Mean		8.5556	
		Median		8.0000	
		Variance		2.300	
		Std. Deviation		1.51658	
		Minimum		7.00	
		Maximum		11.00	
		Range		4.00	
		Interquartile Range		2.50	

Median	8.0000	
Variance	2.300	
Std. Deviation	1.51658	
Minimum	7.00	
Maximum	11.00	
Range	4.00	
Interquartile Range	2.50	

Skewness	1.118	.913
Kurtosis	1.456	2.000

Tests of Normality

	TypesOfProgram	Kolmogorov-Smirnov[a] Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
NumberOfTask	1.00	.141	5	.200*	.979	5	.928
	2.00	.348	5	.047	.779	5	.054
	3.00	.221	5	.200*	.902	5	.421
	4.00	.254	5	.200*	.914	5	.492

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

As P − value > .05 for the four populations.

So, we except H_0: *the four populations follow* a normal distribution

3) Homogeneity of Variance (to get a test of the assumption of homogeneity of variance) i.e.

$$H_0: \sigma^2_{program\ 1} = \sigma^2_{program\ 2} = \sigma^2_{program\ 3} = \sigma^2_{program\ 4}$$

i.e. the variances of each sample are equal

$$Vs$$

$$H_1: The\ variances\ are\ not\ all\ equal$$

This will be clear later.

Now, the **goal** of the question:

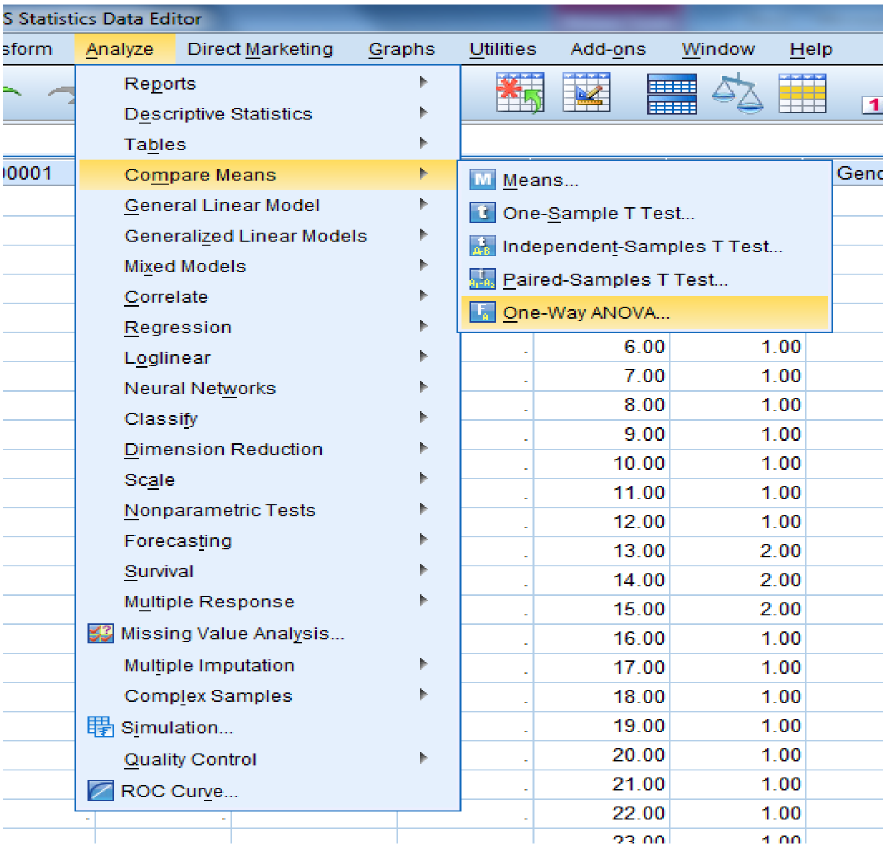
$$H_0: \mu_{program\ 1} = \mu_{program\ 2} = \mu_{program\ 3} = \mu_{program\ 4}$$

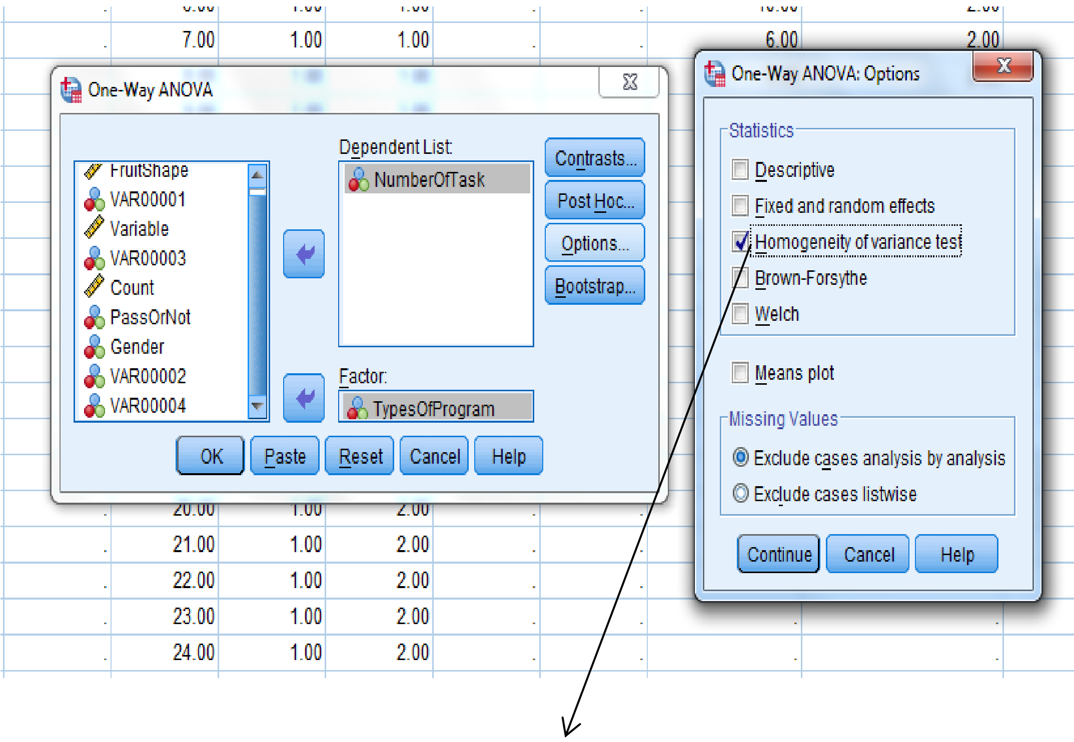
i.e. treatments are equally effective

$$Vs$$

$$H_1: The\ means\ are\ not\ all\ equal$$

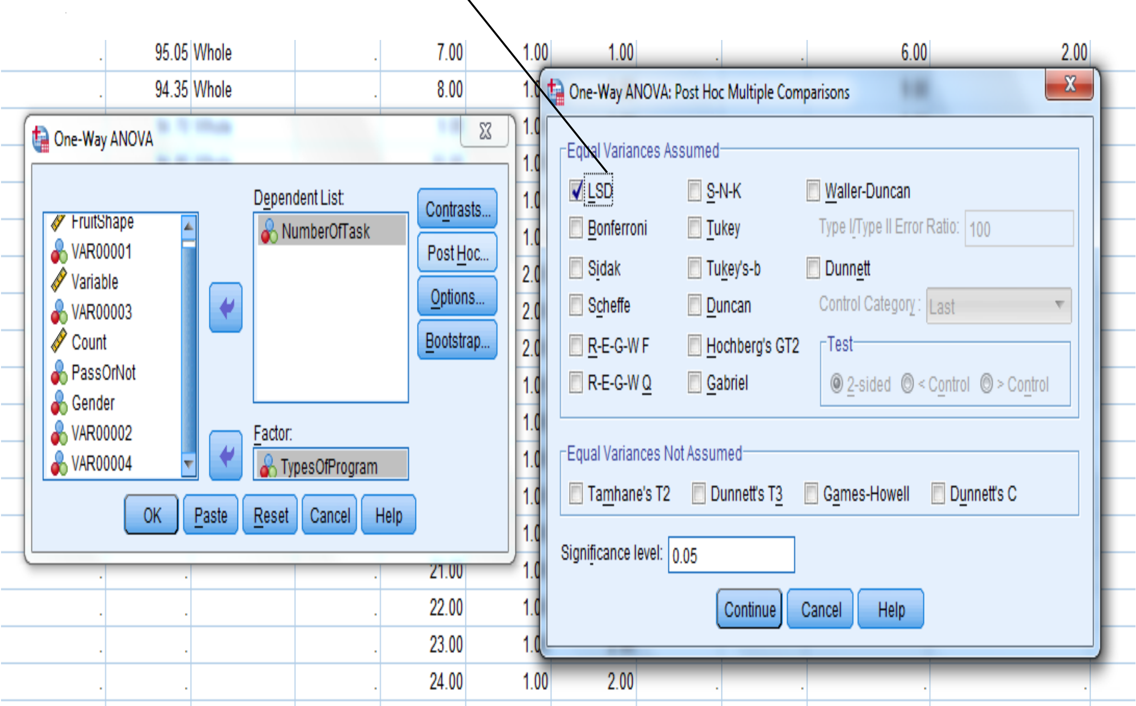
$$at\ \alpha = .05$$





Helps in the homogeneity of variance test

If we reject H_0 in Analysis of Variance (ANOVA one way-test) we need to look at the multiple comparisons output by use the appropriate post hoc procedure (LSD) to determine whether unique pairwise comparisons are significant.



As P − value > .05 .So, we except

$H_0: \sigma^2_{program\ 1} = \sigma^2_{program\ 2} = \sigma^2_{program\ 3} = \sigma^2_{program\ 4}$

Oneway

Test of Homogeneity of Variances

NumberOfTask

Levene Statistic	df1	df2	Sig.
.190	3	16	.902

$= 4 - 1$

$= 20 - 4$

$= 20 - 1$

ANOVA

NumberOfTask

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	54.950	3	18.317	7.045	.003
Within Groups	41.600	16	2.600		
Total	96.550	19			

as $P - value < .05$,then we reject $H_0: \mu_{program\ 1} = \mu_{program\ 2} = \mu_{program\ 3} = \mu_{program\ 4}$.

Post Hoc Tests

Multiple Comparisons

Dependent Variable: NumberOfTask

LSD

(I) TypesOfProgram	(J) TypesOfProgram	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1.00	2.00	3.00000*	1.01980	.010	.8381	5.1619
	3.00	-.40000	1.01980	.700	-2.5619	1.7619
	4.00	3.20000*	1.01980	.006	1.0381	5.3619
2.00	1.00	-3.00000*	1.01980	.010	-5.1619	-.8381
	3.00	-3.40000*	1.01980	.004	-5.5619	-1.2381
	4.00	.20000	1.01980	.847	-1.9619	2.3619
3.00	1.00	.40000	1.01980	.700	-1.7619	2.5619
	2.00	3.40000*	1.01980	.004	1.2381	5.5619
	4.00	3.60000*	1.01980	.003	1.4381	5.7619
4.00	1.00	-3.20000*	1.01980	.006	-5.3619	-1.0381
	2.00	-.20000	1.01980	.847	-2.3619	1.9619
	3.00	-3.60000*	1.01980	.003	-5.7619	-1.4381

*. The mean difference is significant at the 0.05 level.

1) $H_0: \mu_{program\ 1} = \mu_{program\ 2}$ vs $H_1: \mu_{program\ 1} \neq \mu_{program\ 2}$ $at\ \alpha = .05$

$as\ \ P - value = .01 < .05$, then we reject H_0.

2) $H_0: \mu_{program\ 1} = \mu_{program\ 3}$ vs $H_1: \mu_{program\ 1} \neq \mu_{program\ 3}$ $at\ \alpha = .05$

as $\mathrm{P - value} = .7 > .05$, then we except H_0.

3) $H_0: \mu_{program\ 1} = \mu_{program\ 4}$ vs $H_1: \mu_{program\ 1} \neq \mu_{program\ 4}$ $at\ \alpha = .05$

$as\ \ P - value = .006 < .05$, then we reject H_0.

4) $H_0: \mu_{program\ 2} = \mu_{program\ 3}$ vs $H_1: \mu_{program\ 2} \neq \mu_{program\ 3}$ $at\ \alpha = .05$

$as\ \ P - value = .004 < .05$, then we reject H_0.

5) $H_0: \mu_{program\ 2} = \mu_{program\ 4}$ vs $H_1: \mu_{program\ 2} \neq \mu_{program\ 4}$ $at\ \alpha = .05$

as $\mathrm{P - value} = .847 > .05$, then we except H_0.

6) $H_0: \mu_{program\ 3} = \mu_{program\ 4}$ vs $H_1: \mu_{program\ 3} \neq \mu_{program\ 4}$ $at\ \alpha = .05$

$as\ \ P - value = .003 < .05$, then we reject H_0.