```
>Warning # 2004.  Command name: SUBTITLE
>The subtitle given exceeds 60 characters in length.  The first 60 characters
>will be used.
```

Null and Alternative Hypothesis - SPSS Output
One-sample, two-group, correlation and chi-square hypothesis

Descriptives

Notes

Output Created		18-JUN-2026 20:11:08
Comments		
Input	Data	D:\DATA ANALYSIS\A Basic Descriptive Statistics Guides\Null and Alternative Hypothesis\dataset.csv
	Active Dataset	AnalysisData
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	All non-missing data are used.
Syntax		DESCRIPTIVES VARIABLES=G1 G2 G3 absences age /STATISTICS=MEAN STDDEV MIN MAX.
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.01

[AnalysisData]

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
First period grade	649	0	19	11.40	2.745
Second period grade	649	0	19	11.57	2.914
Final grade	649	0	19	11.91	3.231
School absences	649	0	32	3.66	4.641
Student age	649	15	22	16.74	1.218
Valid N (listwise)	649				

Hypothesis Example 1: One-sample test for G3

Hypothesis Example 1: One-sample test for G3
H0: Mean G3 = 10. H1: Mean G3 is different from 10.

T-Test

Notes

Output Created		18-JUN-2026 20:11:09
Comments		
Input	Data	D:\DATA ANALYSIS\A Basic Descriptive Statistics Guides\Null and Alternative Hypothesis\dataset.csv
	Active Dataset	AnalysisData
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	Statistics for each analysis are based on the cases with no missing or out-of-range data for any variable in the analysis.
Syntax		T-TEST /TESTVAL=10 /MISSING=ANALYSIS /VARIABLES=G3 /CRITERIA=CI(.95).
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.01

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Final grade	649	11.91	3.231	.127

Hypothesis Example 1: One-sample test for G3
H0: Mean G3 = 10. H1: Mean G3 is different from 10.

One-Sample Test

	Test Value = 10					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Final grade	15.030	648	.000	1.906	1.66	2.16

```
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```

Hypothesis Example 2: Independent-samples test for G3 by sex
H0: Mean G3 is equal for the two sex groups. H1: Mean G3 dif

T-Test

Notes

Output Created		18-JUN-2026 20:11:09
Comments		
Input	Data	D:\DATA ANALYSIS\A Basic Descriptive Statistics Guides\Null and Alternative Hypothesis\dataset.csv
	Active Dataset	AnalysisData
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Missing Value Handling	Definition of Missing	User defined missing values are treated as missing.
	Cases Used	Statistics for each analysis are based on the cases with no missing or out-of-range data for any variable in the analysis.
Syntax		T-TEST GROUPS=sex_num(0 1) /MISSING=ANALYSIS /VARIABLES=G3 /CRITERIA=CI(.95).
Resources	Processor Time	00:00:00.03
	Elapsed Time	00:00:00.02

Group Statistics

	Sex numeric code for independent samples t test	N	Mean	Std. Deviation	Std. Error Mean
Final grade	Female	383	12.25	3.124	.160
	Male	266	11.41	3.321	.204

Hypothesis Example 2: Independent-samples test for G3 by sex
H0: Mean G3 is equal for the two sex groups. H1: Mean G3 dif

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	df
Final grade	Equal variances assumed	.004	.950	3.311	647
	Equal variances not assumed			3.275	547.439

Independent Samples Test

		t-test for Equality of Means		
		Sig. (2-tailed)	Mean Difference	Std. Error Difference
Final grade	Equal variances assumed	.001	.847	.256
	Equal variances not assumed	.001	.847	.259

Independent Samples Test

		t-test for Equality of Means	
		95% Confidence Interval of the Difference	
		Lower	Upper
Final grade	Equal variances assumed	.345	1.350
	Equal variances not assumed	.339	1.355

```
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Hypothesis Example 3: Pearson correlation for G2 and G3
H0: Population correlation is zero. H1: Population correlati

Correlations

Notes

Output Created		18-JUN-2026 20:11:10
Comments		
Input	Data	D:\DATA ANALYSIS\A Basic Descriptive Statistics Guides\Null and Alternative Hypothesis\dataset.csv
	Active Dataset	AnalysisData
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each pair of variables are based on all the cases with valid data for that pair.
Syntax		CORRELATIONS /VARIABLES=G2 G3 /PRINT=TWOTAIL NOSIG /MISSING=PAIRWISE.
Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.02

Hypothesis Example 3: Pearson correlation for G2 and G3
H0: Population correlation is zero. H1: Population correlati

Correlations

		Second period grade	Final grade
Second period grade	Pearson Correlation	1	.919**
	Sig. (2-tailed)		.000
	N	649	649
Final grade	Pearson Correlation	.919**	1
	Sig. (2-tailed)	.000	
	N	649	649

**. Correlation is significant at the 0.01 level (2-tailed).

```
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```

Hypothesis Example 4: Chi-square independence test
H0: School and higher education intention are independent. H

Crosstabs

Notes

Output Created		18-JUN-2026 20:11:10
Comments		
Input	Data	D:\DATA ANALYSIS\A Basic Descriptive Statistics Guides\Null and Alternative Hypothesis\dataset.csv
	Active Dataset	AnalysisData
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each table are based on all the cases with valid data in the specified range(s) for all variables in each table.
Syntax		CROSSTABS /TABLES=school BY higher /FORMAT=AVALUE TABLES /STATISTICS=CHISQ PHI /CELLS=COUNT ROW COLUMN EXPECTED /COUNT ROUND CELL.
Resources	Processor Time	00:00:00.03
	Elapsed Time	00:00:00.03
	Dimensions Requested	2
	Cells Available	524245

Hypothesis Example 4: Chi-square independence test
H0: School and higher education intention are independent. H

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
school * higher	649	100.0%	0	0.0%	649	100.0%

school * higher Crosstabulation

			higher		
			no	yes	Total
school	GP	Count	32	391	423
		Expected Count	45.0	378.0	423.0
		% within school	7.6%	92.4%	100.0%
		% within higher	46.4%	67.4%	65.2%
	MS	Count	37	189	226
		Expected Count	24.0	202.0	226.0
		% within school	16.4%	83.6%	100.0%
		% within higher	53.6%	32.6%	34.8%
Total		Count	69	580	649
		Expected Count	69.0	580.0	649.0
		% within school	10.6%	89.4%	100.0%
		% within higher	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	12.024[a]	1	.001		
Continuity Correction[b]	11.115	1	.001		
Likelihood Ratio	11.458	1	.001		
Fisher's Exact Test				.001	.001
N of Valid Cases	649				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 24.03.

b. Computed only for a 2x2 table

Hypothesis Example 4: Chi-square independence test

H0: School and higher education intention are independent. H

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	-.136	.001
	Cramer's V	.136	.001
N of Valid Cases		649	

```
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```

Summary rule for null and alternative hypothesis
At alpha = .05, reject H0 when Sig. or p-value is less than

Frequencies

Notes

Output Created		18-JUN-2026 20:11:10
Comments		
Input	Data	D:\DATA ANALYSIS\A Basic Descriptive Statistics Guides\Null and Alternative Hypothesis\dataset.csv
	Active Dataset	AnalysisData
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	649
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=school sex higher /ORDER=ANALYSIS.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.01

Statistics

		school	sex	higher
N	Valid	649	649	649
	Missing	0	0	0

Frequency Table

Summary rule for null and alternative hypothesis
At alpha = .05, reject H0 when Sig. or p-value is less than

school

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	GP	423	65.2	65.2	65.2
	MS	226	34.8	34.8	100.0
	Total	649	100.0	100.0	

sex

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	F	383	59.0	59.0	59.0
	M	266	41.0	41.0	100.0
	Total	649	100.0	100.0	

higher

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	69	10.6	10.6	10.6
	yes	580	89.4	89.4	100.0
	Total	649	100.0	100.0	

```
Data written to D:\DATA ANALYSIS\...\Null and Alternative Hypothesis\SPSS_Outp
ut\clean_data\spss_ready_data.csv.
34 variables and 649 cases written.
Variable: school            Type: String   Width:  12
Variable: sex               Type: String   Width:   8
Variable: age               Type: Number   Width:   8   Dec: 0
Variable: address           Type: String   Width:  12
Variable: famsize           Type: String   Width:  12
Variable: Pstatus           Type: String   Width:  12
Variable: Medu              Type: Number   Width:   8   Dec: 0
Variable: Fedu              Type: Number   Width:   8   Dec: 0
Variable: Mjob              Type: String   Width:  20
Variable: Fjob              Type: String   Width:  20
Variable: reason            Type: String   Width:  20
Variable: guardian          Type: String   Width:  20
```

Summary rule for null and alternative hypothesis
At alpha = .05, reject H0 when Sig. or p-value is less than

```
Variable: traveltime         Type: Number   Width:   8   Dec: 0
Variable: studytime          Type: Number   Width:   8   Dec: 0
Variable: failures           Type: Number   Width:   8   Dec: 0
Variable: schoolsup          Type: String   Width:   8
Variable: famsup             Type: String   Width:   8
Variable: paid               Type: String   Width:   8
Variable: activities         Type: String   Width:   8
Variable: nursery            Type: String   Width:   8
Variable: higher             Type: String   Width:   8
Variable: internet           Type: String   Width:   8
Variable: romantic           Type: String   Width:   8
Variable: famrel             Type: Number   Width:   8   Dec: 0
Variable: freetime           Type: Number   Width:   8   Dec: 0
Variable: goout              Type: Number   Width:   8   Dec: 0
Variable: Dalc               Type: Number   Width:   8   Dec: 0
Variable: Walc               Type: Number   Width:   8   Dec: 0
Variable: health             Type: Number   Width:   8   Dec: 0
Variable: absences           Type: Number   Width:   8   Dec: 0
Variable: G1                 Type: Number   Width:   8   Dec: 0
Variable: G2                 Type: Number   Width:   8   Dec: 0
Variable: G3                 Type: Number   Width:   8   Dec: 0
Variable: sex_num            Type: Number   Width:   8   Dec: 2
```