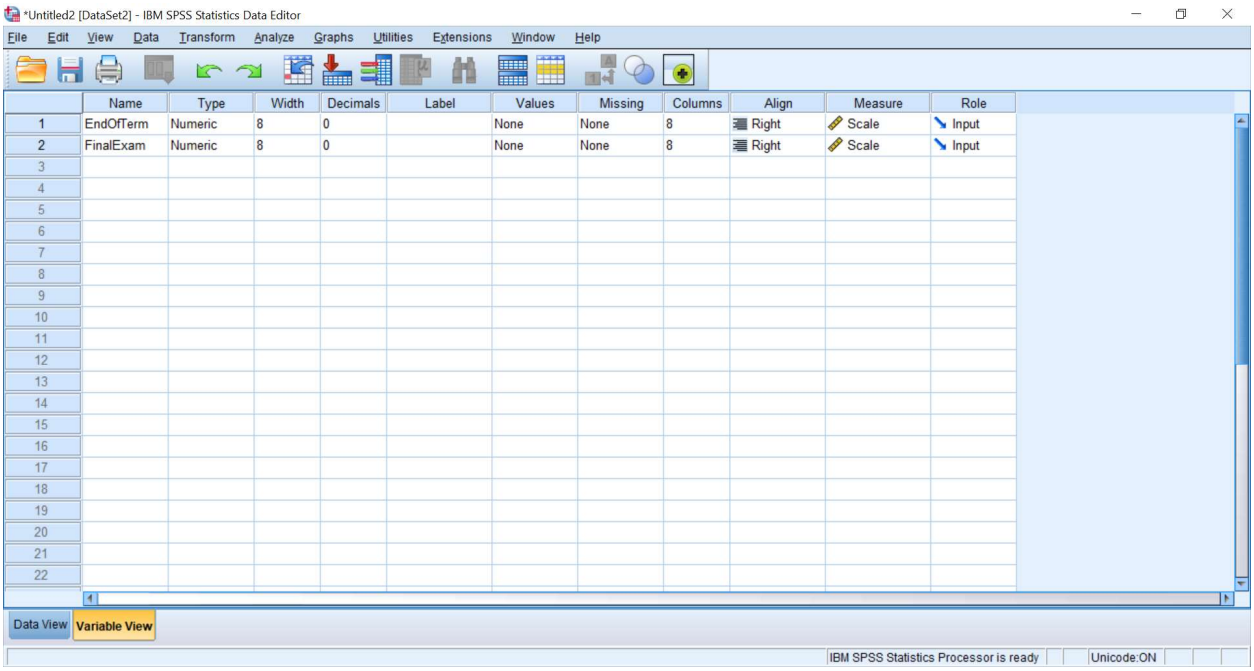
Lab # 1

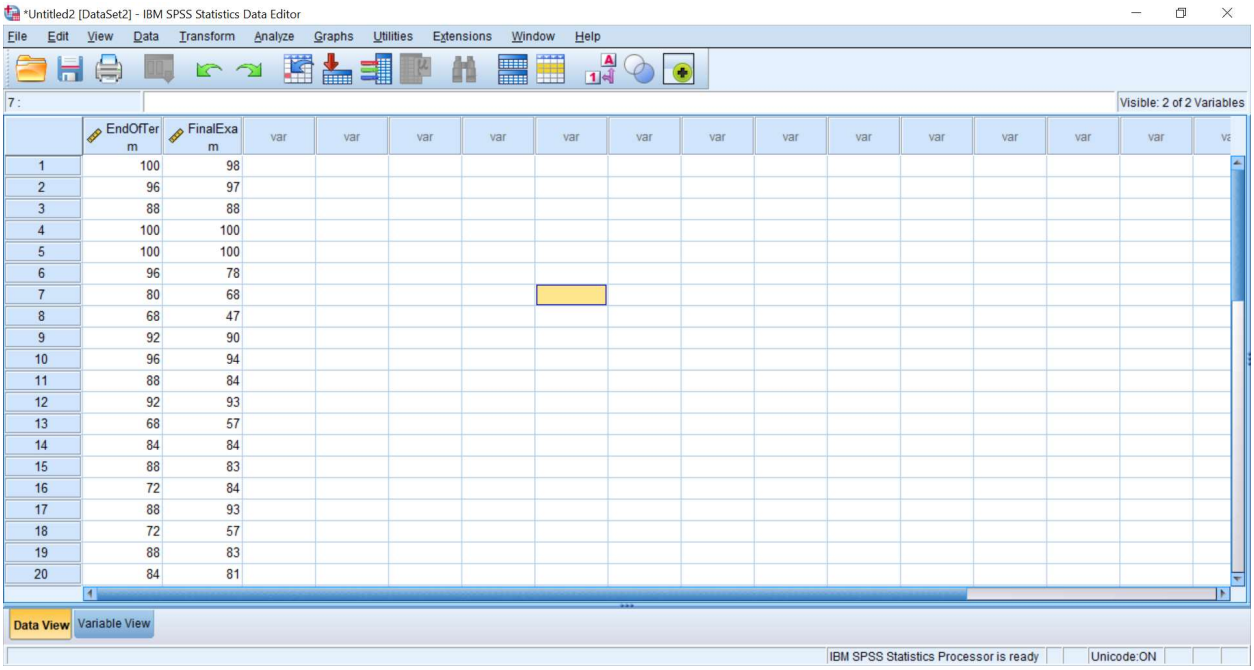
End-of-term survey_SLR Ex.

Two freshmen algebra classes at McNair Academic High School in Jersey City, New Jersey were studied. One of which used laptop computers at school and at home, while the other class did not. In each class, students were given a survey at the beginning and end of the semester, measuring his/her technological level. The scores were recorded for the end of semester survey (X) and the final examination (Y) for the laptop group. The data are recorded in the table below:

Student	End of Term Survey (X)	Final Exam (Y)
1	100	98
2	96	97
3	88	88
4	100	100
5	100	100
6	96	78
7	80	68
8	68	47
9	92	90
10	96	94
11	88	84
12	92	93
13	68	57
14	84	84
15	84	81
16	88	83
17	72	84
18	88	93
19	72	57
20	88	83

Enter the data





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6	96	78
7	80	68
8	68	47
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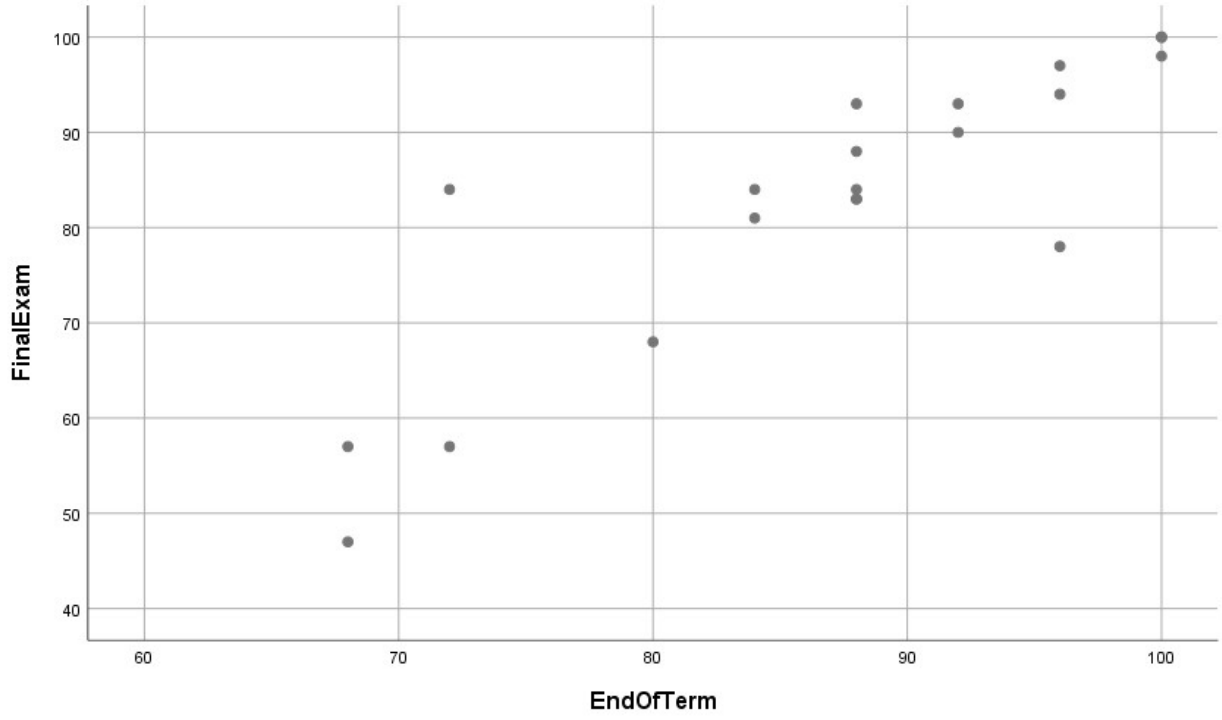
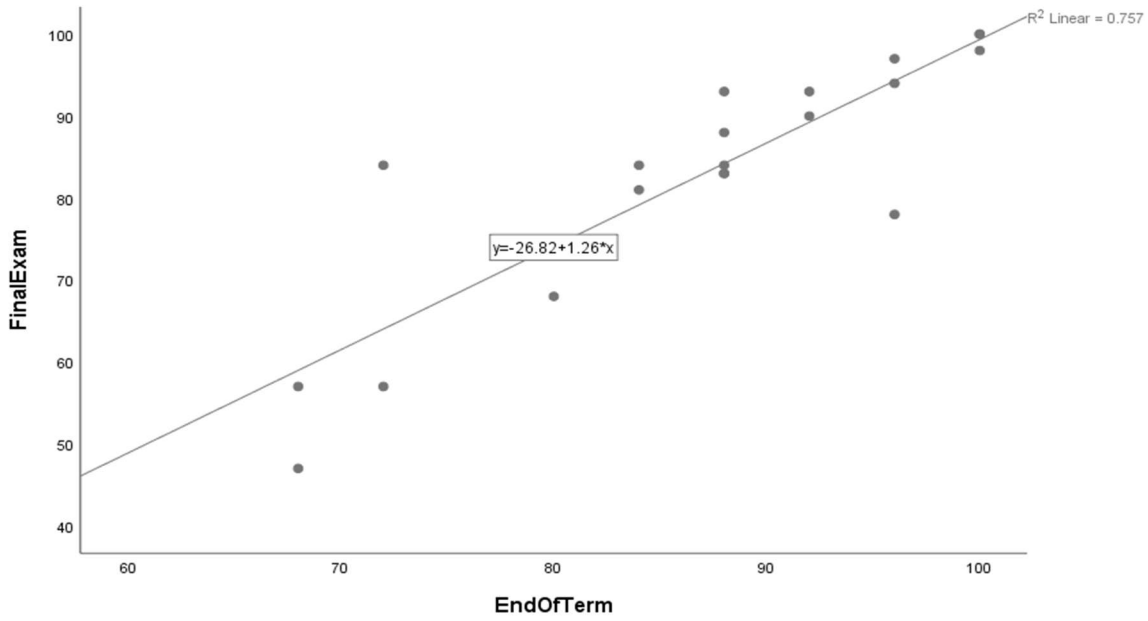
12	92	93
13	68	57
14	84	84
15	88	83
16	72	84
17	88	93
18	72	57
19	88	83
20	84	81

To obtain the **scatter plot** → "graph" → "Legacy Dialog" → "scatter/dot" → "Simple scatter → "Define" →put "final Exam" on the y axis and "End of Term" on the x axis → OK



To obtain the **least squares line** → hold a right button of the mouse on the scatter plot and select "edit" → "edit in a separate window" → from the top menu of chart editor click on "add fit line at total", if you do not wish to show grid lines then click on "hide grid lines" .



To obtain the **basic descriptive statistics** go to "Analyse" → "Descriptive Statistics" → "Descriptives" → "place which variables you want descriptives about (I chose both)" → select "Options" to indicate which descriptives you want and then click OK

Descriptives

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
EndOfTerm	20	32	68	100	87.00	10.372	107.579
FinalExam	20	53	47	100	82.95	15.042	226.261
Valid N (listwise)	20						

To obtain the **ANOVA table** with **coefficient estimates with C.I.'s for parameters** and ***r* and r^2** go to "Analyse" → "Regression" → "Linear" → select your Dependent and Independent/Predictor variables and then click OK

Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.870[a]	.757	.743	7.619

a. Predictors: (Constant), EndOfTerm

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3254.032	1	3254.032	56.055	.000[b]
	Residual	1044.918	18	58.051		
	Total	4298.950	19			

a. Dependent Variable: FinalExam

b. Predictors: (Constant), EndOfTerm

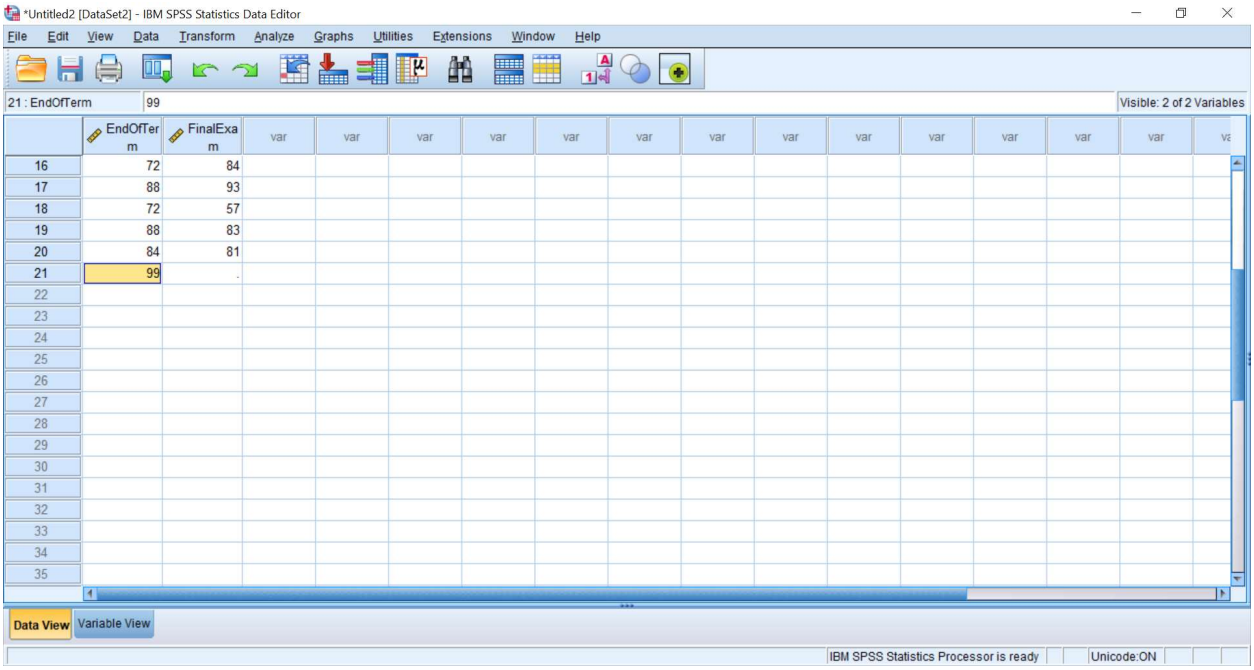
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	-26.822	14.760		-1.817	.086	-57.832	4.189
	EndOfTerm	1.262	.169	.870	7.487	.000	.908	1.616

a. Dependent Variable: FinalExam

Lab #2.

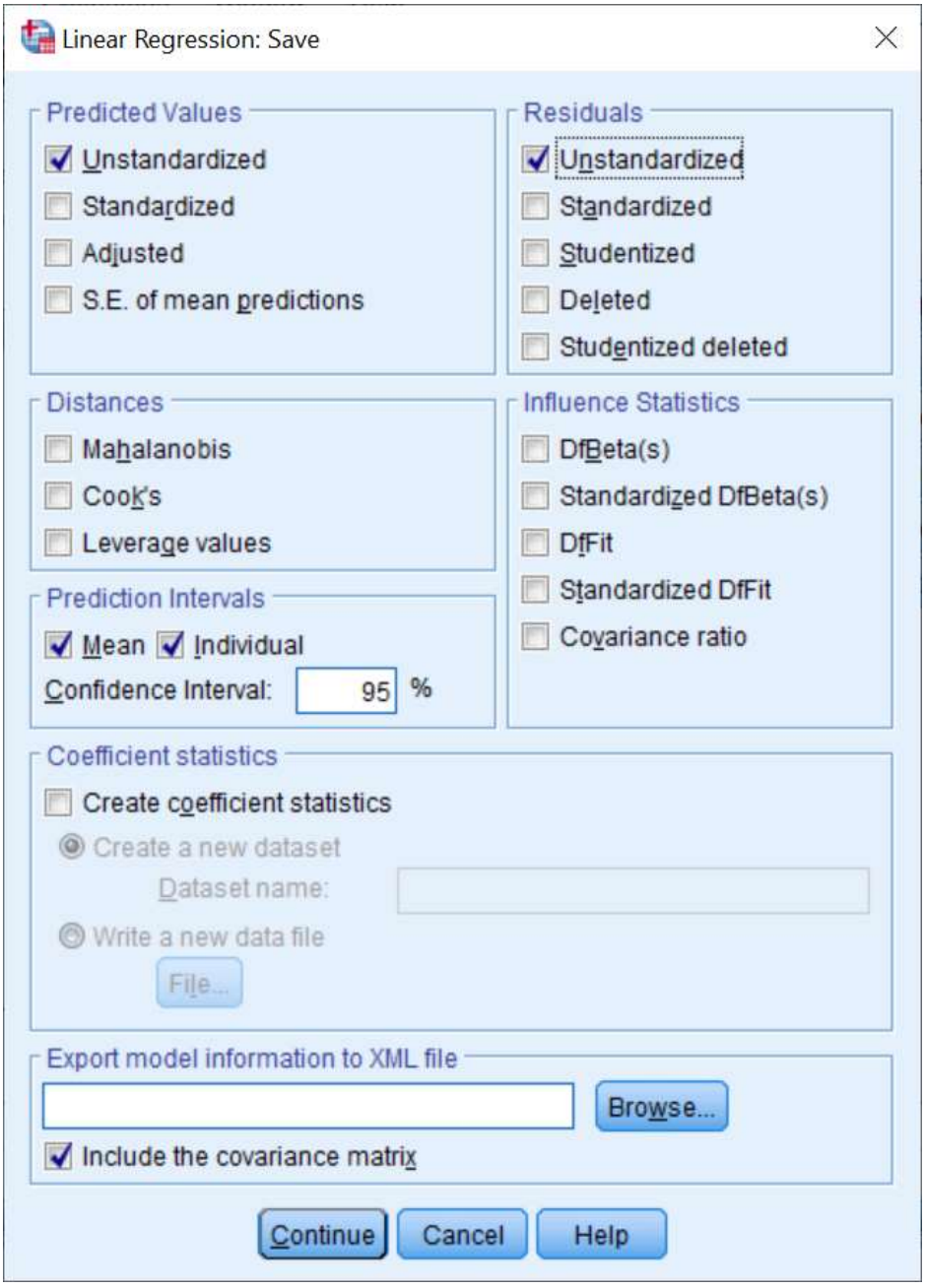
To obtain the **C.I.'s and P.I.'s for a new value of x_p** → first you need to add a new value for x variable in the original data set (we add x=99)



Then go to "Analyse" → "Regression" → "Linear" → click on "save" and select "Mean" and "Individual in "Prediction Interval" (make sure that you select a correct confidence level).

You may as well select "Unstandardized Predicted values" and "Unstandardized residuals" (that are needed for residual analysis).

Then click "continue" and "OK".



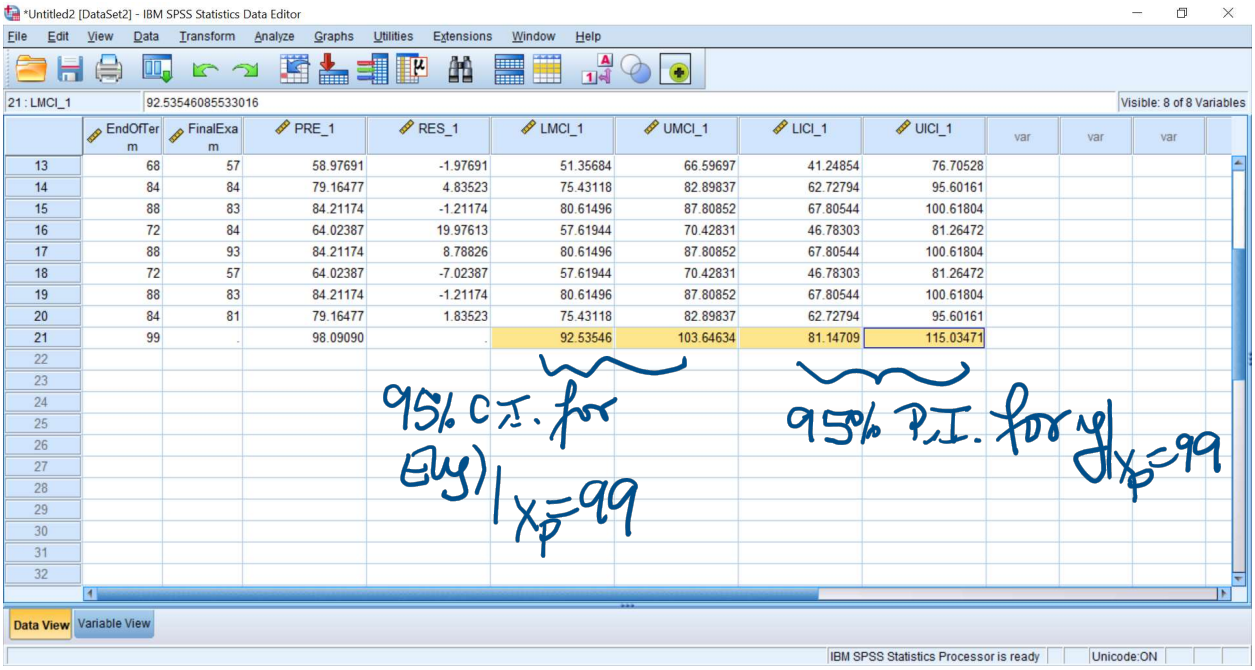
You obtain following:

95% C.I. for *E(y)* when x_p = 99 : (92.53546 , 103.64634)

95% P.I. for *y* when x_p = 99 : (81.14709, 115.03471)

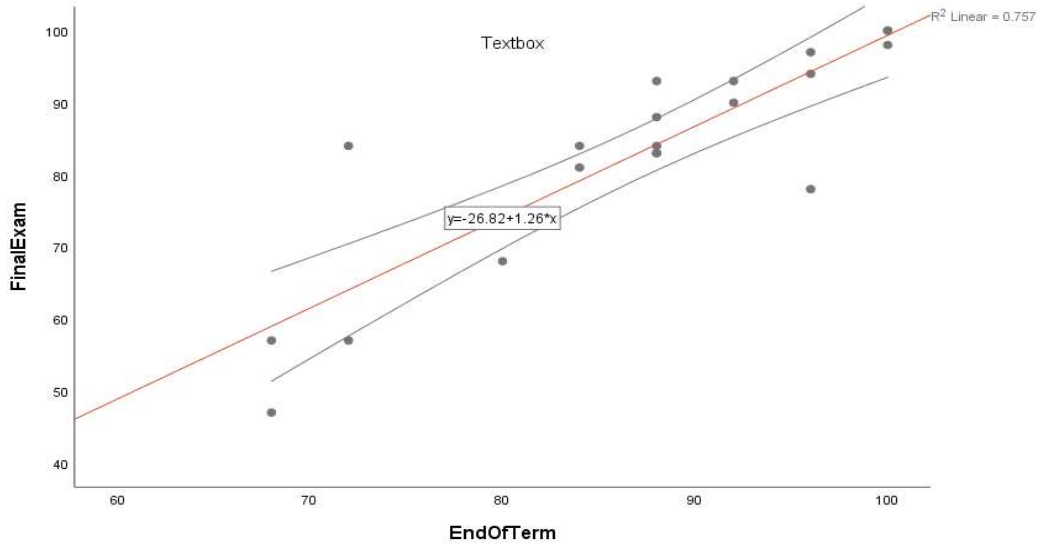
$\hat{y}$ = 98.09090 when x_p = 99

The resulting C.I. for E(y) and P.I. for y will be in an original data set.

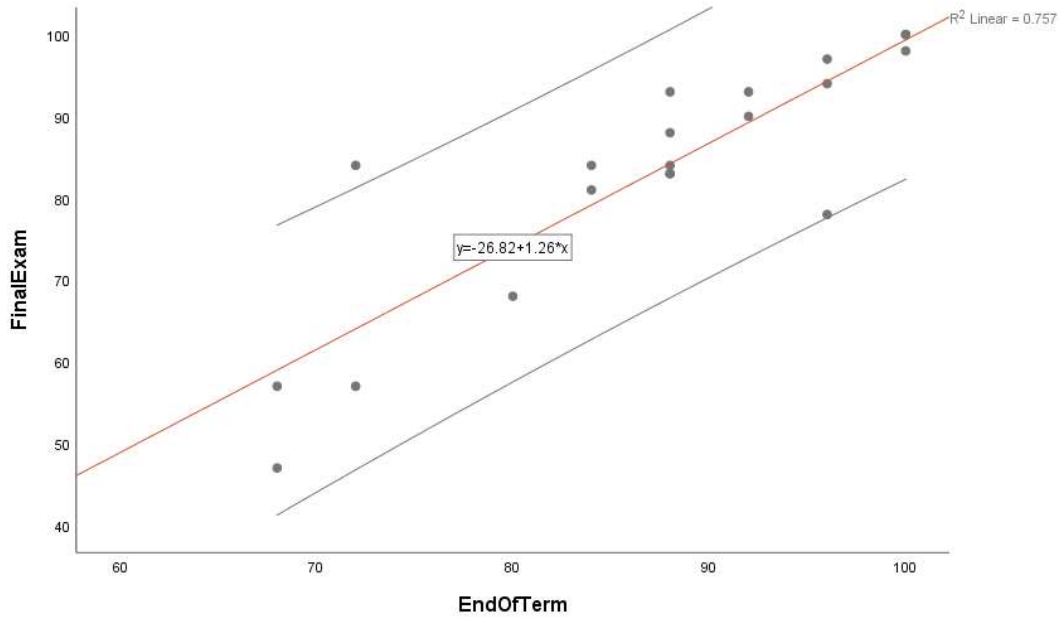


To obtain the **C.I.'s and P.I.'s bands** → go to your scatter plot and click on "edit" → "edit in a new window" → "fit line at total" in in options you select Intervals for mean and then for individual.

95% C.I. bands for E(y):



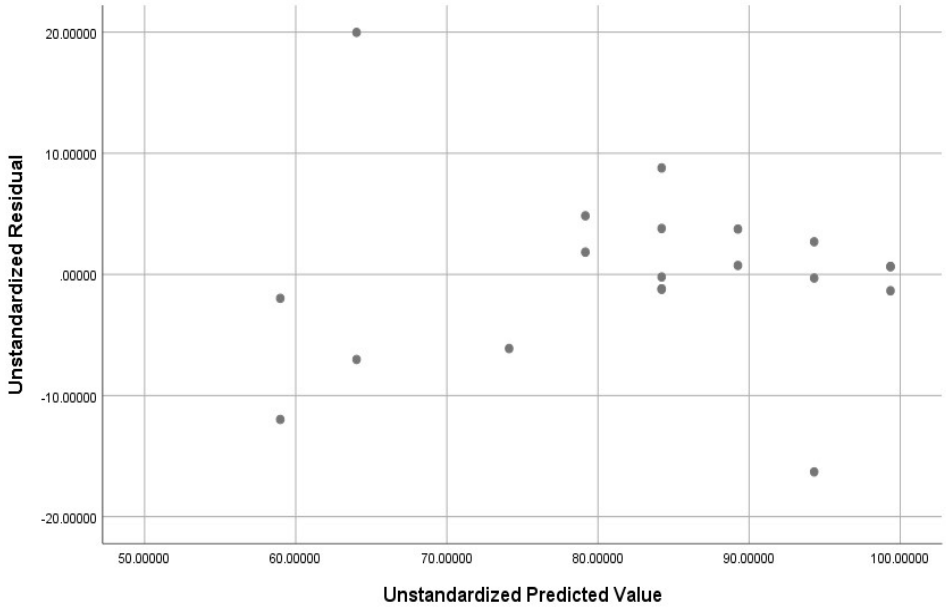
95% P.I. bands for y:



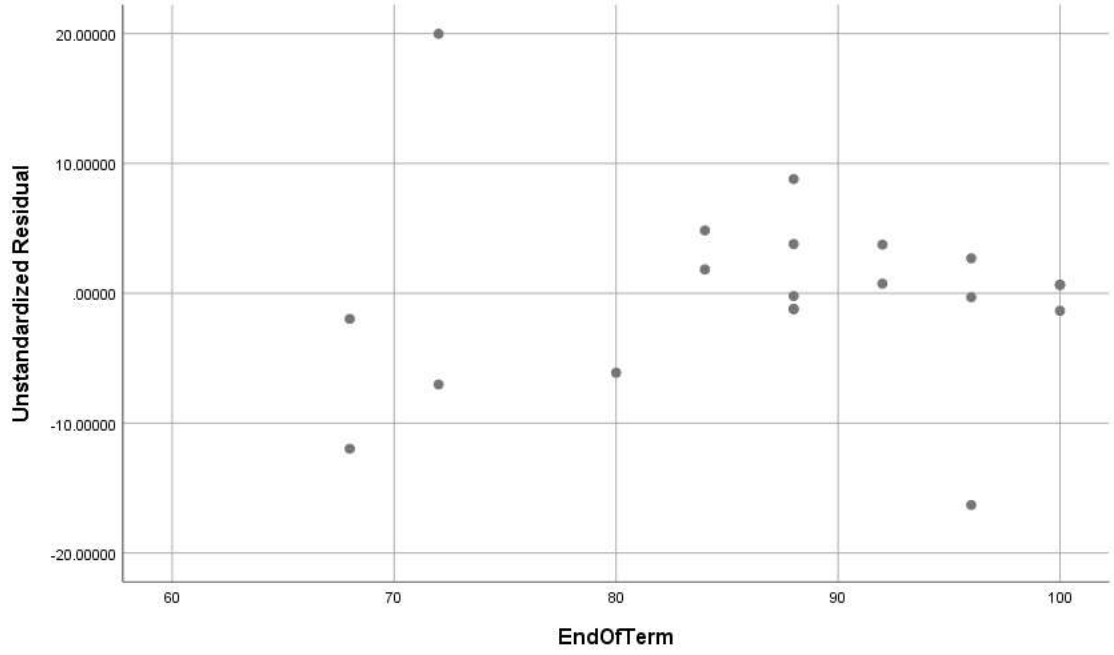
Lab #3.

Residual Analysis:

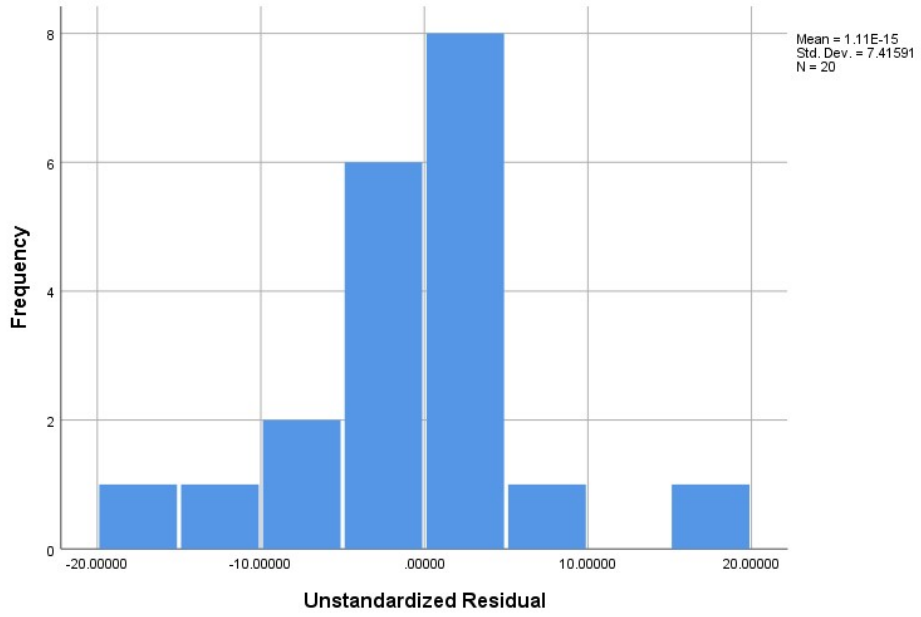
To obtain the **plot of predicted values vs residuals (i.e $\hat{y}_i$ vs e_i)** → "graph" → "Legacy Dialog" → "scatter/dot" → "Simple scatter → "Define" →put "Residuals" on the y axis and "Predicted Values" on the x axis → OK



To obtain the **plot of x's vs residuals (i.e x_i vs e_i)** → "graph" → "Legacy Dialog" → "scatter/dot" → "Simple scatter → "Define" →put "Residuals" on the y axis and "End of term" on the x axis → OK

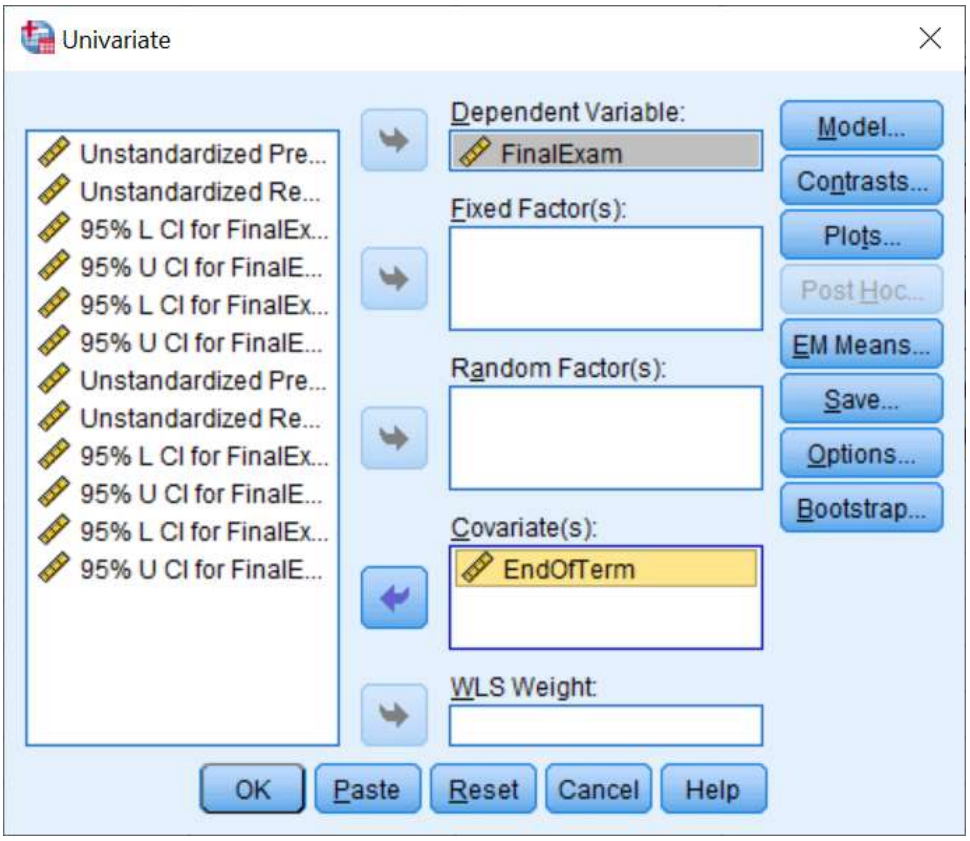


To obtain the **histogram of the errors** → "Graphs" → "Legacy Dialogs" → "Histogram" → select Unstandardized Residuals as a response variable and then click OK



Lack-of-Fit test:

To test lack-of-fit, go to “Analyze” → “General Linear Model” → “Univariate”. Then designate your response variable as the Dependent Variable and your predictor variable as a COVARIATE. Under the Options click the **Lack of fit** test → “continue” and OK.



Lack of Fit Tests

Dependent Variable: FinalExam

Source	Sum of Squares	df	Mean Square	F	Sig.
Lack of Fit	335.285	6	55.881	.945	.499
Pure Error	709.633	12	59.136		

H_0 : *model is appropriate*

H_a : *model is not appropriate*

test-statistics: $F_{LF} = \dfrac{MSLF}{MSPE} = \dfrac{55.881}{59.136} = \underline{\underline{0.944957}}$

R.R.: we reject H_0 if $F_{LF} > F_{\alpha,(df_{LF},df_{PE})} = F_{\alpha,(6,12)}$