1) A developer of food for pigs wishes to determine what relationship exists among ‘age of a pig’ when it starts receiving a newly developed food supplement, the initial weight of the pig and the amount of weight it gains in a week period with the food supplement. The following information is the result of study of eight piglets.

Piglet No.	Initial Weight (x1)	Initial age (x2)	Weight Gain (y)
1	39	8	7
2	52	6	6
3	49	7	8
4	46	12	10
5	61	9	9
6	35	6	5
7	25	7	3
8	55	4	4

Solution :

// don’t copy this

- First go to ANALYZE and hover on regression and on left click on linear regression
- On that linear regression window, keep the value of y in Depended Variable and all other value in independent, and click OK.
- Click on statistics and tick all the first four options in the left and click Ok
- All the output are the answer which are given below

```
DATASET NAME DataSet2 WINDOW=FRONT.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT WeightGain
  /METHOD=ENTER InitialWieght InitalAge.
```

```
/RESIDUALS NORMPROB(ZRESID)
/SAVE PRED RESID.
```

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	x2, x1[b]	.	Enter

a. Dependent Variable: y

b. All requested variables entered.

1) Determine the least square equation that best describes these three variables.
   Ans:

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	-4.192	1.888		-2.220	.077			
	x1	.105	.032	.501	3.247	.023	.514	.824	.500
	x2	.807	.158	.786	5.097	.004	.794	.916	.786

a. Dependent Variable: y

From above table,

$$Y = 0.105x_1 + 0.807x_2 - 4.192$$

is the required least square equation.

2) Calculate the standard error.
   Ans :

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.939[a]	.881	.834	.999	.881	18.539	2	5	.005

a. Predictors: (Constant), x2, x1

Hence, the standard error is 0.999.

3) Determine coefficient of multiple determination. Interpret.
Ans :

Correlations

		y	x1	x2
Pearson Correlation	y	1.000	.514	.794
	x1	.514	1.000	.017
	x2	.794	.017	1.000
Sig. (1-tailed)	y	.	.096	.009
	x1	.096	.	.484
	x2	.009	.484	.
N	y	8	8	8
	x1	8	8	8
	x2	8	8	8

From above table,
Partial correlation coefficients

- The correlation coefficient between x_1 and x_2 keeping y constant, $r_{x1x2.y}$= .017.
- The correlation coefficient between x_1 and y keeping x_2 constant, $r_{x1,y.x2}$ = 0.514
- The correlation coefficient between y and x_2 keeping x_1 constant, $r_{x2,y.x1}$ = 0.794

Coefficient of multiple determination

- $r_{x1x2.y}^2$ = 0.000289 ; 0.0289% of variation in x_1 has been explained by x_2 when y is constant.
- $r_{x1,y.x2}{}^2$ = 0.264 ; 26.4% of variation in x_1 has been explained by y when x_2 is constant.
- $r_{x2,y.x1}{}^2$ = 0.63 ; 63% of variation in x_2 has been explained by y when x_1 is constant.

4) Test the significance of regression coefficients and overall fit of the regression equation

Ans:

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.192	1.888		-2.220	.077
	x1	.105	.032	.501	3.247	.023
	x2	.807	.158	.786	5.097	.004

- Decision

For testing null hypothesis, B_0=0,
Since, p= 0.077 > α = 0.05 ; there is linear relationship between weight gain and
For testing null hypothesis, B_1=0,
Since, p= 0.023 > α = 0.05 ; there is a linear relationship between weight gain and initial weight.
For testing null hypothesis, B_2=0,
Since, p= 0.004 < α = 0.05 ; there is no linear relationship between weight gain and initial age.

5) How much gain in weight of a pig in a week can we expect with the food supplement if it were 9 weeks old and weighed 48 pounds?

Ans :

If x_1 = 48 and x_2 = 9,

$Y = = 0.105x_1 + 0.807x_2 - 4.192$

=(0.105 *48) + (0.807*9) – 4.192
= 8.111

We can expect 8.111 pounds weight gain.

2.

Steps in SPSS: //don't copy

- Go to Analyze and hover on Compare Mean and click on One Way Anova
- Drag value in dependent and treatment in independent and click on Post Hoc and Enable LSD and Click Ok

Solution

- Problem to test

  H_{0T} : There is no significant difference between the treatments.

  H_{1T} : There is at least one significant difference between the treatments.

```
ONEWAY value BY treatment
  /MISSING ANALYSIS.
```

ANOVA

value

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	190336.850	3	63445.617	1.362	.295
Within Groups	652267.150	14	46590.511		
Total	842604.000	17			

```
ONEWAY value BY treatment
  /STATISTICS DESCRIPTIVES
  /MISSING ANALYSIS
  /POSTHOC=LSD ALPHA(0.05).
```

Multiple Comparisons

Dependent Variable: value

LSD

(I) treatment	(J) treatment	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
T1	T2	-17.250	152.628	.912	-344.60	310.10
	T3	-122.650	144.795	.411	-433.21	187.91
	T4	151.150	144.795	.314	-159.41	461.71
T2	T1	17.250	152.628	.912	-310.10	344.60
	T3	-105.400	144.795	.479	-415.96	205.16
	T4	168.400	144.795	.264	-142.16	478.96
T3	T1	122.650	144.795	.411	-187.91	433.21
	T2	105.400	144.795	.479	-205.16	415.96
	T4	273.800	136.514	.065	-18.99	566.59
T4	T1	-151.150	144.795	.314	-461.71	159.41
	T2	-168.400	144.795	.264	-478.96	142.16
	T3	-273.800	136.514	.065	-566.59	18.99

- Decision
  $p = 0.295 > \alpha = 0.05$; Accept H_{0T} at 0.05 level of significance.
- Conclusion
  There is no significant difference between the treatments.