Two sample T

1)

The phosphorus content was measured for independent samples of skim and whole

Whole: 94.95 95.15 94.85 94.55 94.55 93.40 95.05 94.35 94.70 94.90

Skim: 91.25 91.80 91.50 91.65 91.15 90.25 91.90 91.25 91.65 91.00

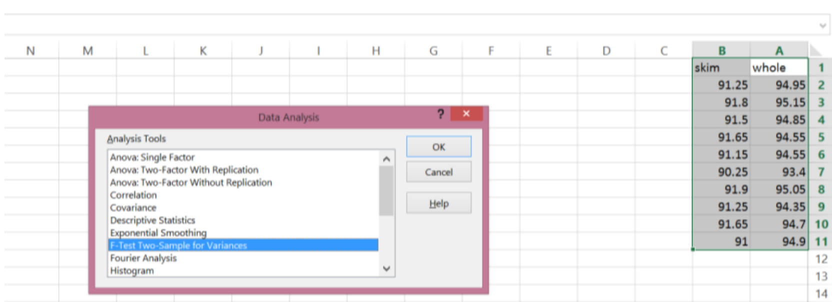
Assuming normal populations with equal variances

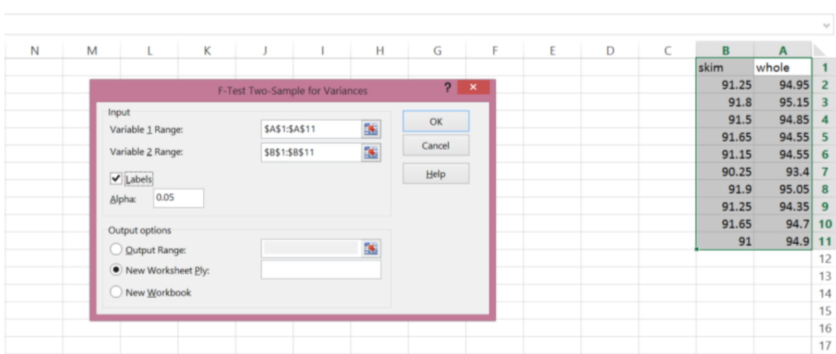
a) Test whether the average phosphorus content of skim milk is less than the average phosphorus content of whole milk. Use α=0.01

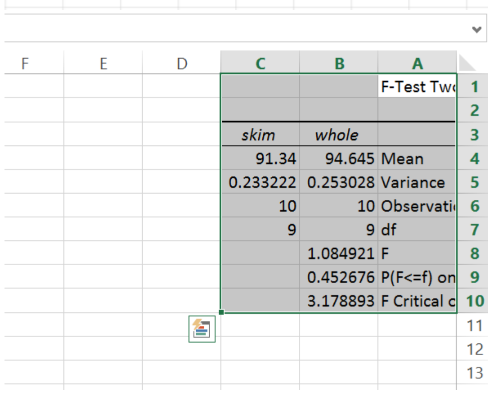
1- Test for equality of variance

$H_0: \sigma_{12} = \sigma_{22}$

$H_1: \sigma_{12} \neq \sigma_{22}$



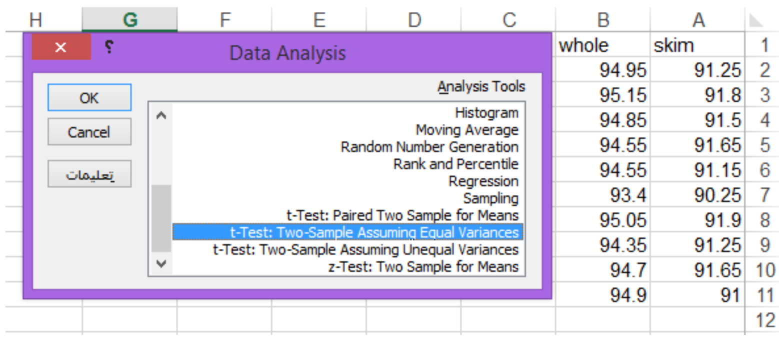


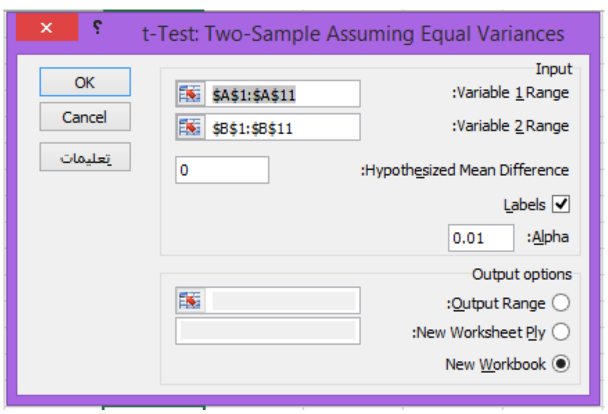


C	B	A
		F-Test Two
skim	whole	
91.34	94.645	Mean
0.233222	0.253028	Variance
10	10	Observati
9	9	df
	1.084921	F
	0.452676	P(F<=f) on
	3.178893	F Critical c

Conclusion: As F ≯ F Critical one-tail, we fail reject the null hypothesis. This is the case, 1.0849 ≯ 3.1789. Therefore, we fail to reject the null hypothesis. The variances of the two populations are equal (p-value=0.4527≮ $\alpha = 0.05$)

(2- T test two samples for means assuming equal variance By Excel)





t-Test: Two-Sample Assuming Equal Variances

	skim	*whole*
Mean	91.34	94.645
Variance	0.233222	0.253028
Observations	10	10
Pooled Variance	0.243125	
Hypothesized Mean Difference	0	
df	18	
t Stat	-14.9879	
P(T<=t) one-tail	6.53E-12	
t Critical one-tail	2.55238	
P(T<=t) two-tail	1.31E-11	
t Critical two-tail	2.87844	

1- Test hypothesis:

$H_0: \mu_2 \geq \mu_1$

$H_1: \mu_2 < \mu_1$

2- T stat = -14.9879

3- T critical one tail = 2.55238

4- **Conclusion:** We do a one-tail test . lf t Stat < -t Critical one-tail, we reject the null hypothesis.As -14.9879 < -2.55238 (p-value=0.00000653<α=0.01) . Therefore, we reject the null hypothesis

5- Independent random samples of 17 sophomores and 13 juniors attending a large university yield the following data on grade point averages:

Sophomores			Juniors		
3.04	2.92	2.86	2.56	3.47	2.65
1.71	3.60	3.49	2.77	3.26	3.00
3.30	2.28	3.11	2.70	3.20	3.39
2.88	2.82	2.13	3.00	3.19	2.58
2.11	3.03	3.27	2.98		
2.60	3.13				

Assuming normal population. At the 5% significance level, do the data provide sufficient evidence to conclude that the mean GPAs of sophomores and juniors at the university different ?

1- Test for equality of variance

$H_0: \sigma_{12} = \sigma_{22}$

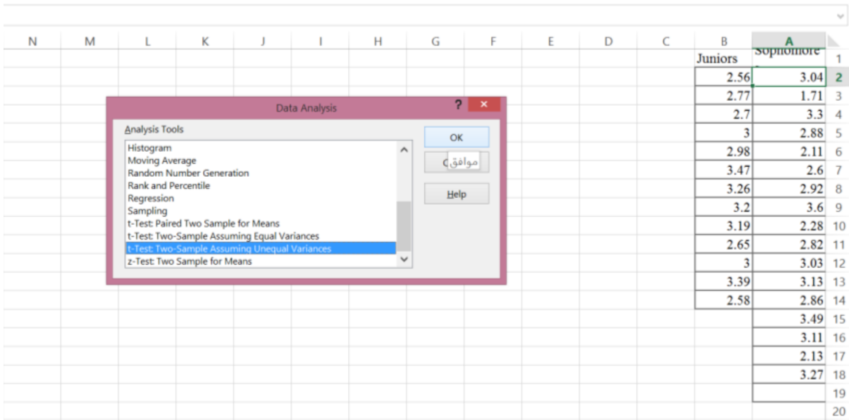
$H_1: \sigma_{12} \neq \sigma_{22}$

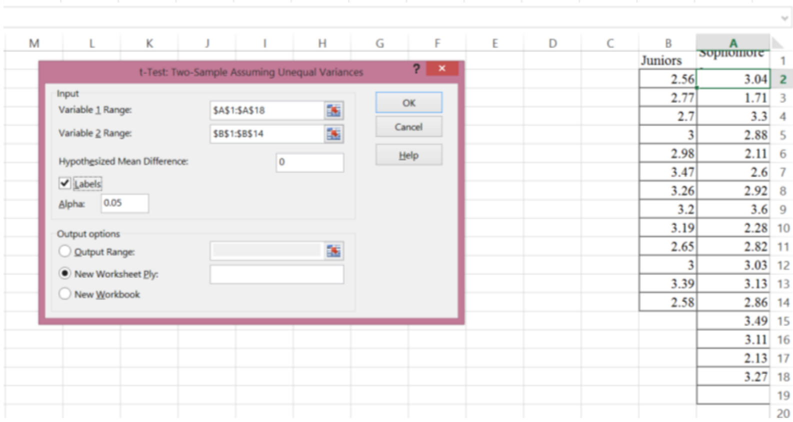
F-Test Two-Sample for Variances

Juniors	*Sophomores*	
2.980769231	2.84	Mean
0.095641026	0.270225	Variance
13	17	Observations
12	16	df
	2.825408847	F
	0.037332216	P(F<=f) one-tail
	2.598881158	F Critical one-tail

Conclusion: As F $>$ F Critical one-tail, we reject the null hypothesis. Therefore, reject the null hypothesis. The variances of the two populations are unequal (p-value=0.03733$< \alpha = 0.05$)

2- T test two samples for means assuming unequal variance By Excel





t-Test: Two-Sample Assuming Unequal Variances

Juniors	*Sophomores*	
2.980769231	2.84	Mean
0.095641026	0.270225	Variance
13	17	Observations
	0	Hypothesized Mean Difference
	27	df
	-0.923149563	t Stat
	0.182052992	P(T<=t) one-tail
	1.703288446	t Critical one-tail
	0.364105983	P(T<=t) two-tail
	2.051830516	t Critical two-tail

1. Test hypothesis:

$H_0: \mu_2 = \mu_1$
$H_1: \mu_2 \neq \mu_1$

2. T stat = - 0.9231
3. T critical two tail = 2.05183
4. **Conclusion:** We do a two-tail test (inequality). lf t Stat < -t Critical two-tail or t Stat > t Critical two-tail, we reject the null hypothesis. This is not the case, -2.05183< -0.9231 < 2.05183. Therefore, we do not reject the null hypothesis (p-value=0.3641$\nless \alpha = 0.05$)

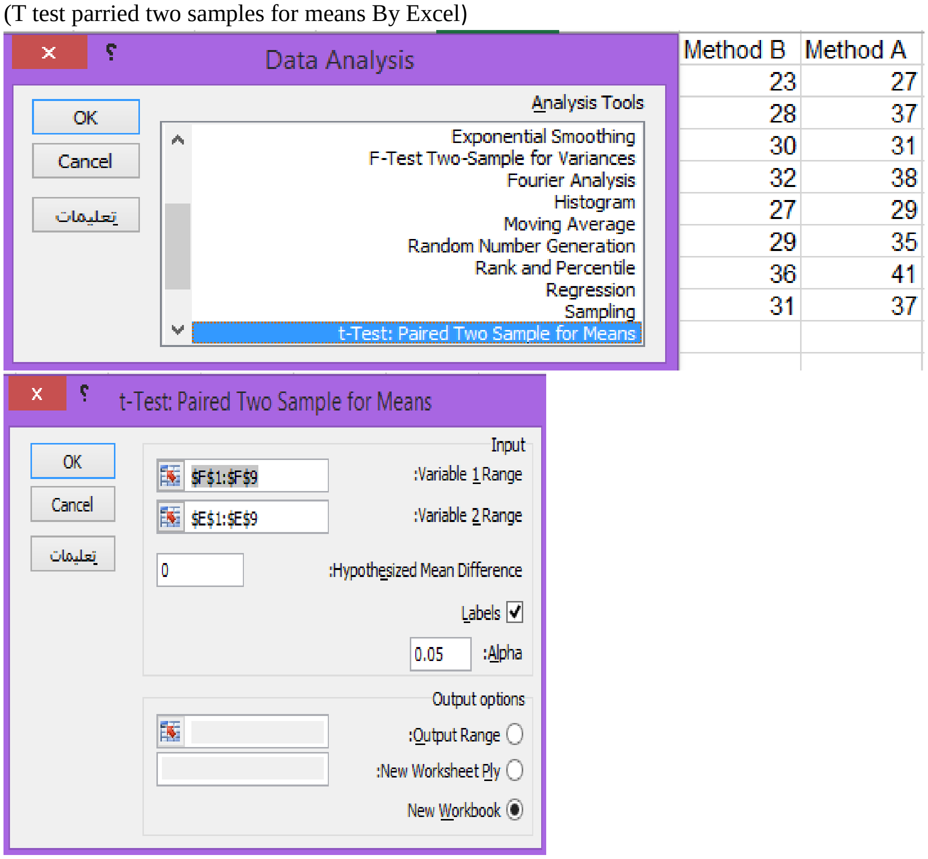
3-

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 parried two samples for means By Excel)



t-Test: Paired Two Sample for Means

method a	*method b*	
34.375	29.5	Mean
23.69642857	14.57142857	Variance
8	8	Observations
	0.857204246	Pearson Correlation
	0	Hypothesized Mean Difference
	7	df
	-5.445859126	t Stat
	0.000480113	P(T<=t) one-tail
	1.894578605	t Critical one-tail
	0.000960226	P(T<=t) two-tail
	2.364624252	t Critical two-tail

1. Test hypothesis:
   $H_0: \mu_b \geq \mu_a$
   $H_1: \mu_b < \mu_a$
2. T stat = -5.44585
3. T critical one tail = 1.89457
4. **Conclusion:** We do a one-tail test . If t Stat < -t Critical one-tail, we reject the null hypothesis.As -5.44585< -1.89457 (p-value=0.00048<α=0.05) . Therefore, we reject the null hypothesis

PEARSON CORRELATION COEFFICIENT

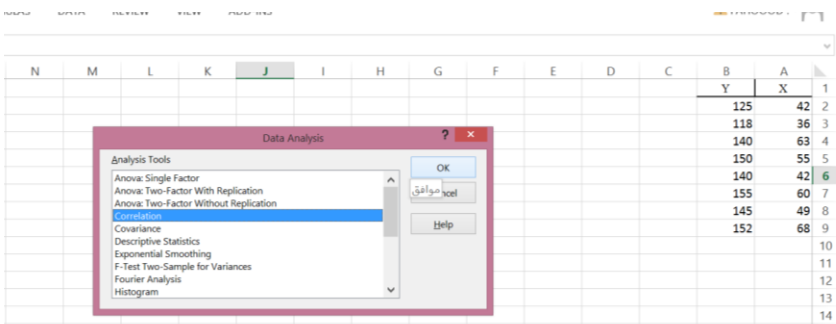
4) We have the table illustrates the age X and blood pressure Y for eight female.

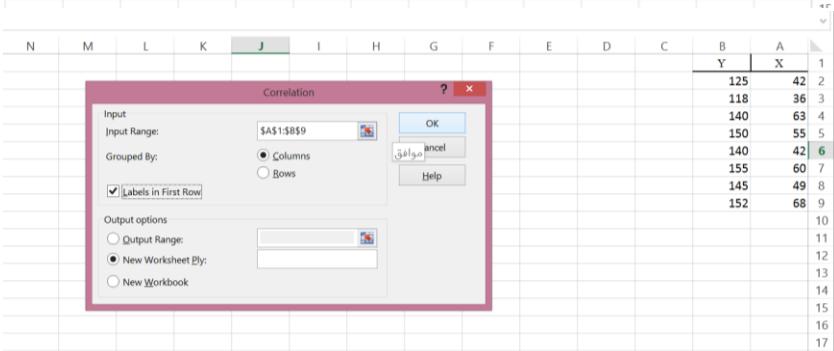
68	49	60	42	55	63	36	42	X
152	145	155	140	150	140	118	125	Y

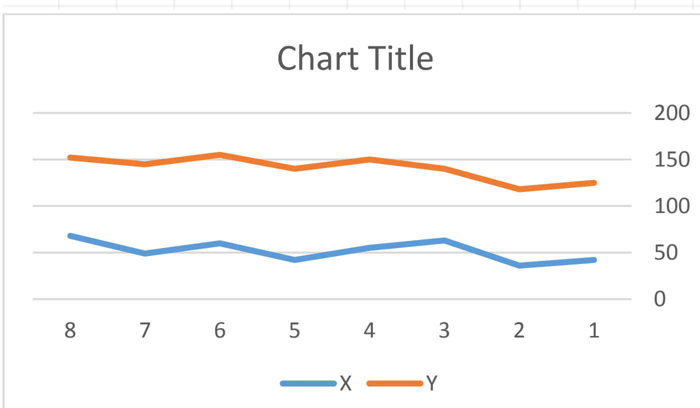
Find:

	By Excel (using (fx) and (Data Analysis))
Correlation=0.791832	CORREL(M3:M10;N3:N10)

Positive correlation between x and y







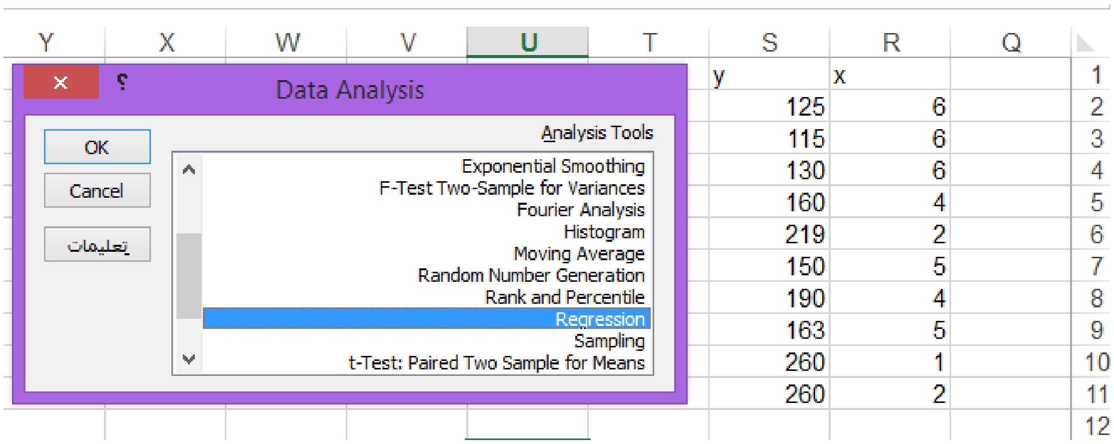
5)

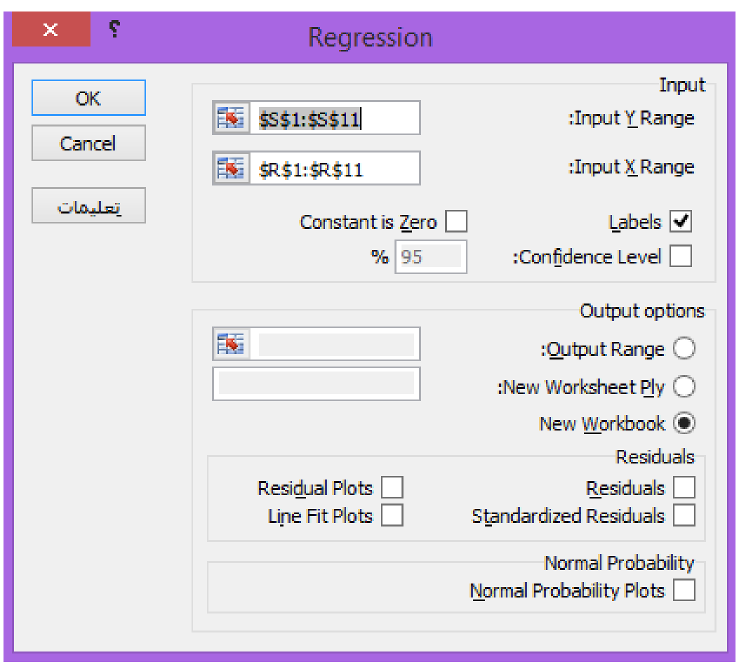
Ten Corvettes between 1 and 6 years old were randomly selected from last year's sales records in Virginia Beach, Virginia. The following data were obtained, where x denotes age, in years, and y denotes sales price, in hundreds of dollars.

x	6	6	6	4	2	5	4	5	1	2
y	125	115	130	160	219	150	190	163	260	260

a) Determine the regression equation for the data.
b) Compute and interpret the coefficient of determination, r^2 .
c) Obtain a point estimate for the mean sales price of all 4-year-old Corvettes.

(Linear regression by Excel)





SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.967871585
R Square	0.936775406
Adjusted R Square	0.928872332
Standard Error	14.24652913
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	24057.89126	24057.89	118.533	4.48427E-06
Residual	8	1623.708738	202.9636		
Total	9	25681.6			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	291.6019417	11.43289905	25.50551	5.98E-09	265.2376293	317.9662542	265.2376293	317.9662542
x	-27.90291262	2.562889198	-10.8873	4.48E-06	-33.81294571	-21.99287953	-33.81294571	-21.99287953

a) $\hat{y} = 291.6019 - 27.9029x$
For every unit in x we expect that y to decrease by 27.9029

b) R^2=0.9367
93.67% of the variation in y data is explained by x

c) c) $\hat{y} = 291.6019 - 27.9029(4) = 180$