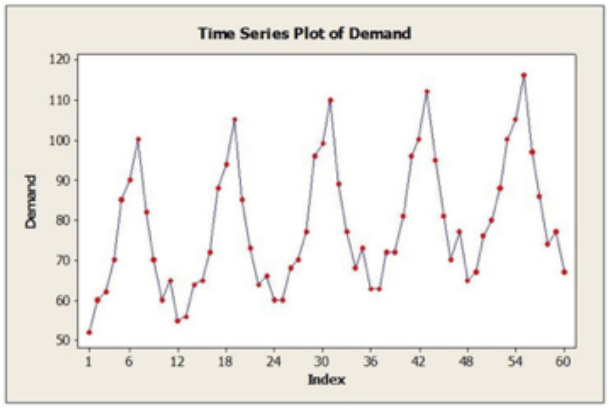
1. A large automobile parts supplier keeps track of the demand for a particular part needed by its customers, automobile manufacturers. The time series plot below shows monthly demand for this part (in thousands) for a five-year period. The dominant component(s) in this time series is(are)



a. cyclical.
b. irregular.
c. seasonal and trend.
d. cyclical and irregular.
e. No time series component is dominant. The time series is random walk.

2. Annual estimates of the population in the age group 65+ in a certain city from 2005 (t = 1) onward are used to estimate the following quadratic trend model:

$\hat{y} = 148187 - 554t + 135.5t^2$, Using this model, the estimate for 2014 is

a. 157,218.
b. 156,197.
c. 153,713.
d. 161,312.
e. 158,489.

3. A second-order autoregressive model for average mortgage rate is:

$$\text{Rate}_i = -1.0 + 1.8(\text{Rate})_{i-1} - 0.5\,(\text{Rate})_{i-2}.$$

If the average mortgage rate in 1998 was 7.0, and in 1997 was 6.4, the forecast for 2000 is

a. 6.32
b. 10.62
c. 8.82
d. 9.92
e. 7.32

Given below are the prices of a basket of four food items and the quantity of each item from 1996 to 2000.

Year	Wheat ($/Bushel)	Q_W	Corn ($/Bushel)	Q_C	Soybeans ($/Bushel)	Q_S	Milk ($/hundredweight)	Q_M
1996	4.25	60	3.71	30	7.41	40	15.03	80
1997	3.43	50	2.7	30	7.55	40	13.63	80
1998	2.63	50	2.3	30	6.05	40	15.18	80
1999	2.11	60	1.97	40	4.68	50	14.72	80
2000	2.16	60	1.9	40	4.81	50	12.32	90

4. what is the simple price indexes for the corn in 1998 using 1996 as the base year?
   a. 61.99
   b. 81.65
   c. 161.30
   d. 53.10
   e. None of the above

5. what is the unweighted aggregate price index for the basket of four food items in 1999 using 1996 as the base year?
   a. 26.16
   b. 86.05
   c. 77.24
   d. 30.4
   e. None of the above

6. what is the Paasche price index for the basket of four food items in 1998 that consisted of 50 bushels of wheat, 30 bushels of corn, 40 bushels of soybeans and 80 hundredweight of milk in 1998 using 1996 as the base year?
   a. 90.25
   b. 90.91
   a. 83.91
   b. 83.13
   c. None of the above

7. what is the Laspeyres price index for the basket of four food items in 1998 that consisted of 60 bushels of wheat, 30 bushels of corn, 40 bushels of soybeans and 80 hundredweight of milk in 1996 using 1996 as the base year?
   a. 90.91
   b. 90.25
   c. 83.91
   d. 83.13
   e. None of the above

The following table contains the number of complaints received in a department store for the first 6 months of last year.

Month	Complaints
January	36
February	45
March	81
April	90
May	108
June	144

8. if a three-term moving average is used to smooth this series, what would be the third calculated term?
   a. 36
   b. 40.5
   c. 72
   d. 93
   e. None of the above

9. if this series is smoothed using exponential smoothing with a smoothing constant of 1/3, what would be the forecast for April term?
   a. 53
   b. 65.3
   c. 45
   d. 39
   e. None of the above

A contractor developed a multiplicative time-series model to forecast the number of contracts in future quarters, using quarterly data on number of contracts during the 4-year period from 2000 to 2003. The following is the resulting regression equation:

$$log_{10}\hat{y} = 2.31 + 0.12\ X + 0.1\ Q2 + 1.1\ Q3 - 0.6\ Q4$$

where $\hat{y}$ is the estimated number of contracts in a quarter

X is the coded quarterly value with $\boldsymbol{X = 1}$ in the first quarter of 2000.

Q_2 is a dummy variable equal to 1 in the second quarter of a year and 0 otherwise.

Q_3 is a dummy variable equal to 1 in the third quarter of a year and 0 otherwise.

Q_4 is a dummy variable equal to 1 in the fourth quarter of a year and 0 otherwise.

10. the quarterly compound growth rate in contracts is around:

A. 23.6%.

B. 31.83%.

C. 131.8%.

D. 25.6%.

E. -31.83%.

11. Which of the following statements is true:

A. the number of contracts in the fourth quarter of a year is approximately 75% lower than the average over all 4 quarters.

B. the number of contracts in the second quarter of a year is approximately 25.9% lower than it would be during the fourth quarter.

C. the number of contracts in the second quarter of a year is approximately 25.9% higher than the average over all 4 quarters.

D. the number of contracts in the fourth quarter of a year is approximately 75% higher than it would be during the first quarter.

E. the number of contracts in the second quarter of a year is approximately 25.9% higher than it would be during the first quarter.

12. using the regression equation, which of the following values is the best forecast for the number of contracts in the first quarter of 2004?

A. 4.34

B. 4.22

C. 16982.44

D. 21379.62

E. 22387.21

Quarterly sales data (in $10,000) for a small company specializing in green cleaning products are obtained. A seasonal regression model was fit to these data and the results are shown below.

The regression equation is : **Sales = 89.06 + 1.37t - 23.37Q_2 - 23.91Q_3 + 27.88Q_4** where **t=0,1,2,3,….**

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	13661.1286	2732.2257	234.6879	0.0000
Residual	19	276.4964	14.5524		
Total	24	13937.6250			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	89.0613	1.9994	44.5441	0.0000
t	1.3732	0.1140	12.0470	0.0000
Q2	-23.3732	2.2054	-10.5982	0.0000
Q3	-23.9131	2.2142	-10.7998	0.0000
Q4	27.8804	2.2288	12.5089	0.0000

13. Which of the following is **not** true?

a. The seasonal regression model is significant in explaining sales as indicated by the *F*-statistic and associated *P*-value.
b. The seasonal regression model explains 98.02% of the variation in sales.
c. The *t*-statistics and associated *P*-values indicate that all dummy variables representing quarters are significant.
d. Q1 is the quarter without dummy variable. The next year sales in Q1 is predicted to be $1,233,100.
e. The seasonal regression model is significant overall because the variable **t** is significant.

14. The regression coefficients in the seasonal regression model indicate that

a. sales are, on average, lower in the first, second and third quarters compared with the fourth quarter.
b. sales are, on average, lowest in the fourth quarter.
c. sales are, on average, higher in the first, second and third quarters compared with the fourth quarter.
d. sales are, on average, lowest in the first quarter.
e. sales are, on average, highest in the first quarter.

A sample of 30 companies was randomly selected for a study investigating what factors affect the size of company bonuses. Data were collected on the number of employees at the company and whether or not the employees were unionized (1 = yes, 0 = no). The following multiple regression model was fit to the data.

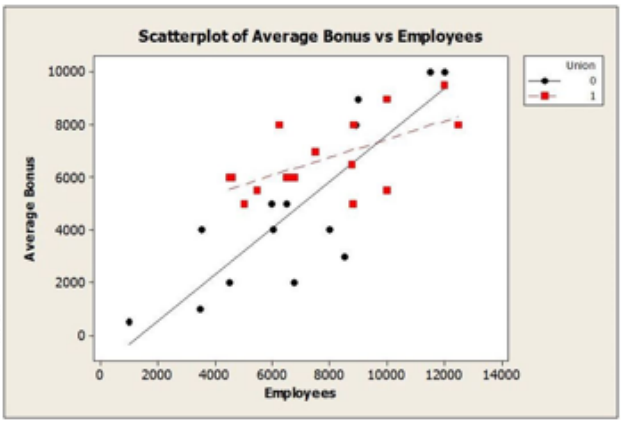
Dependent Variable is Average Annual Bonus

Predictor	Coef	SE Coef	T	P
Constant	347.9	872.2	0.40	0.693
Employees	0.6547	0.1105	5.92	0.000
Union	1259.5	605.8	2.08	0.047

S = 1631.56 R-Sq = 62.4% R-Sq(adj) = 59.6%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	119368382	59684191	22.42	0.000
Residual Error	27	71873285	2661974		
Total	29	191241667			



15. Which of the following statements is **not true** at α = 0.05?

a. The multiple regression model is overall significant in explaining the size of company bonuses.
b. The number of employees at the company is a significant variable in explaining the size of company bonuses.
c. Whether or not the employees are unionized is a significant variable in explaining the size of company bonuses.
d. The regression model accounts for 62.4% of the variation in average annual bonus.
e. The regression model only accounts for 59.6% of the variation in average annual bonus because Employees is not significant variable.

16. The correct interpretation of the regression coefficient of Union is

a. that the annual average bonus is $605.80 less for unionized companies compared to non-unionized companies of the same size (same number of employees).
b. that the annual average bonus is $605.80 more for unionized companies compared to non-unionized companies of the same size (same number of employees).
c. that the annual average bonus is $1259.50 less for unionized companies compared to non-unionized companies of the same size (same number of employees).
d. that the annual average bonus is $1259.50 more for unionized companies compared to non-unionized companies of the same size (same number of employees).
e. that the annual average bonus is $208 more for unionized companies compared to non-unionized companies of the same size (same number of employees).

17. What does the scatterplot of these data suggest?

a. Using the interaction term “Employees × Union” in the model might be more appropriate.
b. The intersection of the line confirms that using Union as an indicator variable in this model is appropriate.
c. The intersection of the line suggests that Union should not be included in the model as a variable.
d. The intersection of the line suggests that Employees should not be included in the model as a variable.
e. Using the interaction term Employees×Union in the model is definitely inappropriate.

What affects 4K Ultra HD Smart TV sales? TVs are sold through a variety of outlets. Sales figures (number of units) for the Samsung 7 Series were obtained for last quarter from a sample of 30 different stores. Also collected were data on the selling price and amount spent on advertising the Samsung 7 Series (as a percentage of total advertising expenditure in the previous quarter) at each store.

Dependent Variable is Sales

Predictor	Coef	SE Coef	T	P
Constant	90.19	25.08	3.60	0.001
Price	-0.03055	0.01005	-3.04	0.005
Advertising	3.0926	0.3680	8.40	0.000

Analysis of Variance

Source	DF	SS	MS
Regression	2	16477.3	8238.7
Residual Error	27	3038.0	112.5
Total	29	19515.4	

18. The calculated value of test statistic to determine the overall significance of the estimated multiple regression model is

a. 10.61.
b. 73.23.
c. 112.5.
d. 3.60.
e. 8.40.

19. The calculated value of test statistic to determine if amount spent on advertising is a significant independent variable in explaining Samsung 7 Series sales is

a. 3.60.
b. - 3.04.
c. 8.40.
d. 10.61.
e. 0.3680.

20. Which of the following statements is true at $\alpha = .05$?

a. The multiple regression model is not significant overall.
b. Price is not a significant independent variable in explaining Samsung 7 Series sales.
c. There is no evidence that Advertising is a significant independent variable in explaining Samsung 7 Series sales.
d. All we can say is that the multiple regression model is significant overall and only Price is a significant independent variable in explaining Samsung 7 Series sales.
e. We can say that the multiple regression model is significant overall. Also, both variables (Price and Advertising) are significant in explaining Samsung 7 Series sales.

21. Using the estimated multiple regression model, the number of units sold on average at a store that sells the Samsung 7 Series for $2199 and spends 10% of its advertising budget on the product is

a. 53.94 ≈ 54 units.
b. 120 units.
c. 66.94 ≈ 67 units.
d. 90.34 ≈ 90 units.
e. 689 units.

22. If an additional explanatory variable was added to the model, what would happen to R^2?

a. It can decrease.
b. It would always decrease.
c. It would stay the same or increase.
d. It can become negative.
e. If the coefficient of the additional variable is negative, R^2 dramatically decreases.

An advertising agency has developed a new ad for one of the national car manufacturing companies. The agency is interested in testing whether the proportion of favourable responses to the ad is the same between male and female adults. It conducted the test using an alpha level of 0.05. A sample of 100 adults of each gender was used in the study. Each person was asked to view the ad and indicate whether they found the ad to be "pleasing" or not. The samples resulted in 57 males and 47 females that liked the ad.

23. The appropriate null and alternative hypotheses are

a. $H_0 : p_1 = p_2$ and $H_A : p_1 \neq p_2$.
b. $H_0 : p_1 = p_2$ and $H_A : p_1 > p_2$.
c. $H_0 : p_1 > p_2$ and $H_A : p_1 \neq p_2$.
d. $H_0 : p_1 \neq p_2$ and $H_A : p_1 = p_2$.
e. $H_0 : p_1 = p_2$ and $H_A : p_1 < p_2$.

24. The correct value of the test statistic is

a. -2.234.
b. 1.645.
c. 2.234.
d. 1.024.
e. 1.42.

After completing sales training for a large company, it is expected that a salesperson will generate a sale on more than 15 percent of the calls he or she makes. To make sure that the sales training process is working, a random sample of 400 sales calls made by sales representatives who have completed the training have been selected and the null hypothesis is to be tested at 0.05 alpha level. Suppose that a sale is made on 76 of the calls.

25. The appropriate null and alternative hypotheses are

a. $H_0 : p = 0.15$ and $H_A : p < 0.15$.

b. $H_0 : p > 0.15$ and $H_A : p = 0.15$.

c. $H_0 : p = 0.15$ and $H_A : p > 0.15$.

d. $H_0 : p < 0.15$ and $H_A : p = 0.15$.

e. $H_0 : p = 0.15$ and $H_A : p \neq 0.15$.

26. The correct value of the test statistic is

a. -2.24.

b. 1.96.

c. 2.24.

d. 3.34.

e. -1.645.

27. At $\alpha = 0.05$:

a. We can conclude that the percentage of sales after training is significantly higher than 15%.

b. We can conclude that the percentage of sales after training is significantly lower than 15%.

c. We can conclude that the percentage of sales after training is equal to 15%.

d. We can conclude that the percentage of sales after training is not significantly different from 15%.

e. We can conclude that the percentage of sales after training is not significantly higher than 15%.

A local cell phone provider wants to determine if the use of text messaging is independent of age. The following data has been collected from a random sample of customers.

	REGULARLY USE TEXT MESSAGING	DO NOT USE IT REGULARLY
UNDER 21	82	34
21-39	57	34
40 AND OVER	6	83

28. Based on the data above what is the expected frequency for the "under 21 and regularly use text messaging" cell?

a. 50.0
b. 120
c. 145
d. 62
e. 56.8

29. The value of the test statistic is

a. 11.0705.
b. 0.
c. 9.2104.
d. 92.2095.
e. 275.02.

30. Assume the test statistic equals 20 (**not necessary the true value**), then At α = 0.05,

a. we reject the null hypothesis. There is no evidence that use of text messaging is independent of age. We and can conclude that there is an association between age and the use of text messaging.
b. we fail to reject the null hypothesis.
c. we fail to reject the null alternative hypothesis and can conclude that use of text messaging is independent of age.
d. as the *P*-value < .0001 is very low, We reject the null hypothesis. There is no association between age and the use of text messaging.
e. since χ^2_{stat}= 20 > χ^2_{α} = 5.991, we support the null hypothesis and can conclude that age and use of text messaging are not related.

A company in the golfing industry is interested in testing its new driver to see if it has greater length off the tee than the best-selling driver. To do this, it has selected a group of golfers of differing abilities and ages. Its plan is to have each player use each of the two clubs to hit five balls. It will record the average length in yards of the drives with each club for each player.

Player	New Club	Leading Club	Di
1	236.4	237.2	-0.80
2	202.5	200.4	2.10
3	245.6	240.8	4.80
4	257.4	259.3	-1.90
5	223.5	218.9	4.60
6	205.3	200.6	4.70
7	266.7	258.9	7.80
8	240.0	236.5	3.50
9	278.9	280.5	-1.60
10	211.4	206.5	4.90
Sum	**2367.7**	**2339.6**	**28.10**
Sum of Squares	**566769.73**	**554086.66**	**174.61**

31. The correct null and alternative hypotheses (assuming the new club is group 1, leading club is group 2, and d = group 1 value - group 2 value) are

a. $H_0 : \mu_d \neq 0$ and $H_A : \mu_d = 0$.

b. $H_0 : \mu_d = 0$ and $H_A : \mu_d > 0$.

c. $H_0 : \mu_d = 0$ and $H_A : \mu_d \neq 0$.

d. $H_0 : \mu_1 - \mu_2 = 0$ and $H_A : \mu_1 - \mu_2 < 0$.

e. $H_0 : \mu_1 - \mu_2 < 0$ and $H_A : \mu_1 - \mu_2 > 0$.

32. Our conclusion at $\alpha = 0.05$ is :

a. We know the new driver has smaller length off the tee than the best-selling driver, on average.

b. We reject the alternative hypothesis.

c. We reject the null hypothesis and conclude that the evidence indicates that the new driver has greater length off the tee than the best-selling driver, on average.

d. We are 95% certain that the new driver is not better than the leading driver.

e. We fail to reject the null hypothesis.

A consumer group was interested in comparing the operating time of cordless toothbrushes manufactured by two different companies. They took a random sample of 18 toothbrushes from Company A and 15 from Company B. Each was charged overnight and the number of hours of use before needing to be recharged was recorded. Company A toothbrushes operated for an average of 119.7 hours with a standard deviation of 1.74 hours; Company B toothbrushes operated for an average of 120.6 hours with a standard deviation of 1.72 hours. Do these samples indicate that Company B toothbrushes operate more hours on average than Company A toothbrushes?

Hours of Operation			
Company A		Company B	
121	119	122	120
122	121	121	118
117	122	121	121
120	119	122	123
120	119	121	118
121	118	119	120
118	120	120	124
120	123	119	
117	118		

33. Which of the following statements is true?

a. This is a one-tailed test for the difference in the means of two dependent groups.
b. This is a two-tailed test for the difference in the means of two independent groups.
c. This is a one-tailed test for the difference in the means of two independent groups.
d. These samples are matched.
e. This is a two-tailed test for the difference in the means of two dependent groups.

34. The correct null and alternative hypotheses (assuming Company A is group 1 and Company B is group 2) are

a. $H_0 : \mu_1 - \mu_2 = 0$ and $H_A : \mu_1 - \mu_2 > 0$.
b. $H_0 : \mu_1 - \mu_2 > 0$ and $H_A : \mu_1 - \mu_2 < 0$.
c. $H_0 : \mu_1 - \mu_2 = 0$ and $H_A : \mu_1 - \mu_2 < 0$.
d. $H_0 : \mu_1 - \mu_2 = 0$ and $H_A : \mu_1 - \mu_2 \neq 0$.
e. $H_0 : \mu_1 - \mu_2 < 0$ and $H_A : \mu_1 - \mu_2 > 0$.

35. Suppose that we test the hypotheses (assuming Company A is group 1 and Company B is group 2):

$H_0 : \mu_1 - \mu_2 = 0$ vs. $H_A : \mu_1 - \mu_2 \neq 0$. (Assume that the P-value is greater than $\alpha = 0.05$.)

If we want to construct a 95% confidence interval for the difference between the mean operating times of cordless toothbrushes of Company A and Company B, we will expect

a. both the upper and lower limits be negative.
b. both the upper and lower limits to be positive.
c. that zero is not included in the interval.
d. that zero falls into the interval.
e. both the upper and lower limits be positive and fairly high.

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

DEPARTMENT OF MATHEMATICS AND STATISTICS

Term 172

STAT 212 BUSINESS STATISTICS II

Final Exam

12 May 2018 at 8:00 AM

ID:_____ NAME:_____ Section 1 2 3

MULTIPLE CHOICE:	A	B	C	D	E	MULTIPLE CHOICE:	A	B	C	D	E
Q.No.1: -	O	O	O	O	O	Q.No.21: -	O	O	O	O	O
Q.No.2: -	O	O	O	O	O	Q.No.22: -	O	O	O	O	O
Q.No.3: -	O	O	O	O	O	Q.No.23: -	O	O	O	O	O
Q.No.4: -	O	O	O	O	O	Q.No.24: -	O	O	O	O	O
Q.No.5: -	O	O	O	O	O	Q.No.25: -	O	O	O	O	O
Q.No.6: -	O	O	O	O	O	Q.No.26: -	O	O	O	O	O
Q.No.7: -	O	O	O	O	O	Q.No.27: -	O	O	O	O	O
Q.No.8: -	O	O	O	O	O	Q.No.28: -	O	O	O	O	O
Q.No.9: -	O	O	O	O	O	Q.No.29: -	O	O	O	O	O
Q.No.10: -	O	O	O	O	O	Q.No.30: -	O	O	O	O	O
Q.No.11: -	O	O	O	O	O	Q.No.31: -	O	O	O	O	O
Q.No.12: -	O	O	O	O	O	Q.No.32: -	O	O	O	O	O
Q.No.13: -	O	O	O	O	O	Q.No.33: -	O	O	O	O	O
Q.No.14: -	O	O	O	O	O	Q.No.34: -	O	O	O	O	O
Q.No.15: -	O	O	O	O	O	Q.No.35: -	O	O	O	O	O
Q.No.16: -	O	O	O	O	O						
Q.No.17: -	O	O	O	O	O						
Q.No.18: -	O	O	O	O	O						
Q.No.19: -	O	O	O	O	O						
Q.No.20: -	O	O	O	O	O						