QMS202 Practice Test 2
Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) When testing for the difference between 2 population variances with sample sizes of $n_1 = 8$ and $n_2 = 10$, where n_1 has the larger variance, the number of degrees of freedom are 1) _____

A) 8 and 10. B) 16. C) 18. D) 7 and 9.

2) The test for the equality of two population variances is based on 2) _____

A) the difference between the sample variances divided by the difference between the sample means.
B) the ratio of the 2 sample variances.
C) the difference between the 2 population variances.
D) the difference between the 2 sample variances.

SCENARIO 10-13

The amount of time required to reach a customer service representative has a huge impact on customer satisfaction. Below is the Excel output from a study to see whether there is evidence of a difference in the mean amounts of time required to reach a customer service representative between two hotels. Assume that the population variances in the amount of time for the two hotels are not equal.

t-Test: Two-Sample Assuming Unequal Variances		
	Hotel 1	*Hotel 2*
Mean	2.214	2.0115
Variance	2.951657	3.57855
Observations	20	20
Hypothesized Mean Difference	0	
df	38	
t Stat	0.354386	
P(T<=t) one-tail	0.362504	
t Critical one-tail	1.685953	
P(T<=t) two-tail	0.725009	
t Critical two-tail	2.024394	

3) Referring to Scenario 10-13, state the null and alternative hypotheses for testing if there is evidence of a difference in the variabilities of the amount of time required to reach a customer service representative between the two hotels. 3) _____

A) H_0: $\sigma_I^2 - \sigma_{II}^2 \neq 0$ versus H_1: $\sigma_I^2 - \sigma_{II}^2 = 0$

B) H_0: $\sigma_I^2 - \sigma_{II}^2 \geq 0$ versus H_1: $\sigma_I^2 - \sigma_{II}^2 < 0$

C) H_0: $\sigma_I^2 - \sigma_{II}^2 = 0$ versus H_1: $\sigma_I^2 - \sigma_{II}^2 \neq 0$

D) H_0: $\sigma_I^2 - \sigma_{II}^2 \leq 0$ versus H_1: $\sigma_I^2 - \sigma_{II}^2 > 0$

4) Referring to Scenario 10-13, suppose $\alpha = 0.05$. Which of the following represents the result of the test on a difference in the variabilities of the amount of time required to reach a customer service representative between the two hotels?4) _____

A) Insufficient information exists on which to make a decision.

B) The null hypothesis is not rejected.
C) The null hypothesis is rejected.
D) The alternative hypothesis is rejected.

SCENARIO 10-15

The table below presents the summary statistics for the starting annual salaries (in thousands of dollars) for individuals entering the public accounting and financial planning professions.

Sample I (public accounting): $\overline{X}_1 = 60.35$, $S_1 = 3.25$, $n_1 = 12$

Sample II (financial planning): $\overline{X}_2 = 58.20$, $S_2 = 2.48$, $n_2 = 14$

Test whether the mean starting annual salaries for individuals entering the public accounting professions is higher than that of financial planning assuming that the two population variances are the same.

5) Referring to Scenario 10-15, state the null and alternative hypotheses for testing whether there is evidence of a difference in the variances of the starting annual salaries. 5) _____

A) $H_0: \sigma_1^2 - \sigma_2^2 = 0$ versus $H_1: \sigma_1^2 - \sigma_2^2 \neq 0$

B) $H_0: \sigma_1^2 - \sigma_2^2 \neq 0$ versus $H_1: \sigma_1^2 - \sigma_2^2 = 0$

C) $H_0: \sigma_1^2 - \sigma_2^2 \geq 0$ versus $H_1: \sigma_1^2 - \sigma_2^2 < 0$

D) $H_0: \sigma_1^2 - \sigma_2^2 \leq 0$ versus $H_1: \sigma_1^2 - \sigma_2^2 > 0$

6) In a one-way ANOVA, if the computed F statistic is greater than the critical F value you may 6) _____
A) not reject H_0 since there is no evidence of a difference in the means.
B) reject H_0 since there is evidence that not all the means are different.
C) not reject H_0 because a mistake has been made.
D) reject H_0 since there is evidence all the means differ.

7) A completely randomized design 7) _____
A) can have more than one factor, each with several treatment groups.
B) has one factor and one block.
C) has only one factor with several treatment groups.
D) has one factor and one block and multiple values.

8) In a one-way ANOVA, the null hypothesis is always 8) _____
A) some of the population means are different.
B) there is no difference in the population means.
C) all the population means are different.
D) there is some treatment effect.

9) An airline wants to select a computer software package for its reservation system. Four software packages (1, 2, 3, and 4) are commercially available. The airline will choose the package that bumps the fewest mean number of passengers as possible during a month. An experiment is set up in which each package is used to make reservations for 5 randomly

selected weeks. (A total of 20 weeks was included in the experiment.) The number of passengers bumped each week is given below. How should the data be analyzed?

Package 1: 12, 14, 9, 11, 16
Package 2: 2, 4, 7, 3, 1
Package 3: 10, 9, 6, 10, 12
Package 4: 7, 6, 6, 15, 12 9) _____

A) One-way ANOVA *F* test B) *t* test for the differences in means
C) *t* test for the mean difference D) *F* test for differences in variances

SCENARIO 10-17

A realtor wants to compare the mean sales-to-appraisal ratios of residential properties sold in four neighborhoods (A, B, C, and D). Four properties are randomly selected from each neighborhood and the ratios recorded for each, as shown below.

A: 1.2, 1.1, 0.9, 0.4 C: 1.0, 1.5, 1.1, 1.3
B: 2.5, 2.1, 1.9, 1.6 D: 0.8, 1.3, 1.1, 0.7

Interpret the results of the analysis summarized in the following table:

Source	*df*	SS	MS	*F*	PR > F
Neighborhoods		3.1819	1.0606	10.76	0.001
Error	12				
Total		4.3644			

10) Referring to Scenario 10-17, the among group degrees of freedom is 10) _____
A) 12 B) 16 C) 3 D) 4

11) The *t* test for the mean difference between 2 related populations assumes that the 11) _____
A) population of differences is approximately normal or sample sizes are large enough.
B) population sizes are equal.
C) sample variances are equal.
D) All of the above.

12) In what type of test is the variable of interest the difference between the values of the observations rather than the observations themselves? 12) _____

A) A test for the equality of variances from 2 independent populations
B) A test for the difference between the means of 2 independent populations
C) A test for the difference between the means of 2 related populations
D) All of the above.

SCENARIO 10-14

The use of preservatives by food processors has become a controversial issue. Suppose two preservatives are extensively tested and determined safe for use in meats. A processor wants to compare the preservatives for their effects on retarding spoilage. Suppose 15 cuts of fresh meat are treated with preservative I and 15 are treated with preservative II, and the number of hours until spoilage begins is recorded for each of the 30 cuts of meat. The results are summarized in the table below.

Preservative I	Preservative II
$\overline{X}_{I}$ = 106.4 hours	$\overline{X}_{II}$ = 96.54 hours
S_{I} = 10.3 hours	S_{II} = 13.4 hours

13) Referring to Scenario 10-14, state the null and alternative hypotheses for testing if the population variances differ for preservatives I and II. 13) _____

A) H_0: $\sigma_I^2 - \sigma_{II}^2 = 0$ versus H_1: $\sigma_I^2 - \sigma_{II}^2 \neq 0$

B) H_0: $\sigma_I^2 - \sigma_{II}^2 \neq 0$ versus H_1: $\sigma_I^2 - \sigma_{II}^2 = 0$

C) H_0: $\sigma_I^2 - \sigma_{II}^2 \geq 0$ versus H_1: $\sigma_I^2 - \sigma_{II}^2 < 0$

D) H_0: $\sigma_I^2 - \sigma_{II}^2 \leq 0$ versus H_1: $\sigma_I^2 - \sigma_{II}^2 > 0$

14) In testing for differences between the means of two independent populations, the null hypothesis is 14) _____

A) H_0: $\mu_1 - \mu_2 < 2$. B) H_0: $\mu_1 - \mu_2 = 0$.

C) H_0: $\mu_1 - \mu_2 = 2$. D) H_0: $\mu_1 - \mu_2 > 0$.

15) When testing H_0: $\pi_1 - \pi_2 = 0$ versus H_1: $\pi_1 - \pi_2 \neq 0$, the observed value of the Z test statistic was found to be -2.13. The p-value for this test is 15) _____

A) 0.9834. B) 0.9668. C) 0.0332. D) 0.0166.

16) Moving companies are required by the government to publish a Carrier Performance Report each year. One of the descriptive statistics they must include is the annual percentage of shipments on which a $50 or greater claim for loss or damage was filed. Suppose two companies, Econo-Move and On-the-Move, each decide to estimate this figure by sampling their records, and they report the data shown in the following table.

	Econo-Move	On-the-Move
Total shipments sampled	900	750
Number of shipments with a claim ≥ $50	162	60

The owner of On-the-Move is hoping to use these data to show that the company is superior to Econo-Move with regard to the percentage of claims filed. Which test would be used to properly analyze the data in this experiment? 16) _____

A) Separate variance *t* test for the difference between two means
B) *F* test for the ratio of variances
C) *Z* test for the difference between two proportions
D) *t* test for the difference between two means

17) *The Wall Street Journal* recently ran an article indicating differences in perception of sexual harassment on the job between men and women. The article claimed that women perceived the problem to be much more prevalent than did men. One question asked to both men and women was: "Do you think sexual harassment is a major problem in the American workplace?" Some 24% of the men compared to 62% of the women responded "Yes." Suppose that 150 women and 200 men were interviewed. For a 0.01 level of significance, what is the critical value for the rejection region? 17) _____

A) 6.635 B) 7.173 C) 7.106 D) 2.33

18) If we wish to determine whether there is evidence that the proportion of items of interest is the same in group 1 as in

group 2, the appropriate test to use is 18) _____

A) Both the Z test and the χ^2 test. B) the Z test.
C) the χ^2 test. D) Neither the Z test nor the χ^2 test.

SCENARIO 11-1

A corporation randomly selects 150 salespeople and finds that 66% who have never taken a self-improvement course would like such a course. The firm did a similar study 10 years ago in which 60% of a random sample of 160 salespeople wanted a self-improvement course. The groups are assumed to be independent random samples. Let π_1 and π_2 represent the true proportion of workers who would like to attend a self-improvement course in the recent study and the past study, respectively.

19) Referring to Scenario 11-1, what is the critical value when performing a chi-square test on whether the population proportions are different if $\alpha = 0.05$? 19) _____

A) ±1.645 B) ±1.96 C) 2.706 D) 3.841

SCENARIO 11-4
A computer used by a 24-hour banking service is supposed to randomly assign each transaction to one of 5 memory locations. A check at the end of a day's transactions gave the counts shown in the table to each of the 5 memory locations, along with the number of reported errors.

Memory Location	1	2	3	4	5
Number of Transactions	82	100	74	92	102
Number of Reported Errors	11	12	6	9	10

The bank manager wanted to test whether the proportion of errors in transactions assigned to each of the 5 memory locations differ.

20) Referring to Scenario 11-4, the degrees of freedom of the test statistic is 20) _____
A) 8 B) 4 C) 10 D) 448

21) Referring to Scenario 11-4, which test would be used to properly analyze the data in this experiment? 21) _____

A) χ^2 test for difference among more than two proportions
B) Kruskal-Wallis rank Test
C) χ^2 test of independence
D) Wilcoxon rank sum test

SCENARIO 11-5

Four surgical procedures currently are used to install pacemakers. If the patient does not need to return for follow-up surgery, the operation is called a "clear" operation. A heart center wants to compare the proportion of clear operations for the 4 procedures and collects the following numbers of patients from their own records:

	Procedure				
	A	B	C	D	Total
Clear	27	41	21	7	96
Return	11	15	9	11	46
Total	38	56	30	18	142

They will use this information to test for a difference among the proportion of clear operations using a chi-square test with a level of significance of 0.05.

22) True or False: Referring to Scenario 11-5, the null hypothesis will be rejected. 22) _____
A) True B) False

SCENARIO 11-8

A study was conducted to determine whether the use of seat belts in motor vehicles depends on the educational status of the parents. A sample of 792 children treated for injuries sustained from motor vehicle accidents was obtained, and each child was classified according to (1) parents' educational status (College Degree or Non-College Degree) and (2) seat belt usage (worn or not worn) during the accident. The number of children in each category is given in the table below.

	Non-College Degree	College Degree
Seat belts not worn	148	31
Seat belts worn	330	283

23) Referring to Scenario 11-8, the calculated test statistic is 23) _____
A) 72.8063 B) -0.9991 C) 48.1849 D) -0.1368

SCENARIO 11-10

One criterion used to evaluate employees in the assembly section of a large factory is the number of defective pieces per 1,000 parts produced. The quality control department wants to find out whether there is a relationship between years of experience and defect rate. Since the job is repetitious, after the initial training period any improvement due to a learning effect might be offset by a loss of motivation. A defect rate is calculated for each worker in a yearly evaluation. The results for 100 workers are given in the table below.

	Years Since Training Period		
	< 1 Year	1 - 4 Years	5 - 9 Years
Defect Rate: High	9	6	9
Average	23	9	19
Low	10	7	8

24) Referring to Scenario 11-10, what is the expected number of employees with less than 1 year of training time and a high defect rate? 24) _____

A) 5.28 B) 4.60 C) 9.17 D) 4.17

25) The *Y-intercept* (b_0) represents the 25) _____
A) predicted value of Y when $X = 0$.
B) variation around the sample regression line.
C) predicted value of Y.

D) change in estimated Y per unit change in X.

26) The slope (b_1) represents 26) _____
A) the predicted value of Y.
B) variation around the line of regression.
C) predicted value of Y when $X = 0$.
D) the estimated average change in Y per unit change in X.

SCENARIO 12-2

A candy bar manufacturer is interested in trying to estimate how sales are influenced by the price of their product. To do this, the company randomly chooses 6 small cities and offers the candy bar at different prices. Using candy bar sales as the dependent variable, the company will conduct a simple linear regression on the data below:

City	Price ($)	Sales
River Falls	1.30	100
Hudson	1.60	90
Ellsworth	1.80	90
Prescott	2.00	40
Rock Elm	2.40	38
Stillwater	2.90	32

27) Referring to Scenario 12-2, what is the estimated slope for the candy bar price and sales data? 27) _____
A) -3.810 B) 0.784 C) 161.386 D) -48.193

SCENARIO 12-9

It is believed that, the average numbers of hours spent studying per day (HOURS) during undergraduate education should have a positive linear relationship with the starting salary (SALARY, measured in thousands of dollars per month) after graduation. Given below is the Excel output for predicting starting salary (Y) using number of hours spent studying per day (X) for a sample of 51 students. **NOTE:** Only partial output is shown.

Regression Statistics	
Multiple R	0.8857
R Square	0.7845
Adjusted R Square	0.7801
Standard Error	1.3704
Observations	51

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	335.0472	335.0473	178.3859	
Residual			1.8782		
Total	50	427.0798			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-1.8940	0.4018	-4.7134	0.0000	-2.7015	-1.0865
Hours	0.9795	0.0733	13.3561	0.0000	0.8321	1.1269

Note: $2.051E - 05 = 2.051*10^{-05}$ and $5.944E - 18 = 5.944*10^{-18}$.

28) Referring to Scenario 12-9, the estimated change in mean salary (in thousands of dollars) as a result of spending an extra hour per day studying is 28) _____

A) 335.0473 B) 0.7845 C) 0.9795 D) -1.8940

29) In a multiple regression problem involving two independent variables, if b_1 is computed to be +2.0, it means that 29) _____

A) the estimated mean of Y is 2 when X_1 equals zero.
B) the estimated mean of Y increases by 2 units for each increase of 1 unit of X_1, holding X_2 constant.
C) the relationship between X_1 and Y is significant.
D) the estimated mean of Y increases by 2 units for each increase of 1 unit of X_1, without regard to X_2.

SCENARIO 13-1

A manager of a product sales group believes the number of sales made by an employee (Y) depends on how many years that employee has been with the company (X_1) and how he/she scored on a business aptitude test (X_2). A random sample of 8 employees provides the following:

Employee	Y	X_1	X_2
1	100	10	7
2	90	3	10
3	80	8	9
4	70	5	4
5	60	5	8
6	50	7	5
7	40	1	4
8	30	1	1

30) Referring to Scenario 13-1, for these data, what is the value for the regression constant, b_0? 30) _____
A) 21.293 B) 0.998 C) 3.103 D) 4.698

SCENARIO 13-3

An economist is interested to see how consumption for an economy (in $ billions) is influenced by gross domestic product ($ billions) and aggregate price (consumer price index). The Microsoft Excel output of this regression is partially reproduced below.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.991
R Square	0.982
Adjusted R Square	0.976
Standard Error	0.299
Observations	10

ANOVA

	df	SS	MS	*F*	*Signif F*
Regression	2	33.4163	16.7082	186.325	0.0001

Residual	7	0.6277	0.0897	
Total	9	34.0440		

	Coeff	StdError	*t Stat*	*p-value*
Intercept	-0.0861	0.5674	-0.152	0.8837
GDP	0.7654	0.0574	13.340	0.0001
Price	-0.0006	0.0028	-0.219	0.8330

31) Referring to Scenario 13-3, what is the predicted consumption level for an economy with GDP equal to $4 billion and an aggregate price index of 150? 31) _____

A) $2.89 billion B) $4.75 billion C) $9.45 billion D) $1.39 billion

32) The coefficient of multiple determination $r^2_{Y.12}$ 32) _____

A) measures the proportion of variation in Y that is explained by X_1 holding X_2 constant.

B) measures the variation around the predicted regression equation.

C) measures the proportion of variation in Y that is explained by X_1 and X_2.

D) will have the same sign as b_1.

SCENARIO 13-3

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GDP	0.7654	0.0574	13.340	0.0001
Price	-0.0006	0.0028	-0.219	0.8330

33) Referring to Scenario 13-3, when the economist used a simple linear regression model with consumption as the dependent variable and GDP as the independent variable, he obtained an r^2 value of 0.971. What additional percentage of the total variation of consumption has been explained by including aggregate prices in the multiple regression? 33) _____

A) 11.1 B) 1.1 C) 98.2 D) 2.8

34) In a multiple regression model, which of the following is correct regarding the value of the adjusted r^2? 34)
_____

A) It can be larger than 1.
B) It has to be larger than the coefficient of multiple determination.
C) It has to be positive.
D) It can be negative.

1) D
2) B
3) C
4) B
5) A
6) B
7) C
8) B
9) A
10) C
11) A
12) C
13) A
14) B
15) C
16) C
17) D
18) A
19) D
20) B
21) A
22) A
23) C
24) A
25) A
26) D
27) D
28) C
29) B
30) A
31) A
32) C
33) B
34) D