1. (10%) The probabilities of three events, A, B, and C, occurring are P(A)=0.35, P(B)=0.45, and P(C)=0.2. Assuming the A, B, or C has occurred, the probabilities of another event, X, occurring are $P(X|A)=0.8$, $P(X|B)=0.65$, and $P(X|C)=0.3$, Find $P(A|X)$ = ?

2. (10%) The monthly sales at a bookstore have a mean of 50,000 and a standard deviation of 6,000. Profits are calculated by multiplying sales by 40% and subtracting fixed costs of 12,000. Find the standard deviation of monthly profits.

3. (10%) A recent survey in Michigan revealed that 60% of the vehicles traveling on highways, where speed limits are posted at 70 miles per hour, were exceeding the limit. Suppose you randomly record the speeds of ten vehicles traveling on US 131 where the speed limit is 70 miles per hour. Let *X* denote the number of vehicles that were exceeding the limit.
   $P(X = 2)$ = ?

4. (10%) The following are the burning times of chemical flares of two different formulations. The design engineers are interested in both the mean and variance of the burning times.

Type 1		Type 2	
65	82	64	56
81	67	71	69
57	59	83	74
66	75	59	82
82	70	65	79

   Assume equal variance, test the hypothesis that the mean burning times are equal. Use α = 0.05.

5. (10%) The diameter of a ball bearing was measured by 12 inspectors, each using two different kinds of calipers. The results were

Inspector	Caliper 1	Caliper 2
1	0.265	0.264
2	0.265	0.265
3	0.266	0.264
4	0.267	0.266
5	0.267	0.267
6	0.265	0.268
7	0.267	0.264
8	0.267	0.265
9	0.265	0.265
10	0.268	0.267
11	0.268	0.268
12	0.265	0.269

Construct a 95 percent confidence interval on the difference in mean diameter measurements for the two types of calipers.

6. (10%) The computer output for the multiple regression model $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \varepsilon$ is shown below. However, because of a printer malfunction some of the results are not shown. These are indicated by the boldface letters ***a*** to ***i***. Fill in the missing results (up to three decimal places).

Predictor	*Coef*	*StDev*	*T*
Constant	***a***	6.15	4.11
x_1	3.51	***b***	1.25
x_2	0.71	0.30	***c***

S = ***d***　　R^2 = ***e***

ANALYSIS OF VARIANCE

Source of Variation	*df*	*SS*	*MS*	*F*
Regression	2	412	***g***	***i***
Error	37	***f***	***h***	
Total	39	974		

7. (10%) Ten business people who fly frequently from Chicago to New York were asked to rank four airlines in terms of the quality of service. The people assigned scores using a 5-point Likert scale where: 1 = bad, 2 = poor, 3 = average, 4 = good, and 5 = excellent. The results are shown below:

	Airline			
Person	A	B	C	D
1	1	3	5	2
2	5	4	2	1
3	2	5	3	2
4	4	2	4	1
5	3	3	1	5
6	4	4	5	3
7	3	4	1	4
8	2	5	2	1
9	5	3	4	2
10	5	5	4	3

(1) Which test is appropriate if you want to compare the quality of service of the four airlines?

(2) Can we conclude at the 5% significance level that there are differences in service quality among the four airlines?

(3) Using the appropriate statistical table, what statement can be made about the *p*-value for the test in the previous question? Explain how to use the *p*-value for testing the hypotheses.

8. (10%) To assess customer satisfaction, we used two methods to evaluate the score on the same person. One uses a lengthy interview by our assistants; the other consists of having the subject fill in a questionnaire. Both methods result in single number of score on a continuous scale. Twenty-two subjects participate in an experiment where they are assessed by both methods. The data summarized are

X : Questionnaire	Y : Interview
Mean = 15	Mean = 20
Variance = 9	Variance = 16

Covariance of X & Y is 10

(1) Find the least squares regression of Y on X.

(2) Another patient now comes in and is given the questionnaire. His score is 16. Predict his score on the interview with the 95% confidence interval.

9. (10%) A random sample of size n =9 is drawn from the uniform pdf, $f_Y(y;\omega)=1/\omega$, $0 \le y \le \omega$, for the purpose of testing $H_0:\omega=3.0$ versus $H_1:\omega<3.0$ at the α=0.05 level of significance. Suppose the decision rule is to be based on Y_9', the largest order statistic, that is $Y_9'=\max\{Y_1, Y_2, ..., Y_9\}$. What would be the probability of committing a Type II error when $\omega=2.7$?

10. (10%) A hotel chain wants to estimate the average number of rooms rented daily in each month. The population of rooms rented daily is assumed to be normally distributed for each with a standard deviation of 24 rooms.
    (1) During January, a sample of 16 days has a sample mean of 48 rooms. This information is used to calculate an interval estimate for the population mean to be from 40 to 56 rooms. What is the level of confidence of this interval?
    (2) During February, a sample of 25 days has a sample mean of 37 rooms. Use this information to calculate a 92% confidence interval for the population mean.