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1. A random variable has the value 6 with probability 0.3 and 2 with probability 0.8. What is the variance of this variable? (8 points)
2. John posted a banner advertisement on Yahoo! And its advertisement hits are normally distributed with a mean of 50 hits per day and a standard deviation of 6 hits per day. What number of advertisement hits per day represents the number so that only 5% of days have more hits? (8 points) [ $z_{0.1}=1.283$ ,  $z_{0.05}=1.645$ ,  $z_{0.025}=1.96$ ]
3. Professor Ma has a data set with 2500 samples. The sample mean was calculated to be 1000. Assuming that the data was generated from a random output that was distributed as a Normal distribution, what is the **mean** and **standard deviation** that you should use for predicting the next sample? (10 points)
4. Uni claims that its coats with water proof function sell 8% better than Zaza's coats without water proof function. In order to examine the correctness of the claim, Mary implemented a survey. In the survey, 18 people out of the 100 survey participants who liked water proof function chose brand Uni. 22 people out of the 200 survey participants who didn't like water proof function chose brand Zaza. Please judge if Uni's claim is right at level  $\alpha=0.05$ . (10 points) [ $z_{0.1}=1.283$ ,  $z_{0.05}=1.645$ ,  $z_{0.025}=1.96$ ]
5. Consumers arrive at a convenient store at random at a rate of 120 people per hour.
  - (a) Find the probability that, during any 3 minute period, the number of consumers arriving at the convenient store is exactly 2. (8 points)
  - (b) A consumer arrives at 10:00 am. Find the probability that the next consumer arrives before 10:02 am. (6 points)
6. A product manager faced with four decision alternatives and four states of nature develops the following product table.

Decision Alternative	States of Nature			
	$s_1$	$s_2$	$s_3$	$s_4$
$A_1$	14	9	10	5
$A_2$	11	10	8	7
$A_3$	9	10	10	11
$A_4$	8	10	11	13

The product manager obtains information that enables the following probability assessments:

$$P(s_1) = 0.3, P(s_2) = 0.1, P(s_3) = 0.2, \text{ and } P(s_4) = 0.4.$$

- (a) Construct a decision tree for this problem. (2 points)
- (b) Use the expected value approach to determine the optimal solution. (3 points)
- (c) Now assume that the entries in the product mix table are costs. Use the expected value approach to determine the optimal decision. (5 points)

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7. A large food manufacturer purchases an identical component from three independent suppliers that differ in unit price and quantity supplied. Please help managers make pricing decision. The relevant price data for 2016- 2017 is given in the following.

Supplier	Quantity 2016	Unit Price(\$)2016	Unit Price(\$)2017
A	150	5.45	6.00
B	200	5.60	5.95
C	120	5.50	6.20

- (a) Compute the price relatives for each of component suppliers. Please compare the price increases by each supplier separately during the 2016-2017 period. (5 points)
- (b) Compute a 2017 weighted aggregate price index for the component. What is the interpretation of this pricing index for the food manufacturer firm? (5 points)
8. The owner of fashion Inc. would like to estimate weekly gross revenue as a function of TV and newspaper advertising expenditures. Historical data for a sample is in the following table:

Weekly Gross Revenue (\$1000s)	Television Advertising (\$1000s)	Newspaper Advertising (\$1000s)
96	5.0	1.5
90	2.0	2.0
95	4.0	1.5
92	2.5	2.5
95	3.0	3.3
94	3.5	2.3
94	2.5	4.2
94	3.0	2.5

- (a) Write a multiple regression equation that can be used to analyze the data. (5 points)
- (b) What are the best estimates of the coefficients in your regression equation? Please interpret the coefficient in each advertising strategy. (5 points)
- (c) What is the estimate of the weekly gross revenue for a week when \$3,000 is spent on television advertising and \$1,000 is spent on newspaper advertising? (5 points)
- (d) Use the F test to test hypotheses at  $\alpha = .05$  level of significance, what conclusion should be drawn? Present the results in the analysis of the Analysis of Variance table. (5 points)

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The SPSS output is shown below:

Predictor	Coef	SE Coef	T	P
Constant	83.230	1.574	52.88	0.000
TVadv	2.290	0.304	7.53	0.001
Newsadv	1.301	0.321	4.06	0.010

S = 0.643      R-sq = 91.9%      R-sq(adj) = 88.7%

Analysis of Variance

SOURCE	DF	SS	MS	F	P
Regression	2	23.435	11.718	28.38	0.002
Residual Error	5	2.065	0.413		
Total	7	35.500			

9. A marketing channel model provides the following computer output from a regression analysis of the data including  $x$ , number of salespersons at a branch office, to  $y$ , annual sales at the office (in thousands of dollars).

The regression equation is $Y = 80.0 + 50.00 X$			
Predictor	Coef	SE Coef	T
Constant	80.0	11.333	7.06
X	50.0	5.482	9.12
Analysis of Variance			
SOURCE	DF	SS	MS
Regression	1	6828.6	6828.6
Residual Error	28	2298.8	82.1
Total	29	9127.4	

- (a) How many branch offices were involved in the firm? (5 points)  
 (b) Predict the annual sales at the branch office. This branch employs 20 salespersons. (5 points)