Business Mathematics I[1]

Sample Midterm Examination 1

This test is only presented as a sample of the types of questions that might appear on an examination. The instructor of each section will set his or her own examinations, which may differ from the sample in both length and content.

Show all of the steps and all of the work that you use to solve each problem.

A list of formulas that you may find useful is provided on the last page of this test

1. (16 points) Let I be the event that IBM stock goes up or stays the same tomorrow and let H be the event that Hewlett-Packard stock goes up or stays the same tomorrow. We believe that $P(I) = 0.6$, $P(H) = 0.3$, and $P(I \, or \, H) = 0.7$.

(i) What is the probability that IBM *and* Hewlett-Packard both go up or stay the same tomorrow?

(ii) What is the probability that IBM and Hewlett-Packard *both* go down tomorrow?

(iii) What is the real-world interpretation of the statement "$P(I) = 0.6$?"

2. (16 points) X is a random variable that can assume only the values 1, 2, 3, or 10. These have the following probabilities.

x	1	2	3	10
$P(X = x)$	0.2	0.5	0.2	0.1

(i) Compute $P(1 \le X \le 3)$.

(ii) Compute $E(X)$.

(iii) Compute $\displaystyle\sum_{i=1}^{2} P(X = i)$.

3. (16 points) A box contains a one dollar bill and a five dollar bill. You are to draw, at random, one bill from the box, note its value, and then replace it in the box. Next you draw a second time and note the value of the bill that you draw. Let X be the random variable that is the total value of the two bills that you have drawn.

(i) Give a sample space S listing the four possible outcomes of the experiment and assign realistic probabilities to each outcome.

(ii) Compute the expected value of X.

(iii) What is the real-world interpretation of the number that you found in part (ii)?

4. (16 points) There is a 30% chance of the event E that the economy will go into a recession and a 20% chance of the event J that Johnson Controls, Inc. will go bankrupt. The chance that the economy goes into a recession **and** that Johnson Controls will go bankrupt is 10%.

(i) If we **know** that Johnson Controls has gone into bankruptcy, what is the probability that the economy will go into a recession?

(ii) Are the events that the economy goes into a recession and that Johnson Controls goes bankrupt independent? Why or why not?

5. (12 points) Let C be the event that a person likes Coca-Cola better than Pepsicola, and let W be the event that a person prefers Wendy's to McDonald's. Market research has shown that $P(C) = 0.6$ and that $P(W) = 0.7$. **We assume that soda preference and fast food preference are independent**. Find the probability that a randomly selected person prefers Coke, but does **not** prefer Wendy's over McDonald's.

6. (12 points) There is a 30% chance that the Federal Reserve raises interest rates and a 70% chance that they do not raise rates. **If the Federal Reserve raises interest rates**, there is an 80% chance that stock prices will fall. **If the Federal Reserve does not raise rates**, there is an 40% chance that stock prices will fall. Let F be the event that stock prices fall, R be the event that the Federal Reserve raises interest rates, and S be the event that the Federal Reserve does not raise rates. Compute $P(F)$.

7. (12 points) The following data shows the records of 10 attempted loan work outs at Acadia Bank. We are going to pick a person at random from current borrowers who are behind in their payments and attempt a loan work out. Consider two events.

S: The work out succeeds.
H: The borrower selected has High School as his or her highest education level.

Bank Information		Borrower			Result
Customer Number	Former Bank	Years In Business	Education Level	State Of Economy	Loan Paid Back?
1	BR	3			yes
2	Cajun		High School		yes
3	DuPont			Normal	no
4	Cajun		High School		no
5	DuPont			Boom	yes
6	Cajun		High School		no
7	Cajun		Graduate Degree		yes
8	BR	8			no
9	DuPont			Boom	no
10	Cajun		Bachelor's Degree		no

Use the data to estimate the following.

(i) $P(S)$

(ii) $P(S|H)$

Formulas

$$P(E \cup F) = P(E) + P(F) - P(E \cap F) \qquad P(E^C) = 1 - P(E)$$

$$E^C \cup F^C = (E \cap F)^C \qquad E^C \cap F^C = (E \cup F)^C \qquad E(X) = \sum_{\text{all } x} x \cdot P(X = x)$$

$$P(A) = \sum_{\text{all } i} P(A \mid B_i) \cdot P(B_i)$$