Unit 6 – Review

Part I

Description of Probability	Formula
Theoretical Probability	$P(E) = \dfrac{\text{the number of outcomes in } E}{\text{the total number of outcomes in the sample space}}$
Empirical Probability	$P(E) = \dfrac{\text{the frequency of event } E}{\text{the total frequency}} = \dfrac{f}{n}$
Complementary Events	$P(E) + P(E') = 1, \; P(E') = 1 - P(E)$
Multiplication Rule	$P(A \cap B) = P(A) \cdot P(B \mid A)$
Multiplication for Independent Events	$P(A \cap B) = P(A) \cdot P(B)$
Quotient Rule (restated multiplication rule)	$P(A \mid B) = \dfrac{P(A \cap B)}{P(B)}$
Addition Rule	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$
Addition Rule for Mutually Exclusive Events	$P(A \cup B) = P(A) + P(B)$

1) On a recent administration of a state bar exam, 22% of the test takers passed the test, 78% of those who passed were first-time test takers, and 60% of those who failed were first-time test takers. What percent of first-time test takers passed the test?

A. 17%
B. 27%
C. 47%
D. 64%
E. 73%

2) A standard deck of cards consisting of 52 cards, 13 in each of 4 different suits, is shuffled, and 4 cards are drawn without replacement. What is the probability that all four cards are of a different suit?

A. 0.004
B. 0.010
C. 0.105
D. 0.121
E. 0.223

3) If A and B are two events such that $P(A) \cdot P(B) > 0$, which of the following is a true statement?
   A. Two mutually exclusive events are independent.
   B. Two mutually exclusive events may be independent.
   C. Two mutually exclusive events are not independent.
   D. Two independent events are mutually exclusive.
   E. No relationship exists between mutually exclusive and independent events.

4) During a given month, the probability that event A occurs is 0.75, the probability that event B occurs is 0.60, and the probability they both occur is 0.50. Are these two events independent? Are they mutually exclusive?
   A. Yes, yes
   B. Yes, no
   C. No, yes
   D. No, no
   E. No, cannot be determined from the information given

5) Which of the following are true?
   I. If $P(A \cap B) = P(A) \bullet P(B)$, the events A and B are independent.
   II. If $P(A \cup B) = P(A) + P(B)$, the events A and B are mutually exclusive.
   III. If $P(A \cap B) = 0$, the events A and B are mutually exclusive.
   IV. If $P(A) = P(A|B)$, the events A and B are independent.

   A. III only
   B. IV only
   C. I and II
   D. I, II, III, and IV
   E. Three of the above statements are true.

6) Use this tree diagram to determine $P(Y|N)$.
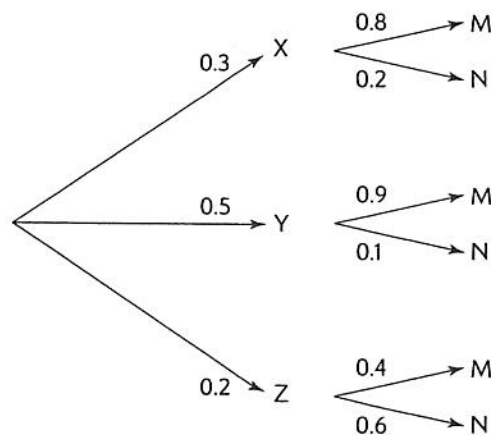
   A. 1/18
   B. 1/9
   C. 1/5
   D. 5/23
   E. 5/9

Use this table for 7-9.

	Mistakes	No Mistakes	Total
Typed	38	66	104
Handwritten	122	46	168
Total	160	112	272

7) What is the probability that an application was typed and had no mistakes?

A. 0.243
B. 0.449
C. 0.551
D. 0.589
E. 0.635

8) What is the probability that an application was handwritten or had mistakes?

A. 0.243
B. 0.449
C. 0.726
D. 0.757
E. 0.762

9) What is the probability that an application was typed, given that mistakes were made?

A. 0.140
B. 0.238
C. 0.365
D. 0.589
E. 0.831

10) Given two independent events, X and Y, such that $P(Y) = 0.2$ and $P(X \cup Y) = 0.4$, what is the value of $P(X)$?

A. 0.05
B. 0.20
C. 0.25
D. 0.30
E. Cannot be determined from the information given

11) A large corporation offers its employees one of three pension plans, A, B, or C. Records show that 70% choose plan A, 20% choose plan B, and 10% choose plan C. Also, 60% of those who choose plan A are married, 20% of those who choose plan B are married, and 60% of those who choose plan C are married. If a married employee is selected at random, what is the probability the employee is in plan A?

A. 0.42
B. 0.43
C. 0.70
D. 0.81
E. 0.86

1) At a local school, 90% of the students take the SAT, and 15% of the students take both the SAT and the ACT. Based on the information provided, which of the following calculations are not possible, and why? What can you say based on the data?

a. P(ACT|SAT)

b. P(SAT|ACT)

c. $P(SAT \cup ACT)$

If you know that everyone who took the ACT also took the SAT, how would that change your answer?

2) A contest is held to give away a free pizza. Contestants pick an integer at random from the integers 1 through 100. If the number chosen is divisible by 24 or by 36, the contestant wins the pizza. What is the probability that a contestant wins a pizza?

3) Given two events, A and B, state why each of the following is not possible. Use formulas or equations to illustrate your answer.

a. $P(A) = -0.46$

b. $P(A) = 0.26$ and $P(A') = 0.62$

c. $P(A \cap B) = 0.92$ and $P(A \cup B) = 0.42$

d. $P(B) = 0.24$ and $P(B|A) = 0.32$

e. $P(A \cap B) = P(A) \cdot P(B)$ and $P(B) > P(B|A)$

4) Harvey, Laura, and Gina take turns throwing spit-wads at a target. Harvey hits the target 1/2 the time, Laura hits it 1/3 of the time, and Gina hits the target 1/4 of the time. Given that somebody hit the target, what is the probability that it was Laura?