Math 114, Ch. 3, Review Exercises Name________________________________

3.1

Demonstration Problems	*Practice Problems*
Write the sample space for the following experiments. **1. (a)** tossing a coin **2. (a)** tossing two coins **3. (a)** tossing a coin and rolling a six-sided die	Write the sample space for the following experiments. **1. (b)** rolling a six-sided die **2. (b)** rolling 2 six-sided dice **3. (b)** tossing a coin and choosing a letter from *a* to *e*

Answers: **1. (b)** {1, 2, 3, 4, 5, 6} **2. (b)** {(1,1), (1,2), (1,3), (1,4), (1,5), (1,6), (2,1), (2,2), (2,3), (2,4), (2,5), (2,6), (3,1), (3,2), (3,3), (3,4), (3,5), (3,6), (4,1), (4,2), (4,3), (4,4), (4,5), (4,6), (5,1), (5,2), (5,3), (5,4), (5,5), (5,6), (6,1), (6,2), (6,3), (6,4), (6,5), (6,6)}; **3. (b)** {T*a*, T*b*, T*c*, T*d*, T*e*, H*a*, H*b*, H*c*, H*d*, H*e*}

Demonstration Problems	*Practice Problems*
Find the probability that **4. (a)** the outcome of the rolling a die is 2 **5. (a)** the outcome of tossing two coins is TT **6. (a)** the outcome of tossing a coin and rolling a six-sided die is H3 **7. (a)** the outcome of rolling a fair die is less than 10	Find the probability that **4. (b)** a card randomly drawn from a standard 52-card deck is a 3 of hearts **5. (b)** the gender outcomes of a randomly chosen family of 2 children is 2 boys **6. (b)** the outcome of tossing a coin and choosing of a letter from *a* to *e* is T*a* **7. (b)** the outcome of rolling a fair die is 9

Answers: **4. (b)** $\frac{1}{52}$;**5. (b)** $\frac{1}{4}$; **6. (b)** $\frac{1}{10}$; **7. (b)** 0;

Number of hours stayed	Frequency
1 (or less)	32
2	28
3	15
4 (or more)	4

Demonstration Problems	*Practice Problems*
Find the probability of the event, E, in which **8. (a)** E = a student stayed exactly 2 hours **9. (a)** E = a student stayed at least 2 hours	Find the probability of the event, E, in which **8. (b)** E = a student stayed exactly 3 hours **9. (b)** E = a student stayed more than 2 hours

Answers: **8. (b)** 0.190; **9. (b)** 0.241

Demonstration Problems	*Practice Problems*
Find the complement of the event, E, in which **10. (a)** E = the outcome of rolling a die is an even number $\bar{E}$ = **11. (a)** E = {fall months} and S = {all months} $\bar{E}$ =	Find the complement of the event, E, in which **10. (b)** E = the outcome of rolling a die is greater than or equal to 4 $\bar{E}$ = **11. (b)** E = {black cards} and S = {52-card standard deck} $\bar{E}$ =
Find the probability of E and $\bar{E}$ if **12. (a)** E = {1} and S = {1, 2, 3, 4, 5, 6} $P(E)$ = $P(\bar{E})$ =	Find the probability of E and $\bar{E}$ if **12. (b)** E={BB} and S={BB, BG, GB, GG} $P(E)$ = $P(\bar{E})$ =
13. (a) Find the probability of a student not buying tater tots at the cafeteria if the probability that a student will buy tater tots is $\frac{1}{25}$.	**13. (a)** Find the probability of a student not getting stopped at a stop light if the probability that a student will get stopped at a stop light is $\frac{4}{5}$.

Answers: **10. (b)** {1, 2, 3}; **11. (b)** {red cards}; **12. (b)** $P(E) = \frac{1}{4}$, $P(\bar{E}) = \frac{3}{4}$, **13. (b)** $P(E) = \frac{1}{5}$,

Demonstration Problems	*Practice Problems*
14. (a) $A = \{1, 3, 6\}$ and $B = \{2, 4, 6\}$, then A *or* $B =$	**14. (b)** $A = \{a, b, c\}$ and $B = \{b, c, d\}$, then A *or* $B =$
15. (a) $A = \{1, 2, 3, 8, 9, 10\}$ and $B = \{2, 4\}$, then A *and* $B =$	**15. (b)** $A = \{a, b, c\}$ and $B = \{b, c, d\}$, then A *and* $B =$
	Answers: **14. (b)** $\{a, b, c, d\}$; **15. (b)** $\{b, c\}$

Demonstration Problems	*Practice Problems*
Using the table of data and events described above, find the following conditional probabilities.	Using the table of data and events described above, find the following conditional probabilities.
16. (a) $P(B\|C) =$	**16. (b)** $P(D\|A) =$
17. (a) $P(D\|C) =$	**17. (b)** $P(A\|D) =$
	Answers: **16. (b)** $\frac{43}{52}$; **17. (b)** $\frac{43}{87}$

3.2

Demonstration Problems	*Practice Problems*
Find the following probabilities: **1. (a)** A red, a brown, and a green M&M are placed in a bag. Two of them will be drawn at random with replacement *S* = {(,); (,); (,); (,); (,); (,); (,); (,); (,)} *A* = {the first M&M drawn is red} *B* = {the second M&M drawn is green} $P(A) =$ If the first M&M is red, then $P(B) =$ $P(A \text{ and } B) =$	Find the following probabilities: **1. (b)** A red and a green M&M are placed in a bag. Two of them will be drawn at random with replacement *S* = {(,); (,); (,); (,)} *A* = {the first M&M drawn is red} *B* = {the second M&M drawn is green} $P(A) =$ If the first M&M is red, then $P(B) =$ $P(A \text{ and } B) =$
2. (a) Four cards are numbered 1 through 4. Two cards are drawn at random without replacement. *S* = {(,); (,); (,); (,); (,); (,); (,); (,); (,); (,); (,); (,)} *A* = {the first card drawn is a 1} *B* = {the second card drawn is a 4} $P(A) =$ If the first card is a 1, then $P(B) =$ $P(A \text{ and } B) =$	**2. (b)** Three cards are lettered *a*, *b*, *c*. Two cards are drawn at random without replacement. *S* = {(,); (,); (,); (,); (,); (,)} *A* = {the first card drawn is an *a*} *B* = {the second card drawn is a *b*} $P(A) =$ If the first card is *a*, then $P(B) =$ $P(A \text{ and } B) =$

Answers: **1. (b)** $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{2}$, $P(A \text{ and } B) = \frac{1}{4}$; **2. (b)** $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{2}$, $P(A \text{ and } B) = \frac{1}{4}$;

Demonstration Problems	*Practice Problems*
Find the following probabilities: A single card is drawn. S = A♣ 2♣ 3♣ 4♣ 5♣ 6♣ 7♣ 8♣ 9♣ 10♣ J♣ Q♣ K♣ A♠ 2♠ 3♠ 4♠ 5♠ 6♠ 7♠ 8♠ 9♠ 10♠ J♠ Q♠ K♠ A♥ 2♥ 3♥ 4♥ 5♥ 6♥ 7♥ 8♥ 9♥ 10♥ J♥ Q♥ K♥ A♦ 2♦ 3♦ 4♦ 5♦ 6♦ 7♦ 8♦ 9♦ 10♦ J♦ Q♦ K♦	Find the following probabilities: A single card is drawn. S = A♣ 2♣ 3♣ 4♣ 5♣ 6♣ 7♣ 8♣ 9♣ 10♣ J♣ Q♣ K♣ A♠ 2♠ 3♠ 4♠ 5♠ 6♠ 7♠ 8♠ 9♠ 10♠ J♠ Q♠ K♠ A♥ 2♥ 3♥ 4♥ 5♥ 6♥ 7♥ 8♥ 9♥ 10♥ J♥ Q♥ K♥ A♦ 2♦ 3♦ 4♦ 5♦ 6♦ 7♦ 8♦ 9♦ 10♦ J♦ Q♦ K♦
3. (a) A = {jacks} B = {kings} $P(A)$ = $P(B)$ = $P(A \text{ or } B)$ =	**3. (b)** A = {red cards} B = {spades} $P(A)$ = $P(B)$ = $P(A \text{ or } B)$ =
4. (a) A = {face cards} B = {7's} $P(A)$ = $P(B)$ = $P(A \text{ or } B)$ =	**4. (b)** A = {prime number cards} B = {kings} $P(A)$ = $P(B)$ = $P(A \text{ or } B)$ =
5. (a) A = {even numbered cards} B = {diamonds} $P(A)$ = $P(B)$ = $P(A \text{ or } B)$ =	**5. (b)** A = {face cards} B = {red cards} $P(A)$ = $P(B)$ = $P(A \text{ or } B)$ =

Answers: **3. (b)** $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{4}$, $P(A \text{ or } B) = \frac{3}{4}$; **4. (b)** $P(A) = \frac{4}{13}$, $P(B) = \frac{1}{13}$, $P(A \text{ or } B) = \frac{5}{13}$;
5. (b) $P(A) = \frac{3}{13}$, $P(B) = \frac{1}{2}$, $P(A \text{ or } B) = \frac{8}{13}$

Demonstration Problems	*Practice Problems*
Two coins are tossed. $S =$ {(,); (,); (,); (,)}	Two coins are tossed. $S =$ {(,); (,); (,); (,)}
6. (a) Find the probability that at least one tail occurs.	**6. (b)** Find the probability that at most one tail occurs.
7. (a) Find the probability that at exactly one tail occurs.	**7. (b)** Find the probability that at exactly one head occurs.
Answers: **6. (b)** $\frac{3}{4}$; **7. (b)** $\frac{1}{2}$;	

3.3

Demonstration Problems	*Practice Problems*
1. (a) Find the probability that a randomly chosen family has exactly 2 sons.	**1. (b)** Find the probability that a student correctly guesses both questions on a two-question true-false quiz.
A coin is flipped and a card is drawn from a standard 52-card deck. A = {head}, B = {tail}, C = {hearts}, D = {queens}	A coin is flipped and a six-sided die is rolled A = {head}, B = {tail}, C = {even numbers}, D = {3}
2. (a) $P(A \text{ and } C) =$	**2. (b)** $P(A \text{ and } C) =$
3. (a) $P(A \text{ and } D) =$	**3. (b)** $P(A \text{ and } D) =$
4. (a) $P(B \text{ and } D) =$	**4. (b)** $P(B \text{ and } D) =$
5. (a) Suppose the probability that an airplane's primary electrical system will work is .99 and the probability that it's secondary back-up system works is .98. Find the probability that both will fail.	**5. (b)** An automobile salesperson finds the probability of making a sale is 0.21. If she talks to 4 customers, find the probability she will make 4 sales.
6. (a) A coin is tossed 5 times. What is the probability of getting at least one tail? Hint: $P(\text{no tails}) + P(\text{at least one tail}) = 1$	**6. (b)** A true-false quiz has 4 questions. What is the probability of correctly guessing at least one question?

Answers: **1. (b)** $\frac{1}{4}$; **2. (b)** $P(A \text{ and } C) = \frac{1}{4}$; **3. (b)** $P(A \text{ and } D) = \frac{1}{12}$; **4. (b)** $P(B \text{ and } D) = \frac{1}{12}$; **5. (b)** ≈ 0.002; **6. (b)** $\frac{15}{16}$

Demonstration Problems	*Practice Problems*
Two cards are drawn randomly from a standard 52-card deck without replacement. A = {kings} B = {hearts} C = {black cards} Let A_1 denote "A on the first card" and A_2 denote "A on the second card". We will use this subscript notation for sets B and C as well. **7. (a)** $P(A_2 \mid A_1) =$ **8. (a)** $P(A_1 \text{ and } A_2) =$ **9. (a)** $P(B_2 \mid B_1) =$ **10. (a)** $P(B_1 \text{ and } B_2) =$	Two cards are drawn randomly from a standard 52-card deck without replacement. A = {aces} B = {queens} C = {red cards} Let A_1 denote "A on the first card" and A_2 denote "A on the second card". We will use this subscript notation for sets B and C as well. **7. (b)** $P(B_2 \mid A_1) =$ **8. (b)** $P(A_1 \text{ and } B_2) =$ **9. (b)** $P(C_2 \mid C_1) =$ **10. (b)** $P(C_1 \text{ and } C_2) =$
	Answers: **7. (b)** $\frac{4}{51}$; **8. (b)** $\frac{4}{663}$; **9. (b)** $\frac{25}{51}$; **10. (b)** $\frac{25}{102}$

Demonstration Problems	*Practice Problems*
A single card is drawn randomly from a standard 52-card deck. A = {kings} B = {queens} C = {hearts} **11. (a)** $P(A \text{ or } B) =$ **12. (a)** $P(A \text{ or } C) =$ **13. (a)** $P(B \text{ or } C) =$	A single card is drawn randomly from a standard 52-card deck. A = {aces} B = {red cards} C = {face cards} **11. (b)** $P(A \text{ or } B) =$ **12. (b)** $P(A \text{ or } C) =$ **13. (b)** $P(B \text{ or } C) =$
	Answers: **11. (b)** $\frac{7}{13}$; **12. (b)** $\frac{4}{13}$; **13. (b)** $\frac{8}{13}$

3.4

Medicine Taken

Cold Length		(*A*) Yes	(*B*) No	Total
	(*C*) 1 – 3 days	86	19	**105**
	(*D*) 4 – 7 days	16	79	**95**
	Total	**102**	**98**	**200**

Demonstration Problems	*Practice Problems*
For the contingency table above, find the following probabilities for a randomly selected subject in this study. **1. (a)** $P(A) =$	For the contingency table above, find the following probabilities for a randomly selected subject in this study. **1. (b)** $P(B) =$
2. (a) $P(A \mid D) =$	**2. (b)** $P(B \mid C) =$
3. (a) $P(D \mid A) =$	**3. (b)** $P(C \mid B) =$
4. (a) $P(A \text{ and } D) =$	**4. (b)** $P(B \text{ and } D) =$
5. (a) $P(A \text{ or } D) =$	**5. (b)** $P(B \text{ or } D) =$

Answers: **1. (b)** $P(B) = 0.49$; **2. (b)** $P(B \mid C) \approx 0.18$; **3. (b)** $P(C \mid B) \approx 0.19$; **4. (b)** $P(B \text{ and } D) = 0.395$; **5. (b)** $P(B \text{ or } D) = 0.57$