UNHM MATH 422 Exam #3 NAME_____
Date_____

PLEASE REMEMBER: Show your reasoning and/or math work in every problem. Some questions have more than one part. Make sure you answer every part of the question that was asked. You are being asked to calculate some things and interpret others. A formula sheet is included separately. A calculator is helpful for this exam. There are ***11 problems*** worth ***5 points*** each:

1. Let S be the universal set, where:

$$S = \{1,2,3, \ldots ,18,19,20\}$$

Let sets A and B be subsets of S , where:

Set $A = \{6, 7, 8, 9, 10, 11, 12, 13, 14, 15\}$

Set $B = \{odd\ numbers\ from\ 1\ to\ 19\}$

Part A. LIST the elements in the set ($A \cap B$):

Part B. LIST the elements in the set A^c :

Part C. LIST the elements in the set ($A \cap B^c$):

Part D. LIST the elements in the set $(A \cup B)^c$:

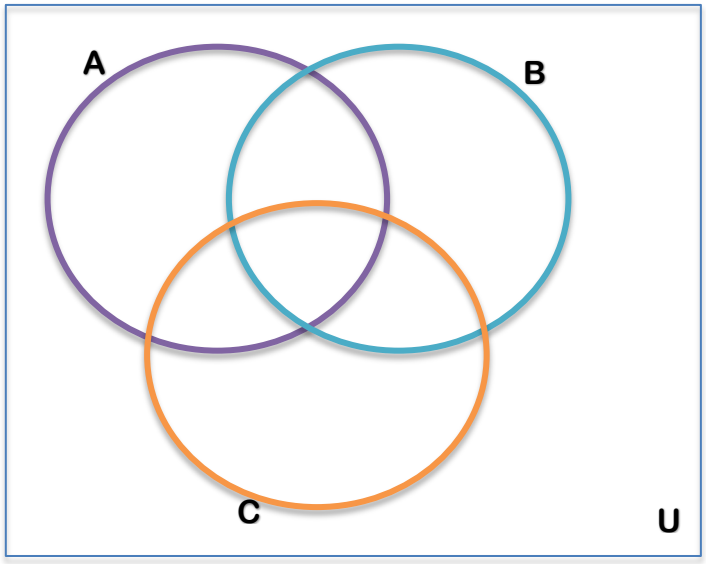
2. Let the Universal set U = {a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u,v,w,y}. Note that U has 24 elements so that $n(U) = 24$

Create subsets A, B, and C of the universal set U so that ***every 'space'*** in the Venn Diagram contains 3 elements of U. Place the elements in the Venn Diagram below:

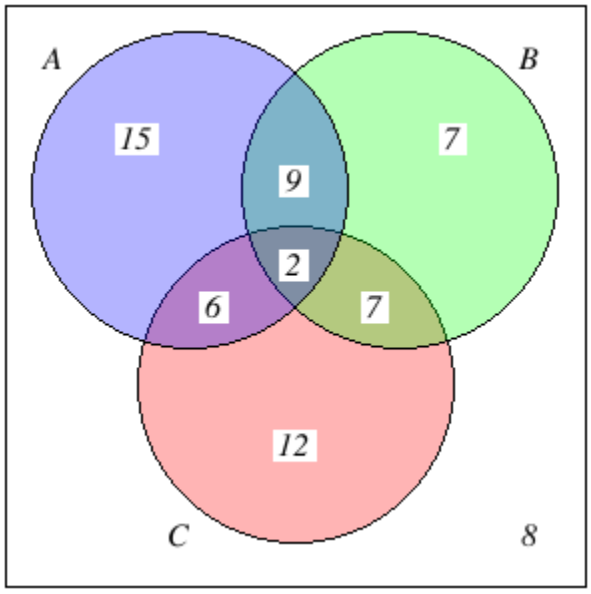
LIST the elements of A:

LIST the elements of B:

LIST the elements of C:



3. The Venn diagram here shows the **cardinality** of each set. Use this to find the cardinality of each given set.



$n(B) =$

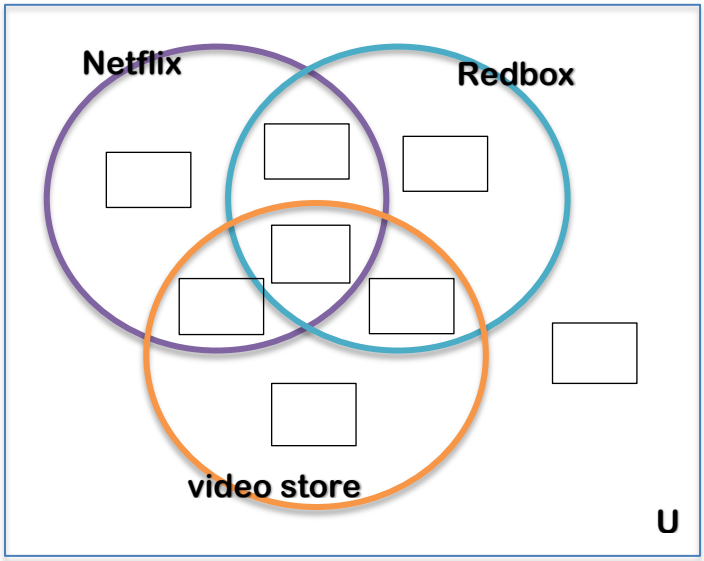
$n(B \cap C) =$

$n(A \cup B) =$

$n(A^c) =$

4. _____ ***people were surveyed*** asking whether they watch movies at home from Netflix, Redbox, or a video store. Use the results to determine how many people were surveyed.

17 only use Netflix	12 only use Redbox
15 only use a video store	20 use **only** a video store and Redbox
31 use **only** Netflix and Redbox	27 use ***both*** a video store and Netflix
19 use all three	13 use none of these



A. Place numbers in the diagram

B. How many people only use Redbox?

C. How many people use Redbox in all?

5. A group of people were asked if they had used an illegal substance last year. 152 responded "yes", and 361 responded "no".

Find the probability that if a person is chosen at random, they have used an illegal substance in the last year.

6. Giving a test to a group of students, the grades and class section are summarized below

	A	B	C	Total
Morning	12	9	18	39
Afternoon	5	15	12	32
Total	17	24	30	71

If one student was chosen at random, find the probability that the student was in the afternoon class.

7. Use the table from question #6 and answer the following question:

If one student is chosen at random, find the probability that the student was in the morning class GIVEN THAT they got a “C”:

8. Ilya buys a bag of cookies that contains 28 chocolate chip cookies, 15 peanut butter cookies, 22 sugar cookies and 17 oatmeal cookies.

What is the probability that Ilya reaches in the bag to get 2 cookies and randomly selects a chocolate chip cookie and a peanut butter cookie from the bag?

9. Suppose a jar contains 21 red marbles and 18 blue marbles. If you reach in the jar and pull out 2 marbles at random at the same time, find the probability that both are red.

10. At any one time, a certain disease occurs in **6% of the population**. A test for the disease is in use with the **false negative rate is 40%** and the false positive rate is 1%.

Part A: Make a contingency table describing the situation:

	Tests positive	Tests negative	Row Totals
Has disease	**4.8**	**3.2**	**8**
Does not have disease	**1.84**	**90.16**	**92**
Column Totals			**100**

Part B: What is the probability that a person has the disease ***given that*** they test positive?

Part C: What is the probability that a person has the disease ***given that*** they test negative?

11. A company estimates that ***7% of their products will fail*** after the original warranty period but within 2 years of the purchase, with a replacement cost of $550.

If they offer a 2-year extended warranty for $39, what is the company's expected value of each warranty sold? Let "x" be the profit or loss to the company for each extended warranty sold.

Part A: Complete the following probability distribution:

x	Explanation:	Pr(x)	$x \cdot \Pr(x)$
39		0.93	36.27
-511		0.07	-35.77

Part B: What is the "Expected Value" in this situation?

Part C: If they adjusted the warranty price to $41, how much does the expected value change?

12. Surab offers the following game. A standard deck of cards is placed face down on the table. The player pays $1.00 to see the top card. If it is a face card the player gets $4.00 in return. If not, the player receives nothing. What can Surab expect to make each time someone plays (over time)?

x	Explanation:	Pr(x)	$x \cdot \Pr(x)$
+1		0.7692	0.7692
-3		0.2308	-0.6924