1. **(8 points)** Library/ASU-topics/setDiscrete/katie1.4_3.pg

Let $Q(x,y)$ be the statement " $x+y=x-y$ ". If the universe of discourse for both variables consists of all integers, what are the truth values?

___1. $\exists x \forall y\ Q(x,y)$
___2. $Q(1,1)$
___3. $\forall x \exists y\ (x=y^2)$
___4. $\forall x \exists y\ Q(x,y)$
___5. $\exists x \exists y\ Q(x,y)$
___6. $\forall y\ Q(1,y)$
___7. $\forall x \exists y\ (Q(x,y) \wedge (2x-y=1))$
___8. $Q(2,0)$

2. **(3 points)** Library/NAU/setFoundations/MAT320_0401.pg

Suppose $\{A_i \mid i \in I\}$ is an indexed family of sets. For each statement below, write the letter of the equivalent symbolic form.

___1. $B \cap A_i \neq \emptyset$ for every i
___2. $B \cap (\bigcap_{i \in I} A_i) \neq \emptyset$
___3. $B \subseteq A_i$ for some i

A. $(\exists i \in I)(\forall x \in B)(x \in A_i)$
B. $(\forall i \in I)(\exists x \in B)(x \in A_i)$
C. $(\exists x \in B)(\forall i \in I)(x \in A_i)$

3. **(3 points)** Library/NAU/setFoundations/MAT320_0303.pg

Match each statement with an equivalent symbolic sentence.

___1. $A \cap B = \emptyset$
___2. $B \subseteq A$
___3. $\widetilde{A \cup B} \neq \emptyset$

A. $(\exists x)(x \notin A \ \wedge\ x \notin B)$
B. $(\forall x)(x \notin A \implies x \notin B)$
C. $(\forall x)(x \in A \implies x \notin B)$

4. **(4 points)** Library/MontanaState/FL/2.2B83Nested1.pg

Let $S = (4,9]$.

True or false?
$\forall x \in S\ \exists y \in S\ y > x$
- A. True
- B. False

True or false?
$\forall x \in S\ \exists y \in S\ y < x$
- A. True
- B. False

True or false?
$\exists y \in S\ \forall x \in S\ x \leq y$
- A. True
- B. False

True or false?
$\exists y \in S\ \forall x \in S\ x > y$
- A. True
- B. False

5. **(4 points)** Library/MontanaState/FL/2.2B83Nested2.pg

Let $S = [6,7)$.

True or false?
$\forall x \in S\ \exists y \in S\ y > x$
- A. True
- B. False

True or false?
$\forall x \in S \exists y \in S\ y < x$
- A. True
- B. False

True or false?
$\exists y \in S\ \forall x \in S\ x \leq y$
- A. True
- B. False

True or false?
$\exists y \in S\ \forall x \in S\ x > y$
- A. True
- B. False

6. **(8 points)** Library/ASU-topics/setDiscrete/katie1.4_1.pg

Let I(x) be the statement "x has an Internet connection", let C(x,y) be the statement "x and y have chatted over the internet". Express each of the following statements in terms of I(x) and C(x,y), quantifiers, and logical connectives. Let the universe of discourse for the variables x and y consist of all students in your class. Put the appropriate letter next to the corresponding symbolic form.

___1. $\forall x \neg C(x, Bob)$
___2. $\exists x \neg I(x)$
___3. $\neg(C(Rachel, Chelsea)$
___4. $C(Jan, Sharon)$
___5. $\exists x \exists y(y \neq x \wedge \neg C(x,y)))$
___6. $\forall x(I(x)) \rightarrow \exists y(x \neq y \wedge C(x,y))$
___7. $\exists x \exists y(y \neq x \wedge \forall z \neg(C(x,z) \wedge C(y,z))$
___8. $\exists x(I(x) \wedge \forall y(I(y) \rightarrow y = x))$

a) Rachel has not chatted over the internet with Chelsea.

b) Jan and Sharon have chatted over the internet.

c) No one in the class has chatted with Bob.

d) Someone in your class does not have internet connection.

e) There are two students in your class who have not chatted over the internet.

f) Exactly one student in your class has an internet connection.

g) Everyone in your class with an internet connection has chatted over the internet with at least one other student in your class.

h) There are at least two students in your class who have not chatted with the same person in your class.

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7. **(4 points)** Library/ASU-topics/setDiscrete/katie4.2-1.pg

(a) Among 77 people at least how many were born in the same month?

Answer = _____

(b) Assuming that no one is born on Feb. 29 (leap day), how many people should be selected to guarantee that at least 4 were born on the same day, not considering the year?

Answer = _____

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8. **(4 points)** Library/Rochester/setDiscrete9Counting/ur_dis_9_6.pg

A bowl contains 10 red balls and 10 blue balls. A woman selects balls at random without looking at them.

(a) How many balls must she select (minimum) to be sure of having at least three blue balls? _____

(b) How many balls must she select (minimum) to be sure of having at least three balls of the same color? _____

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9. **(4 points)** Library/ASU-topics/setDiscrete/katie4-2.1.pg

A computer is printing out subsets of a 3 element set (possibly including the empty set).

(a) At least how many sets must be printed to be sure of having at least 2 identical subsets on the list?

Answer = _____

(b) At least how many identical subsets are printed if there are 25 subsets on the list?

Answer = _____

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10. **(4 points)** Library/Rochester/setDiscrete9Counting/ur_dis_9_7.pg

This question concerns bit strings of length six. These bit strings can be divided up into four types depending on their initial and terminal bit. Thus the types are: 0XXXX0, 0XXXX1, 1XXXX0, 1XXXX1.

How many bit strings of length six must you select before you are sure to have at least 4 that are of the same type? (Assume that when you select bit strings you always select different ones from ones you have already selected.)

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