Due: By 12:00 noon on Thursday, September 28. **Worth**: 7%

You must complete and sign an assignment cover page, and attach it (with a staple) to the front of your assignment. Assignments should be handed into the drop box in BA 2220.

1. Suppose you are playing a card game, and there are four cards on the table. Some cards have faces on the front (the J, Q and K), and some of the cards are marked on the back. The sides that are visible show "K", "marked", "not marked" and "6".

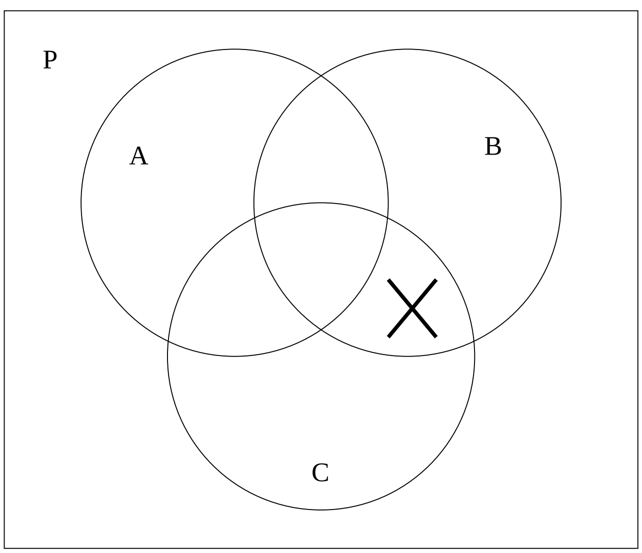
   A stranger walks up and whispers one of the following statements in your ear. In each case, which cards must you turn over to verify whether the stranger's statement is true or false? Justify briefly, using what we've discussed in CSC 165.

   (a) "All face cards are marked."

   (b) "Only face cards are marked."

2. Let P represent the set of people, A represent the set of able people, B represent the set of bright people, and C represent the set of careful people.

   Consider the following Venn diagram showing a relationship between types of people. The "**X**" indicates a region that contains no elements. Assume all other regions contain at least one element.



   (a) Express this relationship both in natural English and symbolically.

   (b) For each of the following statements, determine whether it is true or false. Justify your answers using the diagram.

      i. All bright people are careful.

      ii. $\exists x \in P, A(x) \implies B(x)$

      iii. Some people are both bright and careful only if they are able.

      iv. $\forall x \in P, B(x) \implies (A(x) \vee \neg C(x))$

3. Consider the following database of pets:

Pet	Price	Soft	Cuddly
aardvark	50	no	no
bunny	5	yes	yes
cat	20	yes	yes
dobermann	100	yes	no
emu	150	yes	no

Formalize each of the following statements symbolically. Then determine which ones are true. Justify briefly, by either giving an appropriate example/counterexample, or explaining for which pets (give the names) you checked which property.

(a) Pets costing less than 40 are soft and cuddly.

(b) Some pets are not soft.

(c) For a pet to be cuddly, it must be soft.

(d) No pets are both soft and cost more than 75.

(e) Pets that are cuddly and cost more than 75 are not soft.

4. Consider the following statements:

(S1) If the Maple Leafs win the cup, there will be a party on Yonge Street.

(S2) I'd be surprised if the Maple Leafs won the cup.

(a) Express (S1) and (S2) symbolically. Clearly define any appropriate predicates and domains you require.

(b) Express the contrapositive of (S1) and of (S2) both symbolically and in natural English.

(c) Express the converse of (S1) and of (S2) both symbolically and in natural English.

(d) Suppose there is a party on Yonge Street. Am I surprised? Justify your answer.