1. List the 7 problem solving strategies from section 1.1 in your book.

2. Determine whether each statement below is true or false. If it is true, explain how you know that it is true, and if it is false, give an example that shows it must be false.

   (a) 100 is an underestimate of 12.21×8.17

   (b) $ 9,945.99 rounded to the nearest 10 dollars is less than $ 9,949.99 rounded to the nearest 50 dollars.

   (c) If $A \cup \emptyset = A$, then $A = \emptyset$.

   (d) If A and B are equivalent as sets, then A and B are also equal as sets.

3. (5 points) Suppose you inherit an automobile from your grandfather that is worth $37,467. You know at the end of the year, you will have to pay 37% in taxes on this windfall. Give both an over-estimate and an under-estimate for the amount that you should set aside in order to pay the inheritance taxes on this vehicle.

4. (a) Use set notation to list all the elements of the set:
   $A = \{ \ x \mid x \text{ is a whole number less than 40 that is evenly divisible by 3 } \}$

   (b) Use set-builder notation to describe the set $\{2, 4, 8, 16, 32, 64, \ldots\}$

5. Given that $A = \{ \ x \mid x \text{ is a letter in the word } apple \ \}$, $B = \{ \ x \mid x \text{ is a letter in the word } please \ \}$, $C = \{ \ x \mid x \text{ is a letter in the word } appeases \ \}$, and $D = \{ \ \emptyset \ \}$, indicate whether the following are True or False (you do NOT need to justify your answers)

   (a) $\{a\} \in A$ (e) $B \subset C$

   (b) $d \in A$ (f) $B = C$

   (c) $\emptyset \subset A$ (g) $D \subset B$

   (d) $A \subseteq B$ (h) $\emptyset \in D$

6. Let $U = \{ \ x \mid x \text{ is an odd number less than 30 } \}$; $A = \{1, 3, 5, 7, 11\}$; $B = \{5, 7, 11, 17, 21\}$; $C = \{3, 7, 9, 21, 23, 29\}$

   (a) Write U in roster form   (e) $B \cup C =$

   (b) $A - B =$ (f) $B - A =$

   (c) $A \cap C =$ (g) $n(A \cup C) =$

   (d) $A' =$ (h) $n(C \cap B') =$

7. (a) List all the subsets of the set $\{a, b, c, d\}$

   (b) How many subsets does the set $\{a, b, c, d, e, f\}$ have?

   (c) Write out the first 7 rows of Pascal's Triangle

   (d) Use Pascal's Triangle to find the number of 5 element subsets of $\{a, b, c, d, e, f\}$

8. (3 points each) Illustrate the following by shading the appropriate regions of the given Venn diagrams:
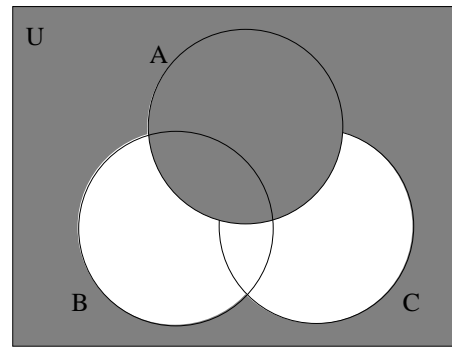
   (a) $(A \cup B) - A'$ (b) $(A - B)'$ (c) $A \cap (B \cup C')$
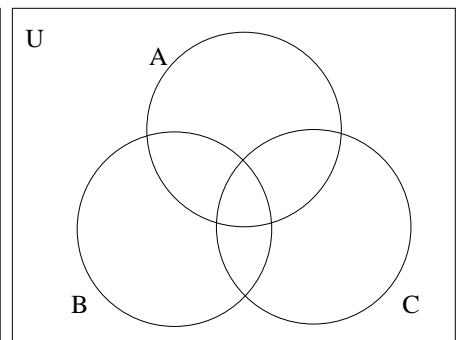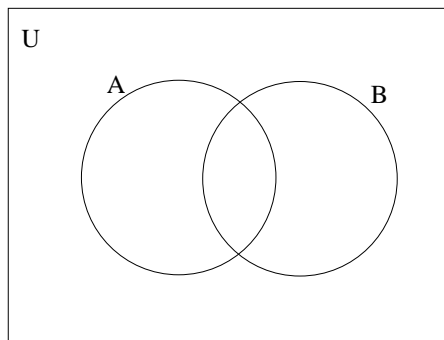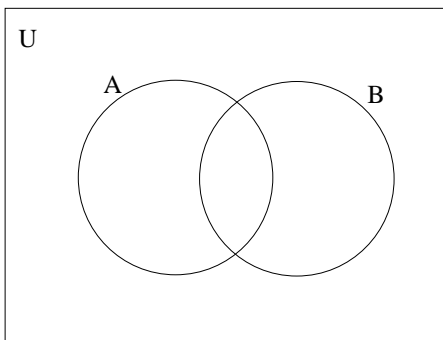
9. (3 points each) Use set notation to describe the shaded regions in each Venn diagram given below:
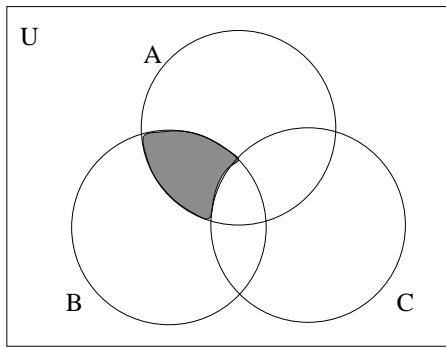

(a)

(b)

10. (2 points each) A survey of 100 college students asked what they plan to do among the following 3 choices: Work, Take Summer Classes, and Travel. Suppose the survey found that 55 plan to take summer classes, 25 plan to work and take summer classes, 5 plan to do all three, 15 plan to both travel and take summer classes, 15 plan to travel but don't plan to work, 70 plan to take summer classes or travel, and 5 plan to do none of the three.
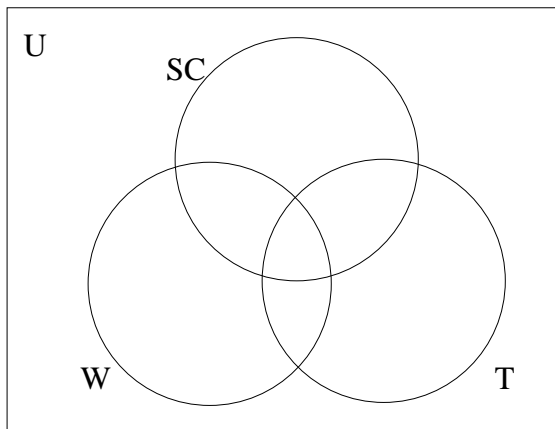
   (a) How many plan to travel but do not plan to take summer classes?

   (b) How many plan to travel and work this summer?

   (c) How many plan to take summer classes or work?

   (d) How many plan to travel?

   (e) How many plan to work but not travel or take classes?

11. For each of the following, state whether the situation is an example of inductive or deductive reasoning:

   (a) You notice that you are tired all morning if you don't have breakfast, so you decide to start eating breakfast every morning before you leave to go to school.

   (b) After getting your monthly paycheck, you do some computations to make sure that your employer paid you at the time-and-a-half rate for the 7 hours of overtime you put in during one of the weeks that month.

12. Use inductive reasoning to predict the next two terms in each of the following sequences:

   (a) $20, 19, 17, 14, 10, ...$

   (b) $1, 4, 3, 8, 5, 12, 7, 16, ...$

13. Determine whether or not each of the following are statements:

   (a) I never missed class this semester.
   (b) How many times did I miss class this semester?

14. Negate each of the following statements, then rewrite them as English sentences:

   (a) All of my friends have already left for the summer.
   (b) This summer I will not get a job or I will not take classes.

15. Given p : cows like grass, q : pigs like slop, r : horses like oats, and s : mice like cheese, translate the following statements into words:

   (a) $p \vee (\sim r)$
   (b) $(r \wedge s) \vee (\sim p)$
   (c) $(p \wedge (\sim s)) \rightarrow q$

16. Explain, in your own words, the difference between "exclusive or" and "inclusive or"

17. Given the statements: p : I win the lottery, and q : I quit going to school

   (a) Write the conditional statement relating p to q in words.
   (b) Write the converse in words.
   (c) Write the inverse in words.
   (d) Write the contrapositive in words.
   (e) Indicate which of these statements above are logically equivalent to each other. You do not need to prove your answer.

18. Given that p is false, q is true, r is false, and s is false:

   (a) What is truth value of the statement: $(p \vee q) \rightarrow (\sim r \wedge s)$
   (b) How many rows would the full truth table for the expression $(p \wedge s) \rightarrow (r \vee \sim s)$ have?

19. Identify the form of the following arguments, and state whether the given argument is valid:

   (a) I will go to the store to buy milk or I will make do without milk today. I did not make do without milk today. Therefore, I went to the store to buy milk.
   (b) If I get over this cold, then I will go out with my friends on Saturday night. I did not get over this cold. Therefore, I did not go out with my friends on Saturday night.

20. (a) (4 points) Draw an Euler diagram for the statements: "All B's are A's", "All A's are not C's", and " Some D's are B's"

   (b) State two different valid conclusions that can be made based on the statements in part (a) above.

21. Use Euler diagrams to determine whether the following syllogism is valid or invalid:
    All exams are too long.
    Some exams are too difficult.
    ―――――――――――――――――――
    Therefore, some exams are too long and too difficult.

22. (12 points) Use a truth table to determine whether or not the following argument is valid:
    If I study, then I will get a good grade on the final exam.
    If I do not get a good grade on the final exam, then I will not pass this class.
    I passed this class.
    ――
    Therefore, I studied.