MATH 1113 – Mathematics for General Education
Study Guide

Instructions: Work neatly. Circle your final answers. Show all work.

1. Consider the following procedure:
   i)   Pick a number.
   ii) Multiply the number by 6.
   iii) Add 8 to the product.
   iv) Divide the sum by 2.
   v)   Subtract twice the original number.
   vi) Subtract 4.

 a.) Use inductive reasoning to make a conjecture about the relationship between the initial number picked and the final result of the above process.

 b.) Use deductive reasoning to prove your conjecture from part (a).

2. Construct a difference table to determine the next number in the sequence below:
$$3, 5, 10, 18, 29, 43, \_\_\_$$

3. Consider the generalized Fibonacci sequence defined as follows:
$$a_1 = 2$$
$$a_2 = 3$$
$$a_n = 4a_{n-2} - 3a_{n-1} \ for \ n > 2.$$
Determine the 3rd, 4th, and 5th terms in the sequence.

4. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ be a universal set and consider the following subsets of U:

$$A = \{1, 3, 5, 7, 9\}$$
$$B = \{2, 3, 4, 5, 8, 9\}$$
$$C = \{1, 2, 8, 9\}$$

Write the following sets using the roster method then draw a Venn diagram with each set shaded.

a.) A'

b.) $A' \cup B$

c.) $A' \cap B$

d.) $(A' \cap B) \cup C$

e.) $A \cap B \cap C$

f.) $(A \cap B \cap C)'$

5. Consider the set $E = \{2, 4, 6, 8\}$. List all of the subsets of E. (Hint: There should be a total of $2^{|E|}$ subsets.)

6. In a survey of 1000 students, 400 are enrolled in a Math class, 700 are enrolled in an English class, and 200 are enrolled in both a Math class and an English class.

a.) How many of the students surveyed are enrolled in either a Math class or an English class or both?

b.) How many of the students surveyed are not enrolled in either a Math or an English class?

7. Two distinct six-sided dice are rolled.

a.) How many outcomes are possible for this experiment?

b.) In how many ways can a roll of the dice result in a sum of 8? (Hint: List them.)

c.) What is the probability of rolling a sum of 8 on any particular roll of the dice?

d.) What are the odds in favor of rolling a sum of 8 on any particular roll of the dice?

8. A baseball lineup consists of 9 players whose positions in the batting order are denoted by the numbers 1 through 9. If there are 15 players on a baseball team, how many different batting orders are possible?

9. A test bank of 20 questions is used to create an exam with 4 questions. How many different exams can be created? (Hint: The order in which the questions are selected does not matter.)

10. A single card is drawn from a standard deck.
 a.) What is the probability that an Ace is drawn?

 b.) What is the probability that a Diamond is drawn?

 c.) What is the probability that an Ace or a Diamond is drawn?

11.) Five cards are drawn from a standard deck without replacement.
 a.) How many different 5-card hands are possible?

 b.) In how many ways can a 5-card hand consist of 5 Spades?

 c.) What is the probability that a single 5-card hand consists of 5 Spades?

 d.) What is the probability that at least one card in the hand is a Spade?