
Problem 1. (4 points)

Michelle chooses one square and one circular disk from the squares and disks shown below.



How many different ways can Michelle choose one square and one disk?

- A. 2
- B. 4
- C. 6
- D. 8

Problem 2. (8 points)

A bit is a 0 or a 1. A bit string of length 5 is a sequence of 5 digits, all of which are either 0 and 1.

(a) How many bit strings of length 5 are there?

(b) How many bit strings of length 5 or less are there? (Count the empty string of length zero also.)

Problem 3. (12 points)

5 -letter "words" are formed using the letters A, B, C, D, E, F, G. How many such words are possible for each of the following conditions?

(a) No condition is imposed.

Your answer is : _____

(b) No letter can be repeated in a word.

Your answer is : _____

(c) Each word must begin with the letter A.

Your answer is : _____

(d) The letter C must be at the end.

Your answer is : _____

(e) The second letter must be a vowel.

Your answer is : _____

Problem 4. (8 points)

In how many ways can 3 different novels, 2 different mathematics books, and 1 biology book be arranged on a bookshelf if

(a) the books can be arranged in any order?

Answer: _____

(b) the mathematics books must be together and the novels must be together?

Answer: _____

(c) the mathematics books must be together but the other books can be arranged in any order?

Answer: _____

Problem 5. (8 points)

A standard deck of cards consists of four suits (clubs, diamonds, hearts, and spades), with each suit containing 13 cards (ace, two through ten, jack, queen, and king) for a total of 52 cards in all.

How many cards in the deck are either a jack or a heart?

How many cards are face cards or clubs?

How many cards are red (diamonds or hearts) or queens?

Problem 6. (8 points)

A survey of 1,000 employees in a company revealed that 264 like rock music, 391 like pop music, 125 like jazz, 137 like pop and rock music, 50 like jazz and rock, 34 like pop and jazz, and 24 employees like all three.

How many employees do not like jazz, pop, or rock music?

How many employees like pop but not jazz? _____

Problem 7. (8 points)

How many 4-element subsets containing the letter A can be formed from the set $\{A, B, C, D, E, F, G\}$?

Answer: _____

Problem 8. (8 points)

A DNA sequence can be represented as a string of the letters ACTG (short for adenine, cytosine, guanine, and thymine).

(a) How many DNA sequences are exactly 28 letters long?

(b) Given a DNA sequence of length 28, how many single letter mutations are possible?

(c) Given a DNA sequence of length 28, how many double letter mutations are possible?

Problem 9. (8 points)

A coin is tossed 11 times.

a) How many different outcomes are possible?

b) How many different outcomes have exactly 4 heads?

c) How many different outcomes have at least 2 heads ?

d) How many different outcomes have at most 7 heads?

Problem 10. (8 points)

You have 3 pairs of pants or skirts, 4 shirts or blouses, and 5 pairs of shoes. You can use them to wear _____ different outfits.

You are a participant in a peace conference with 10 participants. Everybody shakes everybody else's hand. There are _____ handshakes altogether.

A family of five is taking an extended vacation. Every day at lunch they stand in line at a cafeteria in a different order than ever before. On the last day, however, they can't help repeating a previous order. Their vacation lasted _____ days.