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PROBLEM SET 03

PROBLEM 1

How many different seven-digit telephone numbers can be formed if the first digit cannot be zero?

PROBLEM 2

A fleet of nine taxis is to be dispatched to three airports in such a way that three go to airport A, five go to airport B and one goes to airport C. In how many distinct ways can this be accomplished?

PROBLEM 3

Five firms, F_1, F_2, \dots, F_5 each offer bids on three separate contracts, C_1, C_2 and C_3 . Any one firm will be awarded at most one contract. The contracts are quite different, so an assignment of C_1 to F_1 , say, is to be distinguished from an assignment of C_2 to F_1 .

- How many sample points are there altogether in this experiment involving assignment of contracts to the firms? (No need to list them all.)
- Under the assumption of equally likely sample points, find the probability that F_3 is awarded a contract.

PROBLEM 4

A study is to be conducted in a hospital to determine the attitudes of nurses toward various administrative procedures. A sample of 10 nurses is to be selected from a total of 90 nurses employed by the hospital.

- a. How many different samples of 10 nurses can be selected?
- b. Twenty of the 90 nurses are male. If 10 nurses are randomly selected from those employed by the hospital, what is the probability that the sample of ten will include exactly 4 male (and 6 female) nurses?

PROBLEM 5

A student prepares for an exam by studying a list of ten problems. She can solve six of them. For the exam, the instructor selects five problems at random from the ten on the list given to the students. What is the probability that the student can solve all five problems on the exam?

PROBLEM 6

A manufacturer has nine distinct motors in stock, two of which came from a particular supplier. The motors must be divided among three production lines, with three motors going to each line. If the assignment of motors to lines is random, find the probability that both motors from the particular supplier are assigned to the first line.

PROBLEM 7

A labor dispute has arisen concerning the distribution of 20 laborers to four different construction jobs. The first job (considered to be very undesirable) required 6 laborers; the second, third and fourth utilized 4, 5 and 5 laborers, respectively. The dispute arose over an alleged random distribution of the laborers to the jobs which placed all four members of a particular ethnic group on job 1. In considering whether the assignment represented injustice, a mediation panel desired the probability of the observed event.

- a. Determine the number of sample points in the sample space S for this experiment. That is, determine the number of ways the 20 laborers can be divided into groups of the appropriate sizes to fill all of the jobs.
- b. Find the probability of the observed event if it is assumed that the laborers are randomly assigned to jobs.
- c. What is the probability that an ethnic group member is assigned to each type of job?
- d. What is the probability that no ethnic group member is assigned to a type 4 job?

PROBLEM 8

If two events A and B are such that $P(A) = 0.5$, $P(B) = 0.3$ and $P(A \cap B) = 0.1$, find the following,

- $P(A|B)$
- $P(B|A)$
- $P(A|A \cup B)$
- $P(A|A \cap B)$
- $P(A \cap B|A \cup B)$

PROBLEM 9

A survey of consumers in a particular community showed that 10% were dissatisfied with plumbing jobs done in their homes. Half the complaints dealt with plumber A , who does 40% of the plumbing jobs in the town.

- Find the probability that a consumer will obtain an unsatisfactory plumbing job, given that the plumber was A .
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PROBLEM 10

Suppose A and B are mutually exclusive events, with $P(A) > 0$ and $P(B) < 1$. Are A and B independent? Give a proof for your answer.

PROBLEM 11

Suppose that $A \subset B$ and that $P(A) > 0$ and $P(B) > 0$. Are A and B independent? Prove your answer.

PROBLEM 12

If $P(A) > 0$, $P(B) > 0$ and $P(A) < P(A|B)$, show that $P(B) < P(B|A)$.