**Probability and Statistics**

**Assignment 3**

**Total Mark:100 Sections: AI (J), AI (K), DS (N), cyber security (M)**

**Open date:12 -4- 2021**

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**Question No.1:**

A California study concluded that following 7 simple health rules can extend a man’s life by 11 years on the average and a woman’s life by 7 years. These 7 rules are as follows: no smoking, get regular exercise, use alcohol only in moderation, get 7 to 8 hours of sleep, maintain proper weight, eat breakfast, and do not eat between meals. In how many ways can a person

adopt 5 of these rules to follow

(a) if the person presently violates all 7 rules?

(b) if the person never drinks and always eats breakfast?

**Question No.2:**

Married couples have brought 8 seats in a row for a concert in how many ways can they be sitted

(a) No restriction

(b) If all the man sits together to the right of all women

(c) if each couple is to sit together

**Question No.3:**

A foreign students club list as its member 2 Canadian, 3 Japanese, 5 Italian and 2 German. If a committee of 4 is selected at random

(a) all nationality is represented

(b) all nationality except Italian is represented

**Question No.4:**

If 3 books are picked at random from a shelf containing 5 novels, 3 books of poems, and a dictionary, what is the probability that

(a) the dictionary is selected?

(b) 2 novels and 1 book of poems are selected?

**Question No.5:**

The probabilities that a service station will pump gas into 0, 1, 2, 3, 4, or 5 or more cars during a certain 30-minute period are 0.03, 0.18, 0.24, 0.28, 0.10, and 0.17, respectively. Find the probability that in this 30-minute period

(a) more than 2 cars receive gas;

(b) at most 4 cars receive gas;

(c) 4 or more cars receive gas.

**Question No.6:**

An allergist claims that 50% of the patients she tests are allergic to some type of weed. What is

the probability that

(a) exactly 3 of her next 4 patients are allergic to

weeds?

(b) none of her next 4 patients is allergic to weeds?

**Question No.7:**

The table below represents the college degrees awarded in a recent academic year

by gender.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Bachelor’s** | **Master’s** | **Doctorate** |
| **Men** | 573,079 | 211,381 | 24,341 |
| **Women** | 775,424 | 301,264 | 21,683 |

Choose a degree at random. Find the probability that it is

a. A bachelor’s degree

b. A doctorate or a degree awarded to a woman

c. A doctorate awarded to a woman

d. Not a master’s degree

**Question No.8:**

On a hospital staff, there are 4 dermatologists, 7 surgeons, 5 general practitioners, 3 psychiatrists, and 3 orthopedic specialists. If a doctor is selected at random, find the probability that the doctor is

*a.* A psychiatrist, surgeon, or dermatologist

*b.* A general practitioner or surgeon

*c.* An orthopedic specialist, a surgeon, or a

dermatologist

*d.* A surgeon or dermatologist

**Question No.9:**

If one card is drawn from an ordinary deck of cards, find the probability of getting

the following.

*a.* A king or a queen or a jack

*b.* A club or a heart or a spade

*c.* A king or a queen or a diamond

*d.* An ace or a diamond or a heart

*e.* A 9 or a 10 or a spade or a club

**Question No.10:**

From past experience, a stockbroker believes that under present economic conditions a customer will invest in tax-free bonds with a probability of 0.6, will invest in mutual funds with a probability of 0.3, and will invest in both tax-free bonds and mutual funds with a probability of 0.15. At this time, find the probability that a customer will invest

(a) in either tax-free bonds or mutual funds;

(b) in neither tax-free bonds nor mutual funds.

**Question No.11:**

The following table shows the distribution of body mass index (BMI) and age groups among male adults in a certain country.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Normal or low BMI** | **Overweight** | **Obese** | **Total** |
| **Age<30** | 0.09 | 0.06 | 0.05 | 0.20 |
| **Age>=30** | 0.20 | 0.32 | 0.28 | 0.80 |
| **Total** | 0.29 | 0.38 | 0.33 | 1.00 |

a. What is the probability that a person selected at random from the group will be obese?

b. A person, selected at random from this group, is found to be obese. What is the probability that this person is younger than age 30?

**Question No.12:**

The probability that a regularly scheduled flight departs on time is *P*(*D*) = 0*.*83; the probability that it arrives on time is *P*(*A*) = 0*.*82; and the probability that it departs and arrives on time is *P*(*D ∩A*) = 0*.*78. Find the probability that a plane

(a) Arrives on time, given that it departed on time, and

(b) Departed on time, given that it has arrived on time.

**Question No.13:**

The medal distribution from the 2008 Summer Olympic Games for the top 23 countries is shown below.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Gold** | **Silver** | **Bronze** |
| United States | 36 | 38 | 36 |
| Russia | 23 | 21 | 28 |
| China | 51 | 21 | 28 |
| Great Britain | 19 | 13 | 15 |
| Others | 173 | 209 | 246 |

Choose 1 medal winner at random.

a. Find the probability that the winner won the gold medal, given that the winner was from the United States.

b. Find the probability that the winner was from the United States, given that she or he won a gold medal.

**Question No.14:**

The concept of conditional probability has countless uses in both industrial and biomedical applications. Consider an industrial process in the textile industry in which strips of a particular type of cloth are being produced. These strips can be defective in two ways, length and nature of texture. For the case of the latter, the process of identification is very complicated. It is known from historical information on the process that 10% of strips fail the length test, 5% fail the texture test, and only 0.8% fail both tests. If a strip is selected randomly from the process and a quick measurement identifies it as failing the length test, what is the probability that it is texture defective?