AxM: Curso SOA P
Tarea 7

Ejercicio 1

The number of traffic accidents per week at intersection Q has a Poisson distribution with mean 3. The number of traffic accidents per week at intersection R has a Poisson distribution with mean 1.5.

Let A be the probability that the number of accidents at intersection Q exceeds its mean. Let B be the corresponding probability for intersection R.

Calculate $B - A$.

(A) 0.00
(B) 0.09
(C) 0.13
(D) 0.19
(E) 0.31

Ejercicio 2

Each person in a large population independently has probability p of testing positive for diabetes, $0 < p < 1$. People are tested for diabetes, one person at a time, until a test is positive. Individual tests are independent.

Determine the probability that m or fewer people are tested, given that n or fewer people are tested, where $1 \leq m \leq n$.

(A) $\dfrac{m}{n}$

(B) $(1-p)^{m-n}$

(C) $1-(1-p)^m$

(D) $\dfrac{1-p^m}{1-p^n}$

(E) $\dfrac{1-(1-p)^m}{1-(1-p)^n}$

Ejercicio 3

On any given day, a certain machine has either no malfunctions or exactly one malfunction. The probability of malfunction on any given day is 0.40. Machine malfunctions on different days are mutually independent.

Calculate the probability that the machine has its third malfunction on the fifth day, given that the machine has not had three malfunctions in the first three days.

(A) 0.064
(B) 0.138
(C) 0.148
(D 0.230
(E) 0.246

Ejercicio 4

This year, each of the ten employees of a company has probability 0.2 of having at least one accident. The occurrences of accidents among different employees are mutually independent.

Of the ten employees, six are in department A. The other four are in department B.

Exactly three of the ten employees each have at least one accident.

Calculate the probability that at least one of these accidents occurs to an employee in department B.

(A) 0.201
(B) 0.500
(C) 0.590
(D) 0.784
(E) 0.833

Ejercicio 5

A company takes out an insurance policy to cover accidents that occur at its manufacturing plant. The probability that one or more accidents will occur during any given month is 0.60. The numbers of accidents that occur in different months are mutually independent.

Calculate the probability that there will be at least four months in which no accidents occur before the fourth month in which at least one accident occurs.

(A) 0.01
(B) 0.12
(C) 0.23
(D) 0.29
(E) 0.41

Ejercicio 6

Let X be a Poisson random variable with cumulative distribution function F such that

$$\frac{F(2)}{F(1)} = 2.6 \ .$$

Calculate E (X).

(A) 3.2
(B) 4.0
(C) 4.2
(D) 5.0
(E) 5.2

Ejercicio 7

A group of 100 patients is tested, one patient at a time, for three risk factors for a certain disease until either all patients have been tested or a patient tests positive for more than one of these three risk factors. For each risk factor, a patient tests positive with probability p, where $0 < p < 1$. The outcomes of the tests across all patients and all risk factors are mutually independent.

Determine an expression for the probability that exactly n patients are tested, where n is a positive integer less than 100.

(A) $\left[1-3p^2(1-p)\right]^{n-1}\left[3p^2(1-p)\right]$

(B) $\left[1-3p^2(1-p)-p^3\right]^{n-1}\left[3p^2(1-p)+p^3\right]$

(C) $\left[1-3p^2(1-p)-p^3\right]\left[3p^2(1-p)+p^3\right]^{n-1}$

(D) $n\left[1-3p^2(1-p)-p^3\right]^{n-1}\left[3p^2(1-p)+p^3\right]$

(E) $3\left[(1-p)^{n-1}p\right]^2\left[1-(1-p)^{n-1}p\right]+\left[(1-p)^{n-1}p\right]^3$

Respuestas

1. B
2. E
3. C
4. E
5. D
6. B
7. B

Práctica adicional

Ejercicios de la guía gratuita de la SOA para el examen Probability :

90, 96, 105, 106, 122, 156, 157, 203, 233, 303, 322, 356, 357, 387, 413, 470, 503, 558