W01 Homework B

01

Events - descriptions to sets

You are modeling quality assurance for cars coming off an assembly line. They are either good (G) or broken (B). You watch 4 cars come off and record their status as a sequence of these letters, for example 'GGBG'.

Determine the *sets* defined by the events having the following descriptions:

(a) "third car is broken"

(b) "all cars have the same status"

(c) "at least one car is broken"

(d) "no consecutive cars have the same status"

02 ★

Researcher's degree

Of 1000 researchers at a research laboratory, 375 have a degree in mathematics, 450 have a degree in computer science, and 150 of the researchers have a degree in both fields. One researcher's name is selected at random.

(a) What is the probability that the researcher has a degree in mathematics, but not in computer science?

(b) What is the probability that the researcher has no degree in either mathematics or computer science?

03

Inclusion-exclusion reasoning

Your friend says: “according to my calculations, the probability of A is 0.5 and the probability of B is 0.7, but the probability of A and B both happening is only 0.001.”

You tell your friend they don’t understand probability. Why?

04 ★

Conditioning - two dice, at least one is 5

Two dice are rolled, and at least one is a 5.

What is the probability that their sum is 10?

05

Conditioning - two dice, differing numbers

Two dice are rolled, and the outcomes are different.

What is the probability of getting at least one 1?

06 ★

Conditioning relation

Suppose you know $P[A \cap B] = 0.036$ and $P[A \mid B] = 0.18$ and $P[B \mid A] = 0.60$.

Calculate $P[A]$ and $P[B]$ and $P[A \cup B]$.