MT241P - Finite Mathematics

Assignment #4

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Question 1

Suppose Met Eirann provides the following predictions:
(P1) There is a 60 percent chance that it will rain today.
(P2) There is a 50 percent chance that it will rain tomorrow.

Part A

Let 'R' indicate a day with rain and 'N' a day with no rain. List an appro- priate sample space Ω.

Solution

Part B

Let A be the event that it rains today and let B be the event that it rains tomorrow. List the outcomes of the following events:

- A^C
- $A \cup B$
- $A \cap B$
- $A \cap B^C$
- $(A \cup B)^C$

Solution

Part C

Find the probabilities for the following events:

- It will rain today or tomorrow.
- It will rain today and tomorrow.
- It will rain today but not tomorrow.
- It will rain today or tomorrow, but not both days.

Solution

Question 2

Assume you flip a fair coin with a friend n times, where $n \geq 1$

Part A

How many possible outcomes are there?

Solution

Part B

What is the probability of each outcome?

Solution

Part C

If you throw the coin ten times, what is the chance of there being exactly one tail in any three consecutive throws?

Solution

Next you play a game for money. Each time heads comes up you win a Euro, each time tails comes up you lose a Euro. However, as soon as you lose for the first time you claim you have to go home and stop playing.

Part D

Describe the sample space Ω in terms of your possible wins/losses.

Solution

Part E

For each outcome $\omega \in \Omega$ give its probability.

Solution

Part F

What is the probability of you winning at least one, but less than four Euro?

Solution

Part G

What is the probability of you winning more than two Euro?

Solution

Question 3

You are at a party attended by k people, including you. What is the likelihood of somebody else at the party sharing your birthday? (We assume that nobody was born in a leap year). What is the likelihood if k = 23?

Solution

Question 4

Use combinatorial arguments to prove that, for every integer $n \geq 0$,