Discrete Mathematics and Probability **Discrete Probability**
Session 2026/27, Semester 1 Week 8 Tutorial 6

If you need this document in another format then please contact course organiser Ian.Stark@ed.ac.uk

Homework 4 is currently running: ask your tutor if you have any questions about it; you can also discuss the work with other students in your tutorial.

Task A

This is a task to explore the difference between 'mutually exclusive' and 'independent' events.

Suppose you roll two fair six-sided dice and look for the following three events.

- Event A: First die lands on 1
- Event B: Second die shows larger number than first die
- Event C: Both dice show same number

Which of these events are independent and which are mutually exclusive?

Task B

A random variable X has the following probability distribution.

x_i	1	3	4	6
p_i	0.25	0.3	0.3	0.15

Compute the cumulative distribution function (CDF) and from this calculate the probability $P(2 \leq X \leq 5)$.

Plot the probability mass function (PMF) and the cumulative distribution function.

Task C

This is a task to explore how the technical term "expected" in "expected value" relates to an everyday understanding of the word.

An exam is made up of 4 multiple-choice questions. Each question has 4 answers, of which exactly 1 is correct. A total of 256 students sit this exam. If each student answers each question randomly then what is the expected number of exam scripts with no correct answers? With one correct answer? With 2, with 3, with 4?

Consider the expected number of exam scripts with all four answers correct. What is the probability that the actual number of all-correct scripts is exactly the "expected" number? What is the probability that it is lower than that? Higher?

Task D

Alice and Bob play a game by taking turns throwing a fair six-sided die. Alice throws first and the winner is the first one to throw a 5 or 6. What are the probability of the events $A = \{\text{Alice wins}\}$ and $B = \{\text{Bob wins}\}$?

(You may use the fact that $\frac{1}{1-x^2} = 1 + x^2 + x^4 + x^6 + x^8 + \cdots$.)