

# 01/21/2026: Random Variables and their Distributions (Part 2)

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CSCI 546: Diffusion Models

Textbook reference: Sec 2.4-2.6

## Announcement (Sign-in Sheet)

Please sign the sign-in sheet.

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### Announcement (Office Hours)

My office hours this semester are Tues 12:15-1:15 and Thurs 12-2.  
The syllabus has been updated.

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### Announcement (Presentation Logistics)

I have an ipad and HDMI-USBc connector on order at the bookstore.  
They should come in sometime next week.

## Review Problem Set #2

# Random Groups

Aubrey Williams: 5

Austin Barton : 4

Blake Sigmundstad: 7

Diego Moylan: 4

Dillon Shaffer: 3

Felicia Jayasaputra: 2

Ismoiljon Muzaffarov: 6

Jacob Tanner: 8

Josh Stoneback: 2

Joshua Bowen: 1

Joshua Calwell: 3

Laura Banaszewski: 1

Lina Hammel: 1

Logan Racz: 4

Matt Hall: 8

Micah Miller: 3

Mike Kadoshnikov: 5

Owen Cool: 2

Racquel Bowen: 5

Samuel Mocabee: 7

Tatiana Kirillova: 6

# Group exercises - Problem Set 3

1. **The Dice DJ.** A DJ has a strange music mixer with three independent fair six-sided dice:
  - Die A controls bass,
  - Die B controls treble,
  - Die C controls tempo.

Let  $X = \max(A, B, C)$  be the loudest setting reached by any dial.

(a) What is the distribution of  $X$ ? (b) What is the probability that the system hits level 5 or higher?

2. (2.7.18) Eight pawns are placed on a chessboard, no more than one to a square. What is the probability that (a) they are in a straight line (do not forget the diagonals), and (b) no two are in the same row and column?

3. **Transitive Coins.** (2.7.16) Three coins each show heads with probability  $\frac{3}{5}$ . The number of points for heads/tails is 10/2 for coin 1, 4/4 for coin 2, 3/20 for coin 3. You and your opponent each choose a different coin. Each of you tosses your coin and the person with a larger score wins \$ 1 million. Would you prefer to pick your coin first or second?
4. (2.4.1) Let  $X$  be a random variable with continuous distribution function  $F$ . Find expressions for the distribution functions of the following random variables: (a)  $X^2$ , (b)  $\sin X$ .

