

Math 201, Spring 2021

Problem Set # 2

Due February February 2, 2021 at 11:59pm on gradescope

Question 1. Suppose Ram and Laxman play a game: they take turns shooting arrows at a bullseye. Ram goes first, and if he misses, Laxman goes next. If Laxman misses as well, the round ends, and the next round begins where Ram again goes first. Ram hits the bulls eye with probability $1/3$, and Laxman hits with probability $1/2$. The game ends when one of them hits the bullseye. Let X be the total number of rounds played (a round is one in which either Ram hits and wins, Ram misses and Laxman hits and wins, or both players miss).

- (a) Find the chance that Ram wins on the k -th round.
- (b) Find the probability that Ram wins.

Question 2. Imagine a game of 3 players where exactly one player wins in the end and all players have equal chances of being the winner. The game is repeated four times. Find the probability that there is at least one person who wins no games. **Hint:** Consider the events A_i in which person i wins no games and use the inclusion-exclusion formula.