

Recitation 1 Handout

Thursday, September 10

Problem 1.1

Tom rolls two six-sided dice.

- (a) Determine the fraction of possible outcomes in which the first roll is odd.
- (b) Determine the fraction of possible outcomes in which the sum of the two rolls is at least eight.
- (c) Determine the fraction of possible outcomes in which the first roll is odd *or* the sum of the two rolls is at least eight.
- (d) Of the outcomes in which the sum of the two rolls is at least eight, what fraction has at least one die showing '5'?

Problem 1.2

Let $f(x, y) = 2x^2 + \sqrt{xy}$ be a function over the domain $(x, y) \in \{1, \dots, n\} \times \{1, \dots, n\}$.

- (a) Suppose we want to evaluate $f(x, y)$ for all possible pairs (x, y) in its domain. Provide an efficient algorithm to perform these computations.
- (b) Express the total number of operations (additions, multiplications, etc.) that the algorithm in part (a) performs as a function of n .

For each statement below, determine whether it is true or false. If the statement is true, provide a proof. If the statement is false, provide a counterexample.

- (c) The algorithm in part (a) has a time complexity of $\mathcal{O}(n^3)$.
- (d) The algorithm in part (a) has a time complexity of $\mathcal{O}(n^2)$.
- (e) The algorithm in part (a) has a time complexity of $\mathcal{O}(\log n)$.