W04 Homework A

01

> ✍ **PMF and CDF: number of heads in five flips**
>
> Let X count the number of heads resulting from five flips of a coin.
>
> Write complete formulas (using cases) for the PMF and CDF of X.

✍ Intersection accidents

Suppose that the odds of an accident occurring on any given day at the intersection of Ivy and Emmet is 0.05.

What are the odds of the first accident occurring between day 5 and day 10, inclusive? (Use an RV with an appropriate discrete distribution type.)

✑ Lottery game

Suppose a lottery game requires that you purchase a $10 game card and advertises a 10% probability of winning a prize.

If you keep purchasing these game cards until you win twice, what is the probability you will purchase at least 4 of them?

Be sure to define a random variable and name the type of distribution that it has.

✍ Variance from CDF: Drill bit changes

The bits for a particular kind of drill must be changed fairly often. Let X denote the number of holes that can be drilled with one bit. The CDF of X is given below:

$$F_X(x) \quad = \quad \begin{cases} 0 & x < 1 \\ 0.13 & 1 \le x < 2 \\ 0.48 & 2 \le x < 3 \\ 0.81 & 3 \le x < 4 \\ 1 & 4 \le x \end{cases}$$

(a) Find the probability that a bit will be able to drill more than 2 holes.

(b) Find $\mathrm{Var}[X]$ by constructing the PMF.

✐ Reliability - Math competition cutoff score

At a high school math competition, students take a test with 10 questions. Each question is worth one point and the probability of a student getting any one question correct is 0.55, independent of the other questions.

(a) Find the probability of a student getting a score of 8 or higher.

(b) Students take the test individually but compete in teams of 2. To proceed to the second round of competition, each student on the team must score at least 8. Each high school can enter 2 teams. If a high school enters two teams, find the probability at least one of their teams will make it to the second round. Assume students' scores are independent.