

Name: _____

On this quiz, you **do not** need to calculate the final answer. An answer that looks something like

$$\frac{\binom{6}{2}\binom{8}{5}}{\binom{23}{4}} \quad \text{or} \quad \frac{(12)_3 + (11)(10)(9)}{14!}$$

is entirely acceptable.

1. The probability that there is no accident at a certain busy intersection is 89% on any given day, independently of the other days.

(a) Find the probability that there will be no accidents at this intersection during the next 7 days.

Solution: By independence, it's $(.89)^7$.

- (b) Find the probability that next September there will be exactly 2 days with accidents. (There are 30 days in September.)

Solution: We are looking for $P(X = 2)$ where $X \sim \text{Bin}(30, .11)$. This is

$$P(X = 2) = \binom{30}{2} (.11)^2 (.89)^{28}.$$

- (c) Find the probability that the first accident in September happens on or before September 5th.

Solution: The probability that no accident occurs on September 1–5 is $(.89)^5$. So the probability that at least one accident occurs in this time is $1 - (.89)^5$.

2. Suppose a soccer team wins each game with probability $2/5$, loses with probability $2/5$, and ties with probability $1/5$.

In the following questions, your answer should be a distribution, which should look like $\text{Geo}(1/3)$, or $\text{Bin}(17, .3)$, or $\text{Ber}(.9)$, or something like that.

- (a) Let X be the number of games won out of the first ten games. What is the distribution of X ?

Solution: $\text{Bin}(10, 2/5)$

- (b) Let Y be the number of games won or tied out of the first ten. What is the distribution of Y ?

Solution: $\text{Bin}(10, 3/5)$

- (c) Let Z be the number of games played when the team first loses or draws a game. (For example, if the team's season starts win, win, draw, then $Z = 3$.) What is the distribution of Z ?

Solution: $\text{Geo}(3/5)$