

# Stat 330

## Homework 4

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1)

- (a)  $X = \#$  of drivers until one doesn't make a full stop.

$$X \sim \text{Geo}(1 - .85) = \text{Geo}(.15)$$

$$P(X < 10) = ?$$

- (b)  $X = \#$  of correct answers out of total answers.

$$X \sim \text{Bin}(20, .6)$$

$$P(X \geq 12) = ?$$

- (c)  $X = \#$  of customers that arrive between 1:00 pm and 2:00 pm.

$$X \sim \text{Pois}(16)$$

$$P(X = 14) = ?$$

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2)

- (a) There are 6 possible doubles rolls out of 36 possible rolls. Thus,  $p = 6/36 = .16\bar{6}$

$$(b) E(X) = 0(1-p) + 1(p) = 0(.83\bar{3}) + 1(.16\bar{6}) = .16\bar{6}$$

$$E(X^2) = 0^2(1-p) + 1^2(p) = 0^2(.83\bar{3}) + 1^2(.16\bar{6}) = .16\bar{6}$$

$$\text{Var}(X) = E(X^2) - (E(X))^2 = .16\bar{6} - (.16\bar{6})^2 = .16\bar{6} - 0.027\bar{7} = 0.138\bar{8}$$

$$(c) Y \sim \text{Bin}(5, .167)$$

$$(d) E(Y) = np = 5 \cdot .167 = 0.835$$

$$(e) P(Y=3) = \binom{5}{3} (.167)^3 (.835)^{5-3} = .032$$

$$(f) Z \sim \text{Geo}(.167) \Rightarrow E(Z) = 1/.167 = 5.988$$

$$(g) P(Z \geq 4) = 1 - P(Z \leq 3) = 1 - (1 - (1 - .167)^2) = (1 - .167)^2 = .6939$$

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3)

(a)  $X \sim \text{Bin}(15, .85)$ . Then,  $P(X \geq 13) = P(X=13) + P(X=14) + P(X=15)$

$$\binom{15}{13} (0.85)^{13} (1-0.15)^{15-13} + \binom{15}{14} (0.85)^{14} (1-0.15)^{15-14} + \binom{15}{15} (0.85)^{15} (1-0.15)^{15-15} = .2856 + .2312 + .0874 = .6042$$

(b)  $Y \sim \text{Geo}(.85) \Rightarrow E(Y) = 1/.85 = 1.176$

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4)

(a)  $X \sim \text{Pois}(10)$

(b)  $\frac{e^{-10}(10)^8}{8!} = .113$

(c)  $X \sim \text{Pois}(10/(60/12)) = \text{Pois}(2)$

(d)  $\frac{e^{-2}(2)^3}{3!} = .18$

(e)  $E(X) = \lambda = 2$

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5)

(a) 3 goals in the next 5 games  $\Rightarrow \lambda = 1.1*5 = 5.5$

$P(X > 3) = 1 - P(X \leq 3)$ . Using CDF table,  $P(X \leq 3) = 0.2017$

$$P(X > 3) = 1 - 0.2017 = .7983$$

(b) As the team averages 1.1 goals per game, the probability of  $P(Y=0) = .3329$

Thus,  $Y \sim \text{Bin}(5, .3329) \Rightarrow P(Y < 2) = P(Y < 0) + P(Y < 1) =$

$$\binom{5}{0} (0.3329)^0 (1-0.3329)^{5-0} + \binom{5}{1} (0.3329)^1 (1-0.3329)^{5-1} = .1321 + .3296 = .4618$$

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6)

(a)  $X \sim \text{Pois}(1) \Rightarrow P(\text{High risk} \mid 0 \text{ accidents}) = P(X=0) = e^{-1} = .3679$