Stat 330
Homework 5

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1)

(a) X= # of drivers until one doesn't make a full stop.
$X \sim$ Geo(1 - .85) = Geo(.15)
P(X<10) = ...

(b) X = # of correct answers out of total answers.
$X \sim$ Bin(20, .6)
P(X≥12) = ...

(c) X = # of customers that arrive between 1:00 pm and 2:00 pm.
$X \sim$ 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 = $.16\tilde{6}$

(b) E(X) = 0(1-p) + 1(p) = $0(.83\tilde{3}) + 1(.16\tilde{6}) = .16\tilde{6}$
$E(X^2) = 0^2(1\text{-p}) + 1^2(\text{p}) = 0^2(.83\tilde{3}) + 1^2(.16\tilde{6}) = .16\tilde{6}$
$\text{Var}(X) = E(X^2) - (E(X))^2 = .16\tilde{6} - (.16\tilde{6})^2 = .16\tilde{6} - 0.027\tilde{7} = 0.138\tilde{8}$

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

(d) E(Y) = np = 5*.167 = 0.835

(e) P(Y=3) = $\binom{5}{3}(0.167)^3(0.835)^{5-3}$ = .032

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

(g) P(Z≥4) = 1 - P(Z≤3) = 1 - $(1 - (1 - .167)^2) = (1 - .167)^2$ = .6939

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3)

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

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

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

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4)

(a) X $\sim$ Pois(10)

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

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

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

(e) E(X) = λ = 2

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5)

(a) 3 goals in the next 5 games $\Rightarrow$ λ = 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 $\sim$ Bin(5, .3329) $\Rightarrow$ P(Y<2) = P(Y<0) + P(Y<1) =
$\binom{5}{0}(0.3329)^{0}(1\text{-}0.3329)^{5-0} + \binom{5}{1}(0.3329)^{1}(1\text{-}0.3329)^{5-1}$ = .1321 + .3296 = .4618

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6)

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