Course Number: Title Assignment x Submission

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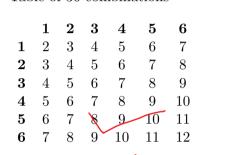
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Bernoulli Distribution

- 1. (Navidi 4.1.2)

 - (a) $p_X = 0.2$ (b) $p_Y = 0.45$
 - (c) $p_Z = 0.2 + 0.45 0.65$
 - (d) No, if we assume a customer cannot order a red and white at the same time.
 - (e) Yes, $p_X + p_Y = 0.2 + 0.45 = 0.65 = p_X$
 - (f) Yes, if X=1, then Y=0 and vis versa, so when ever the is a white or red, i.e. Z=1, then X+Y=1. And When there is neither, Z=0, X+Y=0
- 2. (Navidi 4.1.6)

Table of 36 combinations



- (a) Count from table: $p_X = \frac{6}{36} = \frac{1}{6}$
- (b) Count from table: $p_Y = \frac{5}{36}$
- (c) $p_Z = \frac{1}{36}$
- (d) No, as we roll doubles then we know if we also roll sum=6 then its double 3s, ie $\frac{1}{6}$, where $p_Y = \frac{5}{36}$, so we can say they are not independent.
- (e) $p_X p_Y = \frac{1}{6} \cdot \frac{5}{36} = \frac{5}{216}$ So, no.
- (f) The only case where X=1 and Y=1 (XY=1) is double 3s, ie where Z=1. Therefore yes. if Z=0and either X or y or both is zero then Z=XY.

Binomial Distribution

3. (Navidi 4.2.4)

$$P(X=x) = \frac{N!}{x!(N-x)!}p^x (1-p)^{N-x} : p = 0.75, N = 10$$

(a)
$$P(X = 10) = \frac{10!}{10!(10-10)!} 0.75^{10} (1 - 0.75)^{10-10} \approx 0.05631$$

(b)
$$P(X=8) = \frac{10!}{8!(10-8)!} \cdot 0.75^{8} (1-0.75)^{10-8} = 0.28156$$

- (c) $P(X \ge 8) = P(X = 8) + P(X = 9) + P(X = 10) = 0.05631 + 0.28156 + 0.18771 \approx 0.52558$
- 4. (Navidi 4.2.10)

$$x = 92, \ N = 100$$

(a)
$$\hat{p} = \frac{x}{N} = \frac{92}{100} = 0.92$$

 $\sigma_p = \sqrt{\frac{p \cdot (1-p)}{N}} = \sqrt{\frac{0.92 \cdot 0.08}{100}} = 0.027129$

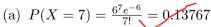
(b)
$$\sigma_p = 0.01$$
 : $N = \frac{p \cdot (1-p)}{\sigma_p^2} = \frac{0.92 \cdot 0.08}{0.01^2} = 736$

Poisson Distribution

5. (Navidi 4.3.4)

$$P(X = x) = \frac{\lambda^x e^{-x}}{x!}$$

6 track per cm^2 , over a $1cm^2$ area so $\lambda = 6$



(b) Via the complement law:

Via the complement law:
$$P(X \ge 3) = 1 - P(X \le 2) = 1 - (P(X = 0) + P(X = 1) + P(X = 2))$$

$$P(X = 0) = \frac{6^0 e^{-6}}{0!} = \frac{1}{e^6} \approx 0.00247$$

$$P(X = 1) = \frac{6^1 e^{-6}}{1!} = \frac{6}{e^6} \approx 0.01487$$

$$P(X = 2) = \frac{6^2 e^{-6}}{2!} = \frac{18}{e^6} \approx 0.04461$$

$$P(X \ge 3) = 1 - (1/e^6 + 6/e^6 + 18/e^6) \approx 0.938031$$

$$P(X=0) = \frac{6^0 e^{-6}}{0!} = \frac{1}{e^6} \approx 0.0024$$

$$P(X=1) = \frac{6^1 e^{-6}}{1!} = \frac{6}{e^6} \approx 0.01487$$

$$P(X=2) = \frac{6^2 e^{-6}}{2!} = \frac{18}{e^6} \approx 0.04461$$

$$P(X \ge 3) = 1 - (1/e^{0} + 6/e^{0} + 18/e^{0}) \approx 0.93803$$

(c)
$$P(2 < X < 7) = P(X = 3) + P(X = 4) + P(X = 5) + P(X = 6)$$

 $P(X = 3) = \frac{6^3 e^{-6}}{3!} = \frac{36}{e^6} \approx 0.08923$
 $P(X = 4) = \frac{6^4 e^{-6}}{4!} = \frac{54}{e^6} \approx 0.13385$
 $P(X = 5) = \frac{6^5 e^{-6}}{5!} = \frac{324}{5e^6} \approx 0.16062$
 $P(X = 6) = \frac{6^6 e^{-6}}{6!} \stackrel{\triangle}{=} \frac{324}{5e^6} \approx 0.16062$
 $P(2 < X < 7) = (0.08923 + 0.13385 + 0.16062 + 0.16062) = 0.54432$

$$P(X=3) = \frac{6^3 e^{-6}}{3!} = \frac{36}{e^6} \approx 0.08923$$

$$P(X=4) = \frac{6^4 e^{-6}}{4!} = \frac{54}{e^6} \approx 0.13385$$

$$P(Y=6) = \frac{-5!}{5!} = \frac{-5}{566} \approx 0.0002$$

$$P(2 < X < 7) \neq (0.08923 + 0.13385 + 0.16062 + 0.16062) = 0.5443$$

- (d) $\mu_X = \lambda = 6$
- (e) $\sigma_X = \sqrt{\lambda} = \sqrt{6} \approx 2.44949$
- 6. (Navidi 4.3.10) $X = \frac{48}{3} = 16$

$$\sigma_X = \sqrt{\frac{\chi}{t}} = \sqrt{\frac{16}{3}} = 2.3094$$

= 16 ± 2.31

