Course Number : Title
Assignment x Submission

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Bernoulli Distribution

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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, $p_X + p_Y = 0.2 + 0.45 = 0.65 = p_Z$
   (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

	1	**2**	**3**	**4**	**5**	**6**
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

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   (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) $p_X p_Y = \frac{1}{6} \cdot \frac{5}{36} = \frac{5}{216}$
   $p_Z = \frac{1}{36}$
   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

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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) $P(X \geq 8) = P(X=8) + P(X=9) + P(X=10) = 0.05631 + 0.28156 + 0.18771 \approx 0.52558$

4. (Navidi 4.2.10)

   $x = 92,\ N = 100$

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

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   6 track per cm^2, over a $1cm^2$ area so $\lambda = 6$
   (a) $P(X=7) = \frac{6^7 e^{-6}}{7!} = 0.13767$
   (b) Via the complement law:
   $P(X \geq 3) = 1 - P(X \leq 2) = 1 - (P(X=0) + P(X=1) + P(X=2))$
   $P(X=0) = \frac{6^0 e^{-6}}{0!} = \frac{1}{e^6} \approx 0.00247$
   $P(X=1) = \frac{6^1 e^{-6}}{1!} = \frac{6}{e^6} \approx 0.01487$
   $P(X=2) = \frac{6^2 e^{-6}}{2!} = \frac{18}{e^6} \approx 0.04461$
   $P(X \geq 3) = 1 - (1/e^6 + 6/e^6 + 18/e^6) \approx 0.938031$
   (c) $P(2 < X < 7) = P(X=3) + P(X=4) + P(X=5) + P(X=6)$
   $P(X=3) = \frac{6^3 e^{-6}}{3!} = \frac{36}{e^6} \approx 0.08923$
   $P(X=4) = \frac{6^4 e^{-6}}{4!} = \frac{54}{e^6} \approx 0.13385$
   $P(X=5) = \frac{6^5 e^{-6}}{5!} = \frac{324}{5e^6} \approx 0.16062$
   $P(X=6) = \frac{6^6 e^{-6}}{6!} = \frac{324}{5e^6} \approx 0.16062$
   $P(2 < X < 7) = (0.08923 + 0.13385 + 0.16062 + 0.16062) = 0.54432$
   (d) $\mu_X = \lambda = 6$
   (e) $\sigma_X = \sqrt{\lambda} = \sqrt{6} \approx 2.44949$

6. (Navidi 4.3.10)
   $X = \frac{48}{3} = 16$
   $\sigma_X = \sqrt{\frac{X}{t}} = \sqrt{\frac{16}{3}} = 2.309401$
   $= 16 \pm 2.31$

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