Math 220 : Elementary Statistics — Kane Nashimoto

Exam 2 Solutions

Summer 2006

1. Binomial random variable.

   Note : X, number of silver cars, is binomial with $n = 12$ and $\pi = .30$.

   (a) $P(X < 6) = P(X \leq 5) = .8822$

   (b) $P(3 \leq X \leq 7) = P(X \leq 7) - P(X \leq 2) = .9905 - .2528 = .7377$

   (c) "More than 7 silver" means "4 or fewer non-silver."
   $\Rightarrow\ P(X \leq 4) = .7237$

2. Correlation and regression by calculator.

   (a) $r = .987$

   (b) The two sets of readings are positively and highly correlated. Thus, it appears that the two sphygmomanometers are reliable.

3. Probability.

   (a) $P(\text{red}) = 1/3$

   (b) $P(\text{white})P(\text{red} \,|\, \text{white}) = 2/3 \cdot 1/2 = 1/3$

   (c) $P(\text{white})P(\text{white} \,|\, \text{white}) = 2/3 \cdot 1/2 = 1/3$

4. Probability.

   E_1 : {high salary} E_2 : {low salary}
   F_1 : {Professor} F_2 : {Associate Professor} F_3 : {Assistant Professor}

   (a) $P(E_2 \cup F_2) = (12 + 3 + 16 + 21)/73 = .712$

   (b) $P(E_1 | F_3) = 5/(5 + 21) = .192$

   (c) $P(E_1 \cap F_1) = 16/73 = .219$ but
   $P(E_1)P(F_1) = (16 + 12 + 5)/73 \cdot (16 + 3)/73 = .118$
   $\Rightarrow$ Two events are not independent.

5. Normal random variable.

   Note : X, IQ score, is normal with $\mu = 100$ and $\sigma = 15$.

   (a) $P(X > 135) = P\left(\dfrac{X - \mu}{\sigma} > \dfrac{135 - 100}{15}\right) = P(Z > 2.33)$
   $= 1 - P(Z \leq 2.33) = 1 - .9901 = .0099 \ \Rightarrow\ 0.99\%$

   (b) $z = 0.44 \ \because\ P(Z \leq 0.44) \approx .67$
   $z = \dfrac{x - \mu}{\sigma}\,;\ 0.44 = \dfrac{x - 100}{15}\,;\ x = 100 + (0.44)(15) = 106.60$

6. Correlation and regression by SPSS.

   (a) $\hat{y} = 632.108 + (1.257)(35) = 676.103$ (predicted value)
   $y - \hat{y} = 619 - 676.103 = -57.103$ (residual)

   (b) The residual plot does not reveal a discernable pattern. Thus, it appears that the regression model provides a good fit.