Math 220: Elementary Statistics — Kane Nashimoto

Exam 2 Solutions

Fall 2006

1. Probability.

   E: {selected student is male}
   F: {selected student prefers morning classes}

   Note: $P(E) = .46$; $P(F) = .67$; $P(E \cap F) = .29$

   (a) $P(E \cup F) = P(E) + P(F) - P(E \cap F) = .46 + .67 - .29 = .840$

   (b) $P(F|E) = \dfrac{P(E \cap F)}{P(E)} = \dfrac{.29}{.46} = .630$

   (c) $P(\text{at least one male}) = 1 - P(\text{all female}) = 1 - (.54)^3 = .843$

   (d) $P(E \cap F) = .29$ but $P(E)P(F) = (.46)(.67) = .308$
   $\Rightarrow$ Two events are not independent.

2. Normal random variable.

   Note: X, heating cost, is normal with $\mu = 450$ and $\sigma = 15$.

   (a) $P(X > 425) = P\left(\dfrac{X - \mu}{\sigma} > \dfrac{425 - 450}{15}\right) = P(Z > -1.67)$
   $= 1 - P(Z \leq -1.67) = 1 - .0475 = .9525$

   (b) $z = 1.28 \because P(Z \leq 1.28) \approx .90$
   $z = \dfrac{x - \mu}{\sigma}$; $1.28 = \dfrac{x - 450}{15}$; $x = 450 + (1.28)(15) = 469.20$

3. Correlation and regression by calculator.

   (a) $r = .245$

   (b) $\hat{y} = 61.934 + 0.286\,x$

4. Binomial random variable.

   Note: X, # of customers ordering Daily Special, is binomial with $n = 20$ and $\pi = .25$.

   (a) $P(X < 5) = P(X \leq 4) = .4148$

   (b) $P(X = 7) = P(X \leq 7) - P(X \leq 6) = .8982 - .7858 = .1124$

   (c) $P(2 < X < 10) = P(X \leq 9) - P(X \leq 2) = .9861 - .0913 = .8948$

   (d) "More than 15 not order Daily Special" means "4 or fewer order Daily Special."
   $\Rightarrow P(X \leq 4) = .4148$
   Alternatively, let Y be # of customers not ordering Daily Special. Then,
   Y is binomial with $n = 20$ and $\pi = .75$.
   $\Rightarrow P(Y > 15) = 1 - P(Y \leq 15) = 1 - .5852 = .4148$

5. Correlation and regression by SPSS.

   (a) $r^2 = .190$

   (b) $s_e = 2.618$

   (c) $\hat{y} = 28.278 + (1.667)(1.42) = 30.645$