Math 220 : Elementary Statistics — Kane Nashimoto
Exam 2 Solutions
Summer 2009

1. Correlation and regression by calculator.

   (a) $r = -.679$
   $\hat{y} = 114.767 - 0.662\,x$

   (b) $\hat{y} = 114.767 - 0.662(20) = 101.53$
   The predicted humidity is more than 100%. This is due to extrapolation.

2. Normal random variable.

   Note : X, price of a gallon of milk, is normal with $\mu = 2.17$ and $\sigma = 0.08$.

   (a) $P(X < 2.30) = P\left(\dfrac{X-\mu}{\sigma} < \dfrac{2.30-2.17}{0.08}\right) = P(Z < 1.63) = .9484$

   (b) $z = -0.13 \ \because\ P(Z \le -0.13) \approx .45$
   $z = \dfrac{x-\mu}{\sigma}$; $-0.13 = \dfrac{x-2.17}{0.08}$; $x = 2.17 + (-0.13)(0.08) = 2.16$

3. Contingency table.

   (a) Conditional proportions are as follows.

	Shift		
Gender	Morning	Midday	Evening
Male	0.250	0.467	0.283
Female	0.250	0.513	0.238

   (b) Proportionately, more female janitors than male janitors work midday shift, and more male janitors than female janitors work evening shift.

4. Probability.

   (a) $P(\text{evening}\,|\,\text{female}) = \dfrac{19}{80} = .238$

   (b) $P(\text{male} \cup \text{midday}) = \dfrac{161}{200} = .805$

   (c) $P(\text{male} \cap \text{morning}) = \dfrac{30}{200} = .15$ and

   $P(\text{male})\,P(\text{morning}) = \dfrac{120}{200} \cdot \dfrac{50}{200} = (.60)(.25) = .15$

   $\Rightarrow$ Two events are independent.

5. Binomial random variable.

   Note : X, number of students with double majors, is binomial with $n = 20$ and $p = .25$.

   (a) $\mu = np = (20)(.25) = 5.0$
   (b) $P(X \geq 10) = 1 - P(X \leq 9) = 1 - .9861 = .0139$
   (c) $P(2 < X < 7) = P(X \leq 6) - P(X \leq 2) = .7858 - .0913 = .6945$

6. Probability.

   $P(\text{at least one girl}) = 1 - P(\text{all boys}) = 1 - (.512)^5 = .965$

7. Correlation and regression by SPSS.

   (a) $r^2 = .872 \;\Rightarrow\;$ Approximately 87% of the variability in the data is accounted for by the regression model.
   (b) $\hat{y} = 65.028 + 48.279\,x = 234$
   $\Rightarrow\; x = 3.50$