Statistics for the Life Sciences

Math 20340 Section 01, Fall 2008

Homework 4 Solutions

- **5.40**:
  - **a**: $.109$
  - **b**: $.958$
  - **c**: $.257$
  - **d**: $.809$
- **5.42**: $n = 25, p = .05$ so $\mu = np = 1.25$ for Poisson approximation
  - $p(0) = .2865$... using Poisson; actually $.277$...
  - $p(1) = .35813$... using Poisson; actually $.365$...
- **5.43**: Model number of near misses by Poisson with $\mu = 5$
  - **a**: $p(0) = .007$
  - **b**: $p(5) = .171$
  - **c**: $p(\geq 5) = 1 - p(\leq 4) = .56$
- **5.47**:

  Probability that count will exceed maximum is probability that Poisson with $\mu = 2$ is six or greater; this is $.017$; so it is unlikely that count will exceed maximum.
- **5.48**: Model number of occurrences per $100,000$ as Poisson with $\mu = 2.5$
  - **a**: $p(\leq 5) = .958$
  - **b**: $p(> 5) = 1 - p(\leq 5) = .042$
  - **c**: At most 5 (95.8%)
- **6.4**:
  - **a**: $.8384$
  - **b**: $.9974$

- **6.6**:
  - **a**: $.9901$
  - **b**: $.95$
  - **c**: $.025$
  - **d**: $.9902$
- **6.10**:
  - **a**: 1.645
  - **b**: 2.575
- **6.13**:
  - **a**: $.1596$
  - **b**: $.1151$
  - **c**: $.1359$
- **6.14**:
  $$P(x > 7.5) = P((x - \mu)/2 > (7.5 - \mu)/2) = P(z > (7.5 - \mu)/2)$$
  This probability is given to be .8023. From a standard normal table, $P(z > -.85) = .8023$. So
  $$(7.5 - \mu)/2 = -.85$$
  or $\mu = 9.2$
- **6.19**: Let x be height of randomly selected man. x is normal with mean 69, standard deviation 3.5. Standardizing, $(x - 69)/3.5$ is a standard normal.
  - **a**: Taller than $6'$ is same as taller than 72 inches, that is 4 inches or $3/3.5 = .857$ standard deviations above mean. $p(z > .857) = .1949$, so about 12.7% of men are $6'$ or taller
  - **b**: $p(5'8" \leq x \leq 6'1") = p(68 \leq z \leq 73) = p(-1/3.5 \leq z \leq 4/3.5) = p(-.29 \leq z \leq 1.14) = .487$
  - **c**: $5'11"$ is 71 inches, only .57 standard deviations from the mean; not unusual
  - **d**: $18/42 = .428$ is observed proportion among presidents; .127 is proportion among general population. Observed proportion does seem unusual
- **6.23**:
  - 1300 is 1.01 standard deviations above mean; probability of exceeding this is .1562
  - 1500 is 3.03 standard deviations above mean; probability of exceeding this is .0012

- **6.29**: More than 100 is more than $15/9 = 1.66...$ standard deviations above mean. Probability of this is $.0475$

- **6.30**: With mean set to μ, and x the amount the grain per container,

  $p(\text{overflow}) = p(x > 2000) = p((x-\mu)/25.7 > (2000-\mu)/25.7) = p(z > (2000-\mu)/25.7).$

  We want this to be $.01$. From a standard normal table, $p(z > 2.33) = .01$, so want

  $$(2000 - \mu)/25.7 = 2.33$$

  or $\mu = 1940.12$.