Statistics – Solutions : Mu Alpha Theta National Convention 2003

1) B. $\frac{11.5-17}{\sqrt{6}} = -2.245 = -2.25$, B.

2) B. $t_{14,.005} = 2.977$. $\$124 \pm 2.977\left(\frac{\sqrt{90}}{\sqrt{15}}\right) = (116.71, 131.29)$, B

3) C. Definition of a confidence Interval.

4) A. P(B|A)P(A)=P(A|B)P(B). So P(B|A)(0.65) = (0.5)(0.2). Thus P(B|A) = 0.1538 = 0.15, A.

5) A. $Z_J = \frac{170-195}{\sqrt{58}} = -3.28$ $Z_B = \frac{13-17}{\sqrt{8}} = -1.414$ Since $Z_J < Z_B$, Jimmy performed better, A.

6) D. Control and Randomization are the only components listed that ARE principles of exp. design. Variation is an unavoidable statistical phenomena and blocking is a type of design, but not a necessary component. Thus, D.

7) C. Trails are independent, e.g. one trial doesn't affect the outcome of another. Thus, C.

8) D. Definition of slope for L.S.R. line. One addition unit of X will increase the expected Y by the multiplicative factor of slope.

9) B. Correlation coefficient is independent of units, scale, switching X and Y, and linear alterations such as those listed. Thus, B.

10) D. $n = 10$, p=2/3. P(at least 3 sucesses) = 1- P(X=0,1,2) = $1-\binom{10}{0,1,2}\left(\frac{2}{3}\right)^{0,1,2}\left(\frac{1}{3}\right)^{10,9,8}$ = 1- 0.0035 = 0.9965 = 0.997, D.

11) B. Homers gain is \$998 w/ prob 0.0001, \$98 w/ prob 0.001, \$8 w/ prob 0.01, and \$-2 w/ prob (1-0.0111). Use expected value to find his gain to be: (998)(0.0001) + (98)(0.001) + (8)(0.01) + (-2)(.9889) = \$-1.70, Thus B.

12) A. The problem specified "They believe the true weight" referring to μ was "less than … 10 pounds". Thus, A.

13) B. The test statistic in this case is $\frac{9.2-10}{1.5/\sqrt{85}}$ = -4.917, so absolute value makes is 4.9 to the nearest tenth, thus B.

14) C. Choices A and B are the same, but incorrect for p-value < alpha. Choice D is not used in common statistics. Thus, C.

15) C. Since it is a uniform interval, the width of the interval divided by the whole is appropriate, (50-10) / 50 = 0.80, C.

16) C. Definition of Type II error.

17) C. $\frac{({}_1C_1)({}_{50}C_9)}{{}_{50}C_{10}} = 0.24$, C.

18) B. The right skewed distribution has a tail stretched out to the right. These few extreme values pull the mean higher than the other measures. As usual though the mode is the most frequent, and thus represented by the high point. Thus the median must be between them. So the appropriate order is mode < median < mean, thus, B.

19) D. Use P(Vio|Rep)P(Rep) = P(Rep|Vio)P(Vio). So $P(V \mid R) = \frac{P(R \mid V)P(V)}{P(R)} = \frac{(0.90)(0.20)}{(0.90)(0.20)+(0.70)(0.80)} = 0.243$, thus D.

20) D. Hyper geometric distn. P(X>1) = 1-P(X=0) = $1-\frac{\binom{10}{0}\binom{4}{3}}{\binom{14}{3}} = 1-\frac{1*4}{364} = 0.989$, Thus D.

21) B. P(killed) = 0.02 + 0.01 + 0.03 = 0.06, Thus B.

22) D. P(NoIn | not old)P(not old) = P(not old | NoIn)P(NoIn): $\frac{(0.7246)(0.69)}{0.6} = 0.8333...$, so 0.83, Thus D.

23) B. A high Chi-square test statistic for an independence test shows dependence, thus B.

24) C. Multinomial distn. P(8,2,0) = $\frac{10!}{8!2!0!}(0.80)^8(0.15)^2(0.05)^0 = 0.1698$, or 0.17, Thus C.

25) A. Z* = 2.576. CI → $0.35 \pm (2.576)\sqrt{\frac{0.35*0.65}{80}}$ = (0.2126, 0.4873), Thus A.

26) C. Binomial Distn. P(x≥8) = P(x=8,9) = $\binom{9}{8}(0.3)^1(0.7)^8 + \binom{9}{9}(0.3)^0(0.7)^9 = 0.155649 + 0.0403 = 0.196$, thus C.

27) B. Poisson Distn. P(X≥4) = 1-P(x=0,1,2,3) = $1-\left(\frac{(2.5)^{0,1,2,3}(e^{-2.5})}{(0,1,2,3)!}\right)$ = 1- 0.7575 = 0.2424, thus B.

28) A. First, find P(trav. For bus) = (0.5)(0.6)+(0.6)(0.3)+(0.9)(0.1)=0.57. Then, P(per.own plane|bus)(0.57) = (0.6)(0.30). So P=0.316.

29) C. Replace 1% of batteries → 1% fail, so 1st percentile is Z = -2.33. So $Z = -2.33 = \frac{x-48}{9}$, so x = 27.03, or C.

30) D. Option II is for a multinomial experiment, not binomial. So I & III are appropriate, Thus D.