

Solutions for quiz for Biostatistics session 2
July 5, 2001

- 1) Independent events are those which:
 - a. Can never occur together
 - b. Do not influence the probability of one another**
 - c. Always occur together
 - d. Cover the entire sample space

- 2) Assume A is the event of having SBP ≥ 120 with $P(A)=0.2$, and B is the event of having DBP ≥ 90 with $P(B)=0.15$. Also assume that A and B are independent events.
 - a. What is the probability of the intersection of A and B?
 $P(A \text{ and } B) = P(A) * P(B) = 0.03$

 - b. What is the probability of the union of A and B?
 **$P(A \text{ or } B \text{ or both}) = P(A) + P(B) - P(A \text{ and } B)$
 $= 0.2 + 0.15 - 0.03 = 0.32$**

 - c. What is the conditional probability of B given that A occurred?
 $P(B | A) = P(A \text{ and } B) / P(A) = 0.15$
Or, since A and B are independent, $P(B | A) = P(B)$.

- 3) Explain the difference between a population and a sample. Why is the method of selecting items to be in your sample important?
A population is the group of all items of interest and is the group about which you would like to make conclusions. A sample is a smaller group of items selected from the population and is the group on which you calculate statistics and use inference to make conclusions about the population.
The method of selecting items to be in your sample is important because inference relies on your sample being representative of the population.

- 4) Data for this question is in Table 6.9 (p.204) in Rosner. Provide point and interval estimates for the mean zone diameter of *E. coli* in common medium. Assume the confidence interval formula we've discussed is appropriate.
Mean = 25.1
SD = 1.7
Point estimate for population mean = 25.1
95% confidence interval estimate for population mean:
 $25.1 \pm 1.96 * (1.7/\sqrt{9}) = [24.0, 26.2]$

5) A question about the possible carcinogenic effects of a compound arises. In an accident, 264 men were exposed to the compound. After 1 year, none of the men were observed to have cancer. After 10 years, 24 of the men were observed to have cancer.

a. Provide point and interval estimates of the proportion of exposed men with cancer by 1 year.

$$p = 0/264 = 0$$

Point estimate for proportion with cancer = 0

95% confidence interval estimate for proportion with cancer:

Use 3/n rule: $[0, 3/264] = [0, 0.01]$

b. Provide point and interval estimates of the proportion of exposed men with cancer by 10 years.

$$p = 24/264 = 0.09$$

Point estimate for proportion with cancer = 0.09

95% confidence interval estimate for proportion with cancer:

$0.09 \pm 1.96 \sqrt{0.09 \cdot 0.91/264} = [0.06, 0.12]$