

2004 AP[®] STATISTICS FREE-RESPONSE QUESTIONS

3. At an archaeological site that was an ancient swamp, the bones from 20 brontosaur skeletons have been unearthed. The bones do not show any sign of disease or malformation. It is thought that these animals wandered into a deep area of the swamp and became trapped in the swamp bottom. The 20 left femur bones (thigh bones) were located and 4 of these left femurs are to be randomly selected without replacement for DNA testing to determine gender.
- Let X be the number out of the 4 selected left femurs that are from males. Based on how these bones were sampled, explain why the probability distribution of X is not binomial.
 - Suppose that the group of 20 brontosaurs whose remains were found in the swamp had been made up of 10 males and 10 females. What is the probability that all 4 in the sample to be tested are male?
 - The DNA testing revealed that all 4 femurs tested were from males. Based on this result and your answer from part (b), do you think that males and females were equally represented in the group of 20 brontosaurs stuck in the swamp? Explain.
 - Is it reasonable to generalize your conclusion in part (c) pertaining to the group of 20 brontosaurs to the population of all brontosaurs? Explain why or why not.
4. Two antibiotics are available as treatment for a common ear infection in children.
- Antibiotic A is known to effectively cure the infection 60 percent of the time. Treatment with antibiotic A costs \$50.
 - Antibiotic B is known to effectively cure the infection 90 percent of the time. Treatment with antibiotic B costs \$80.

The antibiotics work independently of one another. Both antibiotics can be safely administered to children. A health insurance company intends to recommend one of the following two plans of treatment for children with this ear infection.

- Plan I: Treat with antibiotic A first. If it is not effective, then treat with antibiotic B.
 - Plan II: Treat with antibiotic B first. If it is not effective, then treat with antibiotic A.
- If a doctor treats a child with an ear infection using plan I, what is the probability that the child will be cured?
If a doctor treats a child with an ear infection using plan II, what is the probability that the child will be cured?
 - Compute the expected cost per child when plan I is used for treatment.
Compute the expected cost per child when plan II is used for treatment.
 - Based on the results in parts (a) and (b), which plan would you recommend?
Explain your recommendation.