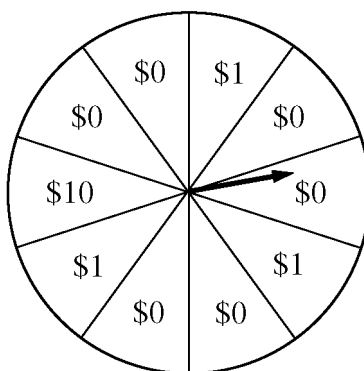


2011 AP[®] STATISTICS FREE-RESPONSE QUESTIONS (Form B)

2. People with acrophobia (fear of heights) sometimes enroll in therapy sessions to help them overcome this fear. Typically, seven or eight therapy sessions are needed before improvement is noticed. A study was conducted to determine whether the drug D-cycloserine, used in combination with fewer therapy sessions, would help people with acrophobia overcome this fear.
- Each of 27 people who participated in the study received a pill before each of two therapy sessions. Seventeen of the 27 people were randomly assigned to receive a D-cycloserine pill, and the remaining 10 people received a placebo. After the two therapy sessions, none of the 27 people received additional pills or therapy. Three months after the administration of the pills and the two therapy sessions, each of the 27 people was evaluated to see if he or she had improved.
- (a) Was this study an experiment or an observational study? Provide an explanation to support your answer.
 - (b) When the data were analyzed, the D-cycloserine group showed statistically significantly more improvement than the placebo group did. Based on this result, would the researchers be justified in concluding that the D-cycloserine pill and two therapy sessions are as beneficial as eight therapy sessions without the pill? Justify your answer.
 - (c) A newspaper article that summarized the results of this study did not explain how it was determined which people received D-cycloserine and which received the placebo. Suppose the researchers allowed the therapists to choose which people received D-cycloserine and which received the placebo, and no randomization was used. Explain why such a method of assignment might lead to an incorrect conclusion.
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3. An airline claims that there is a 0.10 probability that a coach-class ticket holder who flies frequently will be upgraded to first class on any flight. This outcome is independent from flight to flight. Sam is a frequent flier who always purchases coach-class tickets.
- (a) What is the probability that Sam's first upgrade will occur after the third flight?
 - (b) What is the probability that Sam will be upgraded exactly 2 times in his next 20 flights?
 - (c) Sam will take 104 flights next year. Would you be surprised if Sam receives more than 20 upgrades to first class during the year? Justify your answer.

2012 AP[®] STATISTICS FREE-RESPONSE QUESTIONS

2. A charity fundraiser has a Spin the Pointer game that uses a spinner like the one illustrated in the figure below.



A donation of \$2 is required to play the game. For each \$2 donation, a player spins the pointer once and receives the amount of money indicated in the sector where the pointer lands on the wheel. The spinner has an equal probability of landing in each of the 10 sectors.

- (a) Let X represent the net contribution to the charity when one person plays the game once. Complete the table for the probability distribution of X .

x	\$2	\$1	-\$8
$P(x)$			

- (b) What is the expected value of the net contribution to the charity for one play of the game?
- (c) The charity would like to receive a net contribution of \$500 from this game. What is the fewest number of times the game must be played for the expected value of the net contribution to be at least \$500 ?
- (d) Based on last year's event, the charity anticipates that the Spin the Pointer game will be played 1,000 times. The charity would like to know the probability of obtaining a net contribution of at least \$500 in 1,000 plays of the game. The mean and standard deviation of the net contribution to the charity in 1,000 plays of the game are \$700 and \$92.79, respectively. Use the normal distribution to approximate the probability that the charity would obtain a net contribution of at least \$500 in 1,000 plays of the game.

2017 AP[®] STATISTICS FREE-RESPONSE QUESTIONS

2. The manager of a local fast-food restaurant is concerned about customers who ask for a water cup when placing an order but fill the cup with a soft drink from the beverage fountain instead of filling the cup with water. The manager selected a random sample of 80 customers who asked for a water cup when placing an order and found that 23 of those customers filled the cup with a soft drink from the beverage fountain.
- (a) Construct and interpret a 95 percent confidence interval for the proportion of all customers who, having asked for a water cup when placing an order, will fill the cup with a soft drink from the beverage fountain.
 - (b) The manager estimates that each customer who asks for a water cup but fills it with a soft drink costs the restaurant \$0.25. Suppose that in the month of June 3,000 customers ask for a water cup when placing an order. Use the confidence interval constructed in part (a) to give an interval estimate for the cost to the restaurant for the month of June from the customers who ask for a water cup but fill the cup with a soft drink.