# Exam Review (4) AP Statistics

## Binomial/Geometric Distributions

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**1. A set of ten cards consists of five red cards and five black cards. The cards are shuffled thoroughly and I am given the first four cards. I count the number of red cards $X$ in these four cards. The random variable $X$ has which of the following probability distributions?**

A. The binomial distribution with parameters $n = 10$ and $p = 0.5$.

B. The binomial distribution with parameters $n = 4$ and $p = 0.5$.

C. None of the above.

**2. There are twenty multiple-choice questions on an exam, each having responses a, b, c, or d. Each question is worth 5 points and only one response per question is correct. Suppose a student *guesses* the answer to each question, and her guesses from question to question are independent. If the student needs at least 40 points to pass the test, the probability the student passes is closest to**

A. 0.0609.

B. 0.1019.

C. 0.9590.

**3. There are twenty multiple-choice questions on an exam, each having responses a, b, c, or d. Each question is worth 5 points and only one reponse per question is correct. Suppose a student *guesses* the answer to each question, and her guesses from question to question are independent. The student's mean *score on the exam* should be**

A. 5.

B. 25.

C. 50.

**4. A test consists of twenty multiple-choice questions, with possible answers a, b, c, d. Each question has only one right answer. Suppose that a student guesses the answer to each question. Then the *standard deviation* of the number of correct answers is approximately:**

A. 1.94.

B. 3.75.

C. 5.

**5. In the old children's game of "rock, scissors, paper," two players simultaneously use their hands to show one of three objects: a rock (a closed fist), a pair of scissors (two fingers extended in a V-shape), or a piece of paper (an open palm). The winner is chosen in the following ways:**

**Rock beats scissors (rock can crush scissors)**
**Scissors beats paper (scissors can cut paper)**
**Paper beats rock (paper can wrap around rock)**

**If the players show the same object, then the game is played again, with repeats as needed under one player wins. Assuming that each player selects an object indepen dently and that each player is equally likely to choose any of the three objects. Let X = the number of games that must be played in order to declare a winner (assume that the identity of the winner is unimportant). Then X is a geometric random variable with probability of success p equal to:**

A. 1/3.

B. 1/2.

C. 1/6.

**6. 70% of a certain large population is right-handed. You need a left-handed pitcher for your softball team and decide to find one by asking people chosen from the population at random. (We assume that once you *do* find a left-hander, he or she will be happy to join your team and will not say no.) Let X = the number of people you must ask in order to find a left-hander. Then X has the following distribution:**

A. Geometric with p = 0.7.

B. Binomial with n = the size of the population and
C. p = 0.3.

D. Geometric with p = 0.3.

**7. 70% of a certain large population is right-handed. You need a left-handed pitcher for your softball team and decide to find one by asking people chosen from the population at random. (We assume that once you *do* find a left-hander, he or she will be happy to join your team and will not say no.) Then the probability that the first left-hander you find is the fourth person you ask is approximately:**

A. .103.

B. .019.

C. .072.

**8. 70% of a certain large population is right-handed. You need a left-handed pitcher for your softball team and decide to find one by asking people chosen from the population at random. (We assume that once you *do* find a left-hander, he or she will be happy to join your team and will not say no.) Then the probability that you will have to ask more than three people before finding your first left-hander is approximately:**

A. .027.

B. .240.

C. .343.

**9. 70% of a certain large population is right-handed. You need a left-handed pitcher for your softball team and decide to find one by asking people chosen from the population at random. (We assume that once you *do* find a left-hander, he or she will be happy to join your team and will not say no.) Then the probability that you will have to ask *at most two* people in order to find your first left-hander is approximately:**

A. 0.657.

B. 0.49.

C. 0.973.

**10. 70% of a certain large population is right-handed. You need a left-handed pitcher for your softball team and decide to find one by asking people chosen from the population at random. (We assume that once you *do* find a left-hander, he or she will be happy to join your team and will not say no.) Then the number of people you can *expect* to have to ask in order to find your first left-hander is approximately:**

A. 1.43.

B. 3.33.

C. .3.

## Sampling Distributions
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**1. A news magazine claims that 30% of all New York City police officers are overweight. Indignant at this claim, the New York City police commissioner conducts a survey in which a random sample of 200 New York City police officers are weighed. 52, or 26%, of the surveyed officers turn out to be overweight. Which of the following statements about this situation is *false* ?**

A. The number “26%” is a parameter.

B. The number “30%” is a parameter.

C. The number “26%” is a statistic.

**2. A simple random sample of 1000 Americans found that 61% were satisfied with the service provided by the dealer from which they bought their car. A simple random sample of 1000 Canadians found that 58% were satisfied with the service provided by the dealer from which they bought their car. The sampling variability associated with these statistics is**

A. about the same.

B. much smaller for the sample of Canadians since the population of Canada is smaller than that of the United States, hence the sample is a larger proportion of the population.

C. much larger for the Canadians since Canada has a lower population density than the United States, hence Canadians tend to live farther apart which always increases sampling variability.

**3. There are two statistics classes. The first has 250 students and the second has 200 students. In the first class the students are instructed to toss a coin 20 times and record the value of $\hat{p}$, the proportion of heads. The instructor then makes a histogram of the 250 values of $\hat{p}$ obtained. In the second class the students are instructed to toss a coin 40 times and record the value of $\hat{p}$, the proportion of heads. The instructor then makes a histogram of the 200 values of $\hat{p}$ obtained. The histogram of $\hat{p}$ values for the first class should be**

A. more biased since it is based on a smaller number of tosses.

B. more variable since it is based on a smaller number of tosses.

C. less variable since it is based on a larger number of students.

**4. As part of a promotion for a new type of cracker, free samples are offered to shoppers in a local supermarket. The probability that a shopper will buy a packet of crackers after tasting the free sample is 0.200. Different shoppers can be regarded as independent trials. Let $\hat{p}$ be the proportion of the next $n$ shoppers that buy a packet of the crackers after tasting a free sample. How large should $n$ be so that the standard deviation of $\hat{p}$ is no more than 0.1?**

A. 4.

B. 16.

C. 256.

**5. As part of a promotion for a new type of cracker, free trial samples are offered to shoppers in a local supermarket. The probability that a shopper will buy a packet of crackers after tasting the free sample is 0.200. Different shoppers can be regarded as independent trials. If $\hat{p}$ is the proportion of the next 100 shoppers that buy a packet of the crackers after tasting a free sample, then $\hat{p}$ has approximately a**

A. $N(0.2, 0.0016)$ distribution.

B. $N(0.2, 0.04)$ distribution.

C. $N(0.2, 4)$ distribution.

**6. As part of a promotion for a new type of cracker, free samples are offered to shoppers in a local supermarket. The probability that a shopper will buy a packet of crackers after tasting the free sample is 0.200. Different shoppers can be regarded as independent trials. If $\hat{p}$ is the proportion of the next 100 shoppers that buy a packet of the crackers after tasting a free sample, then the probability that fewer than 30% buy a packet after tasting a free sample is approximately (don't use the continuity correction)**

A. 0.3000.

B. 0.9938.

C. None of the above.

**7. Suppose that you are a student worker in the statistics department and agree to be paid by the Random Pay system. Each week the Chair flips a coin. If the coin comes up heads, your pay for the week is $80; if it comes up tails, your pay for the week is $40. You work for the department for 100 weeks (at which point you have learned enough probability to know the system is not to your advantage). The probability that $\bar{x}$, your average earnings in the first *two* weeks, is greater than $65 is**

A. 0.2500.

B. 0.3333.

C. 0.5000.

**8. The scores of individual students on the American College Testing (ACT) Program composite college entrance examination have a normal distribution with mean 18.6 and standard deviation 6.0. At Northside High, 36 seniors take the test. If the scores at this school have the same distribution as national scores, the sampling distribution of the average (sample mean) score for the 36 students is**

A. approximately normal, but the approximation is poor.

B. approximately normal, and the approximation is good.

C. exactly normal.

**9. The duration of Alzheimer's disease, from the onset of symptoms until death, ranges from 3 to 20 years, with a mean of 8 years and a standard deviation of 4 years. The administrator of a large medical center randomly selects the medical records of 30 deceased Alzheimer's patients and records the duration of the disease for each. Find the probability that the average duration of the 30 patients will lie within 1 year of the overall mean of 8 years.**

A. 0.8294.

B. 0.1706.

C. 0.4147.

**10. The duration of Alzheimer's disease, from the onset of symptoms until death, ranges from 3 to 20 years, with a mean of 8 years and a standard deviation of 4 years. The administrator of a large medical center randomly selects the medical records of 30 deceased Alzheimer's patients and records the duration of the disease for each. Find the value L such that there is a probability of 0.99 that the average duration of the 30 patients lies less than L years above the overall mean of 8 years.**

A. 0.73.

B. 1.70.

C. 2.33.