Week 4 Quiz

测验, 7 个问题

6/7 分 (85%)

恭喜！您通过了！

下一项

1 / 1 分

1。
Suppose IQ scores are normally distributed with mean 100 and standard deviation 10. Which of the following is **false**?

- Roughly 68% of people have IQ scores between 90 and 110.
- A normal probability plot of IQ scores of a random sample of 1,000 people should show a straight line.
- An IQ score greater than 130 is highly unlikely, but not impossible.
- An IQ score of 80 is more unusual than an IQ score of 120.

正确

This question refers to the following learning objective: Use the Z score

- if the distribution is normal: to determine the percentile score of a data point (using technology or normal probability tables)
- regardless of the shape of the distribution: to assess whether or not the particular observation is considered to be unusual (more than 2 standard deviations away from the mean).

The scores of 80 and 120 are the same distance (2 standard deviations) from the mean (100) of the distribution. Because the normal distribution is symmetric, these scores are equally likely.

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1 / 1 分

2。

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A 2005 survey found that 7% of teenagers (ages 13 to 17) suffer from an extreme fear of spiders (arachnophobia). At a summer camp there are 10 teenagers sleeping in each tent. Assume that these 10 teenagers are independent of each other. What is the probability that at least one of them suffers from arachnophobia?

- 82%
- 72%
- 62%
- 42%
- 52%

正确

This question refers to the following learning objective: Calculate the probability of a given number of successes in a given number of trials using the binomial distribution.

We are asked for P(k ≥ 1 | n = 10,p = 0.07). Notice this is equal to 1 − P(k = 0 | n = 10, p = 0.07). The latter is easier to calculate since it only requires one calculation using the binomial distribution. So, we use the binomial distribution with n = 10, k = 0, and p = 0.07 and calculate P (k ≥ 1 | n = 10, p = 0.07) = 1 − P (k = 0 | n = 10, p = 0.07) = 1 − $\binom{10}{0}0.07^{0}0.93^{10}$ = 1 − 0.4840 = 0.516.0

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1 / 1 分

3。

Your roommate loves to eat Chinese food for dinner. He estimates that on any given night, there's a 30% chance he'll choose to eat Chinese food. Although he loves Chinese food, he doesn't like to eat it too much in a short period of time, so on most weeks he eats several different kinds of foods for dinner. Suppose you wanted to calculate the probability that, over the next 7 days, you friend eats Chinese food at least 3 times. Which of the following is the most accurate statement about calculating this probability?

- Because "success" or "failure" have no real meaning in the context of this problem, we cannot use the binomial distribution to calculate the desired probability.
- Because we know n = 3, k = 7, and p = 0.30, we can use the binomial distribution to calculate the desired probability.

Because we do not know the probabilities of your roommate eating any other types of foods, we cannot use the binomial distribution to calculate the desired probability.

Because we know n = 7, k = 3, and p = 0.30, we can use the binomial distribution to calculate the desired probability.

Because he doesn't like to eat Chinese food too much in a short period of time, p is not really the same for each trial and so we cannot use the binomial distribution to calculate the desired probability.

正确

This question refers to the following learning objective:
Determine if a random variable is binomial using the four conditions.

- The trials are independent.
- The number of trials, n, is fixed.
- Each trial outcome can be classified as a success or failure.
- The probability of a success, p, is the same for each trial.

The statement that he doesn't like to eat Chinese food too much in a short period of time suggests that p is not constant over each of the n = 7 trials (days).

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1 / 1 分

4。
Suppose you observe a data point x = 12 and it is known that this data point came from a normal distribution with mean 5 and standard deviation 2. Which of the following statements is **true** regarding the observation of x = 12?

The observation would not be considered unusual, because we know exactly which normal distribution it comes from.

The observation would not be considered unusual, because it comes from a normal distribution.

The observation would be considered unusual because x = 12 is over twice as large as the mean of the distribution.

The observation would be considered unusual because it is farther than three standard deviations from the mean.

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正确

This question refers to the following learning objective: Assess whether or not a distribution is nearly normal using the 68-95-99.7% rule or graphical methods such as a normal probability plot.

The observation x = 12 is more than three standard deviations from the mean (mean+3×SD = 5+3×2 = 11; we observed 12). Recall that 99.7% of data following a normal distribution are within 3 standard deviations of the mean of that distribution.

- The observation would not be considered unusual because it is only about three standard deviations from the mean.

✖ 0 / 1 分

5。

Which of the following is **false**? Hint: It might be useful to sketch the distributions.

- The Z score for the median of a symmetric distribution is approximately 0.
- Regardless of the shape and skew of a distribution, Z scores are still defined and can be calculated for observations from that distribution.
- If you calculated the Z score for the median of a right skewed distribution, you'd most likely get a positive number.
- If observations don't come from a distribution that's nearly normal, we can't calculate percentiles based on the Z table.

这个选项的答案不正确

This question refers to the following learning objective: Depending on the shape of the distribution determine whether the median would have a negative, positive, or 0 Z score keeping in mind that the mean always has a Z score of 0.

Calculating percentiles using the Z score and the normal probability distribution (e.g. the table) require normality, while calculation of Z scores do not.

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1 / 1 分

6。

At any given time about 5.5% of women (age 15-45) are pregnant. A home pregnancy test is accurate 99% of the time if the woman taking the test is actually pregnant and 99.5% accurate if the woman is not pregnant. If the test yields a positive result, what is the posterior probability of the hypothesis that the woman is pregnant?

- 0.99
- 0.995
- 0.92

正确

This question refers to the following learning objective: Distinguish between marginal and conditional probabilities. Construct tree diagrams to calculate conditional probabilities and probabilities of intersection of non-independent events using Bayes' theorem: P(A|B) = P(A and B) / P(B)

Let P and N denote the events "is pregnant" and "is not pregnant" respectively. Let "+" and "−" denote a positive and negative test result. We are given that P(P) = 0.055, P (+|P) = 0.99, P (−|N) = 0.995. Now let's write down the desired quantity, use Bayes' Theorem on it, and see what we have. We are asked to calculate P(P|+), which we write as $\frac{P(+|P)P(P)}{P(+|P)P(P)+P(+|N)P(N)}$. We weren't given P(N) or P(+|N), but we can calculate them using given information. Specifically P (N) = 1 − P (P) = 0.945 and P(+|N) = 1 − P(−|N) = 0.005. Then plug in to Bayes' Theorem to find P(P|+) = $\frac{0.99(0.055)}{0.99(0.055)+0.005(0.945)}$ = 0.92. Your answer may vary slightly due to rounding.

- 0.08

1 / 1 分

7。

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Your boss is a biologist who needs wood samples from long-leaf pine trees with a fungal disease which is only visible under a microscope, and she sends you on an assignment to collect the samples. She wants at least 50 different diseased samples. She tells you that approximately 28% of long-leaf pine trees currently have the fungal disease. If you sample 160 long-leaf pine trees at random, what is the probability you'll have at least 50 diseased samples to return to your boss? (Use the normal approximation to calculate this probability and chose the closest answer to the question.)

- 18%

正确

This question refers to the following learning objective: When number of trials is sufficiently large, use normal approximation to calculate binomial probabilities, and explain why this approach works.

This calculation would involve the sum of many binomial probabilities, so after checking conditions for the normal approximation to the binomial $\mu = np$ = 160 × 0.28 = 44.8 > 10 and $n(1 - p)$ = 115.2 > 10) and calculating $\sigma = \sqrt{np(1 - p)}$ = 5.68, we let T denote the number of tree samples containing the disease. Then calculate

P(T > 50) = P((T - 44.8)/5.68)

= P((50 - 44.8)/5.68

≈ P(Z > .92)

≈ 0.18

- 13%
- 28%
- 82%
- 92%

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