Statistics 2035—Distance Studies—Summer 2008
Midterm Exam

1. A manager has just received the expense checks for six of her employees. She randomly distributes the checks to the six employees. What is the probability that exactly five of them will receive the correct checks (checks with the correct names).
   A) 1
   B) 1/2
   C) 1/6
   D) 0
   E) 1/3

2. A manufacturing company measures the weight of boxes before shipping them to the customers. If the box weights have a population mean and standard deviation of 90 kg and 24 kg respectively, then based on a sample size of 36 boxes, the probability that the average weight of the boxes will exceed 94 kg is

   A) 34.13%
   B) 84.13%
   C) 15.87%
   D) 56.36%
   E) 16.87%

Use the following to answer Questions 3-4:

An automobile insurance company is in the process of reviewing its policies. Currently drivers under the age of 25 have to pay a certain premium. The company is considering increasing the value of the premium charged to drivers under 25. According to company records, 35% of the insured drivers are under the age of 25. The company records also show that 280 of the 700 insured drivers under the age of 25 had been involved in at least one automobile accident. On the other hand, only 130 of the 1300 insured drivers 25 years or older had been involved in at least one automobile accident.

3. What is the probability that an insured driver of any age will be involved in an accident?
   A) 35%
   B) 20.5%
   C) 65%
   D) 68.3%
   E) 79.5%

4. An accident has just been reported. What is the probability that the insured driver is under the age of 25?
   A) 35%
   B) 20.5%
   C) 14%
   D) 68.3%
   E) 40%

5. If a one-sided null hypothesis for a single mean can not be rejected at a given significance level, then the corresponding two-sided null hypothesis (i.e., the same sample size, the same standard deviation, and the same mean) will_____ be rejected at the same significance level.

   A) Always
   B) Sometimes
   C) Never

Use the following to answer Question 6:

A major airline company is concerned that its proportion of late arrivals has substantially increased in the past month. Historical data shows that on the average 18% of the company airplanes have arrived late. In a random sample of 1,240 airplanes, 310 airplanes have arrived late. If we are conducting a hypothesis test of a single proportion to determine if the proportion of late arrivals has increased:

6. What is the value of the calculated test statistic?

   A) Z = 6.416
   B) Z = 3.208
   C) Z = -3.208
   D) Z = -6.416
   E) Z = 1.833

7. Unoccupied seats on flights cause airlines to lose revenue. Suppose a large airline wants to estimate its average number of unoccupied seats per flight over the past year. 225 flight records are randomly selected and the number of unoccupied seats is noted with a sample mean of 11.6 seats and a standard deviation of 4.1 seats. Calculate a 90% confidence interval for μ, the mean number of unoccupied seats per flight during the past year.
   A) [4.86, 18.34]
   B) [11.25, 11.95]
   C) [11.57, 11.63]
   D) [11.15, 12.05]
   E) [11.30, 12.20]

8. The mean of the binomial distribution is equal to:

   A) p
   B) np
   C) $p^x(1-p)^{n-x}$
   D) (n)(p)(1-p)
   E) $\sqrt{np(1-p)}$

9. If the hourly earnings of workers for a given company are normally distributed with a mean of $15 per hour, then the proportion of the workers earning more than $13 per hour:
   A) Is greater than the proportion earning less than $13 per hour.
   B) Is greater than the proportion earning less than $18 per hour.
   C) Is less than 50%.
   D) Is less than the proportion earning more than the mean wage.
   E) None of the above are correct

Use the following to answer Question 10:

The manager of the local grocery store has determined that, on the average, 4 customers use the service desk every half-hour. Assume that the number of customers using the service desk has a Poisson distribution.

10. What is the probability that during a randomly selected half-hour period exactly 2 customers use the service desk?
    A) 0.0183
    B) 0.0733
    C) 0.1465
    D) 0.9084
    E) 0.7619

11. The width of a confidence interval will be:

    A) Narrower for 99% confidence than 95% confidence.
    B) Wider for a sample size of 100 than for a sample size of 50.
    C) Narrower for 90% confidence than 95% confidence.
    D) Wider when the sample standard deviation (s) is small than when s is large.
    E) Both (A) and (B) are correct

Use the following to answer Question 12:

The average waiting time per customer at a fast food restaurant has been 7.5 minutes. The customer waiting time has a normal distribution. The manager claims that the use of a new cashier system will decrease the average customer waiting time in the store.

12. A random sample of 12 customer transactions has been recorded. At a significance level of 0.05, what is the rejection point condition? We would reject the null hypothesis if:
    A) $Z < -1.645$
    B) $Z > 1.645$
    C) $t > 1.796$
    D) $t < -1.796$
    E) $t < -1.782$

13. If events A and B are independent, then the probability of simultaneous occurrence of event A and event B can be found with:
    A) $P(A) \bullet P(B)$
    B) $P(A) \bullet P(B / A)$
    C) $P(B) \bullet P(A / B)$
    D) All of the above are correct

14. If the random variable of x is normally distributed, ____% of all possible observed values of x will be within three standard deviations of the mean.
    A) 68.26
    B) 95.44
    C) 99.73
    D) 100
    E) None of the above

15. As the sample size _____ the variation of the sampling distribution of $\bar{X}$ _____.
    A) Decreases, decreases
    B) Increases, remains the same
    C) Decreases, remains the same
    D) Increases, decreases
    E) None of the above are correct

16. A fair die is rolled 10 times. What is the probability that an even number (2, 4, or 6) will occur between 2 and 4 times?
    A) 0.6123
    B) 0.1709
    C) 0.1611
    D) 0.3662
    E) 0.3223

17. Measurements from a population are called
    A) Statistics
    B) Observations
    C) Variables
    D) Processes
    E) Functions

Use the following to answer Question 18:

According to a hospital administrator, historical records over the past 10 years have shown that 20% of the major surgery patients are dissatisfied with after-surgery care in the hospital. A scientific poll based on 400 hospital patients has just been conducted.

18. What is the approximate probability that at least 70 patients will be dissatisfied with the after-surgery care? (use any necessary corrections if applicable).
    A) 90.49%
    B) 89.44%
    C) 88.30%
    D) 11.70%
    E) 84.49%

19. If there are 130 values in a data set, how many classes should be created for a frequency histogram?
    A) 4
    B) 5
    C) 6
    D) 7
    E) 8

20. Ratio variables have the following unique characteristic:
    A) meaningful order
    B) an inherently defined zero value
    C) categorical in nature
    D) predictable
    E) equal distance between points

21. If a population distribution is positively skewed (to the right), then, given a random sample from that population, one would expect that the _____
    A) median would be greater than the mean.
    B) mode would be equal to the mean.
    C) median would never equal the mode.
    D) median would be equal to the mean.
    E) median would be less than the mean.

22. In a manufacturing process, we are interested in measuring the average length of a certain type of bolt. Past data indicates that the standard deviation is 0.25cm. How many bolts should be sampled in order to make us 95% confident that the sample mean bolt length is within 0.02cm of the true mean bolt length?
    A) 25
    B) 49
    C) 423
    D) 601
    E) 1225

23. The mean life of pair of shoes is 40 months with a standard deviation of 8 months. If the life of the shoes is normally distributed, how many pairs of shoes out of one million will need replacement before 36 months?
    A) 500,000
    B) 808,500
    C) 191,500
    D) 308,500
    E) 705,100

Use the following to answer Question 24:

In a statistic class, 10 scores were randomly selected and the following results were obtained: 74, 73, 77, 77, 71, 68, 65, 77, 67, missing. You notice that one of the scores is missing though. You are also told that the sample mean is 71.5.

24. What is the median?
    A) 69.5
    B) 72.0
    C) 66.0
    D) 73.5
    E) Cannot be determined

25. For a given hypothesis test, if we do not reject H_0, and in fact, H_0 is true, then
    A) no error has occurred.
    B) a type I error has occurred with probability α.
    C) a type II error has occurred with probability β.
    D) a type I error has occurred with probability β..
    E) a type II error has occurred with probability α..

26. When a _____ probability distribution is used to approximate a _____ probability distribution we must make _____ correction.
    A) Continuous, discrete, continuity
    B) Discrete, continuous, continuity
    C) Continuous, discrete, finite population
    D) Finite population, world, a global
    E) None of the above are correct

27. If $p = 0.1$ and $n = 5$, then the corresponding binomial distribution is
    A) Right skewed
    B) Left skewed
    C) Symmetric
    D) Bimodal

28. In 2007, 13,000 internet users were surveyed and asked about their willingness to pay fees for access to websites. Of these, 2,938 were definitely not willing to pay such fees. Construct a 95% confidence interval for the proportion definitely unwilling to pay fees.
    A) [0.286, 0.302]
    B) [0.219, 0.233]
    C) [0.220, 0.232]
    D) [0.212, 0.241]
    E) [0.214, 0.245]

29. When the population is normally distributed, population standard deviation σ is unknown, and the sample size is $n = 15$; the confidence interval for the population mean μ is based on:
    A) The z (normal) distribution
    B) The t distribution
    C) The Binomial distribution
    D) The Poisson Distribution
    E) None of the above are correct

30. Which one of the following sampling examples would generally lead to the least reliable statistical inferences about the population from which the sample has been selected?
    A) A random sample selected without replacement.
    B) A random sample selected with replacement.
    C) A voluntary response sample
    D) A systematic sample
    E) A stratified random sample