

Men's heights are normally distributed with a mean of 69 inches and a standard deviation of 3 inches. Women's heights are normally distributed with a mean of 63 inches and a standard deviation of 2 inches. Use this information to answer the next **FIVE** questions. **Note that the questions continue onto the next page.**

1. What woman's height is equally extreme as that of a man who is 63 inches in height?
 - A. 57 inches
 - B. 67 inches
 - C. 60 inches
 - D. There is insufficient information to answer this question.
2. What is the approximate probability of randomly selecting a man who is 66 inches tall?
 - A. $\approx 84\%$
 - B. $\approx 34\%$
 - C. $\approx 16\%$
 - D. $\approx 0\%$
3. The Beanstalk Club is a social organization for tall people. Women must be at least 70 inches tall to join. What percent of women meet that requirement?
 - A. = NORM.DIST(70, 63, 2, 1)
 - B. = 1-NORM.DIST(69, 63, 2, 1)
 - C. = NORM.S.DIST(3.5,1)
 - D. = 1-NORM.S.DIST(3.5,1)
4. What is the shortest height of the tallest 70% of women?
 - A. = NORM.INV(0.3, 63, 2)
 - B. = 1-NORM.INV(0.7, 63, 2)
 - C. = NORM.S.INV(0.3)
 - D. = 1-NORM.S.INV(0.7)
5. What is the maximum height of the 40% of men's heights symmetric about the mean?
 - A. = NORM.INV(0.7, 69, 3)
 - B. = NORM.INV(0.4, 69, 3)
 - C. = NORM.S.INV(0.7)
 - D. = 1 - NORM.S.INV(0.3)
6. Ceteris paribus, which is narrower, a 90% confidence interval with $n = 20$ or a 95% confidence interval with $n = 10$?
 - A. The 90% confidence interval.
 - B. The 95% confidence interval.
 - C. The intervals are the same width.
 - D. It is impossible to tell.

7. Which of the following is true of Binomial distributions?
- For the same value of n , the expected value of a Binomial distribution increases as π increases.
 - For the same value of π , the standard deviation of a Binomial remains constant as the number of trials increases.
 - A Binomial distribution with $\pi = 0.26$ is right skewed for all $n < 30$.
 - In Binomial distributions the probability of success increases after a success and decreases after a failure.

The ABC television primetime drama *Grey's Anatomy* has been successful for many years. On the day and time of the weekly broadcast of *Grey's Anatomy* 50% of American households have TV sets in use. The show recently had a share of 20, meaning that among the TV sets in use, 1 in 5 TV sets was tuned to *Grey's Anatomy*. An advertiser wants to verify the share value by conducting its own survey, and performs a pilot survey of 10 households having TV sets in use at the time of a *Grey's Anatomy* broadcast. Use this information to answer the next **THREE** questions.

8. What is the probability that the survey will find three TV sets tuned to *Grey's Anatomy*?
- = BINOM.DIST(3, 10, 0.5, 1)
 - = BINOM.DIST(3, 10, 0.5, 0)
 - = BINOM.DIST(3, 10, 0.2, 0)
 - = BINOM.DIST(3, 10, 0.2, 1)
9. What is the likelihood that more than 4 but no more than 9 TV sets are tuned to *Grey's Anatomy*?
- = BINOM.DIST(10, 10, 0.5, 1) - BINOM.DIST(4, 10, 0.5, 1)
 - = BINOM.DIST(9, 10, 0.2, 1) - BINOM.DIST(4, 10, 0.2, 1)
 - = BINOM.DIST(10, 10, 0.2, 1) - BINOM.DIST(3, 10, 0.2, 1)
 - = BINOM.DIST(9, 10, 0.5, 1) - BINOM.DIST(3, 10, 0.5, 1)
10. The advertiser wishes to expand the study of *Grey's Anatomy* TV ratings but is concerned about costs. What is the smallest number of TV sets that must be selected before this advertiser can use the Normal to approximate probabilities?
- 10
 - 25
 - 30
 - In this case, the normal approximation can be used for any number of TV sets.

11. Which of the following is true?
- A. The *Student's t* distribution has a single parameter and thus only one *Student's t* distribution exists, similar to the Standard Normal.
 - B. The *Student's t* distribution has a single parameter and thus an infinite number of *Student's t* distributions exist, similar to the Normal.
 - C. The choice between the *Student's t* distribution and the Standard Normal is based on sample size, the parameter of the *Student's t* distribution.
 - D. The choice between the Normal and the Standard Normal is based on knowledge of the population parameters.
12. The area under a *Student's t* distribution ($df=n-1$) between 0 and 1 is _____ the area under a *Student's t* distribution ($df=2n-1$) between 0 and 1.
- A. always equal to
 - B. always larger than
 - C. always smaller than
 - D. The sample size is required to answer this question.

It is desired to estimate the proportion of drivers age 18-24 who use seat belts. Data were randomly collected and the 97% confidence interval was calculated to be [.232, .528]. Use this information to answer the following **TWO** questions.

13. Which of the following interpretations of this interval is correct?
- A. We are confident that 97% of the individuals in the sample used seat belts between 23.2% and 52.8% of the time.
 - B. We are 97% confident that the interval 23.2% to 52.8% includes the true proportion of 18 to 24 year old seat belt users.
 - C. Of all 18 to 24 year olds, we are confident that 23.2% to 52.8% of them use their seat belts 97% of the time.
 - D. We are 97% confident that the proportion of 18 to 24 year olds in the sample wear a seat belt between 23.2% and 52.8% of the time.
14. Based on this interval, is the true proportion of drivers age 18 to 24 who use seat belts 0.30?
- A. Yes, and we are 97% sure of it.
 - B. No, and we are 97% sure of it.
 - C. No, the proportion is 0.41.
 - D. Maybe. 0.30 is a believable value of the population proportion based on a 97% level of confidence.

15. The Central Limit Theorem says for samples of sufficient size
- A. that sample items will always form a normal, bell-shaped distribution.
 - B. that sample items will often form a normal, bell-shaped distribution.
 - C. that the variance of the sample mean exceeds the population variance.
 - D. that the population variance exceeds the variance of the sample mean.

According to recent information released at www.indianagasprices.com, the price of a gallon of gas in Bloomington is uniformly distributed between \$2.28 and \$2.62 (ie, for X = price of a gallon of gas, $X \sim U(2.28, 2.62)$). Use this information to answer the next **THREE** questions.

16. Which of the following is true of the distribution of Bloomington gas prices?
- A. As gas prices increase, the probability density function comes to resemble that of a binomial when π equals 0.5.
 - B. As gas prices increase, the probability density function increases in height and comes to resemble a triangle.
 - C. As gas prices increase, the probability density function fails to change in height.
 - D. As gas prices increase, the probability density function is unpredictable.
17. If Kensin finds that one randomly selected gas station in Bloomington sells gas at a price higher than \$2.50 per gallon, he will go to another gas station looking for a lower price. How likely is it that Kensin will have to go to more than one gas station, to two decimals?
- A. 0.12 B. 0.22 C. 0.35 D. 0.65
18. www.indianagasprices.com randomly sampled 30 gas prices to see if the mean gas price remained the same. What is the distribution of the mean of such a sample?
- A. $\bar{X} \sim U[2.28, 2.62]$
 - B. $X \sim U[2.28, 2.62]$
 - C. $X \sim N(2.28, 0.018)$
 - D. $\bar{X} \sim N(2.45, 0.018)$

19. The standard error of \bar{X}_i is equal to 9 when $n=25$. How must the sample size change to reduce the standard error of \bar{X}_i to one third its original size?
- A. It must triple.
 B. It must increase by a factor of nine..
 C. It must be reduced by a factor of one-third.
 D. It must be reduced by a factor of two-thirds.
20. Of the two Excel commands below, which will return the larger probability?

=1-NORM.S.DIST(2.0,1)	=1-T.DIST(2.0, 9, 1)
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- A. The probability from the NORM.S.DIST command will be larger.
 B. The probability from the T.DIST command will be larger.
 C. The two probabilities will be identical.
 D. Excel is required to answer this question.

During the week of August 21, 2006, Gallup Poll surveyed 1220 voters in Ohio and 427 voters said they would vote for the Republican senatorial candidate Mike DeWine. The other 793 voters said they would vote for the Democratic senatorial candidate Sherrod Brown. Use this information to answer the next **FOUR** questions. Some useful numbers will be found in this table:

$$\begin{aligned} \text{NORM.S.INV}(0.96) &= 1.75 & \text{T.INV}(0.96,99) &= 2.08 \\ \text{NORM.S.INV}(0.98) &= 2.05 & \text{T.INV}(0.98,99) &= 2.36 \\ \text{NORM.S.INV}(0.99) &= 2.33 & \text{T.INV}(0.99,99) &= 2.63 \end{aligned}$$

21. A 98% confidence interval has been calculated for the proportion of voters supporting Mike DeWine. What is the point estimate of the confidence interval in question?
- A. 0.35
 B. 427
 C. 0.54
 D. The limits of the interval are required to answer this question.
22. What is the margin of error of the 98% confidence interval for the proportion of voters supporting Mike DeWine?
- A. 0.021 B. 0.023 C. 0.028 D. 0.032

23. Suppose you wish to calculate a 96% confidence interval for the proportion of voters planning to vote for Sherrod Brown, and you wish to have a margin of error no larger than 0.01. How many people would Gallup need to interview at a minimum to enable you to do this?
- A. 1126 B. 6968 C. 9561 D. 12351
24. Ceteris paribus, the width of a confidence interval estimate for a sample mean will be
- A. narrower when the sample mean is 1 than when it is 5.
B. narrower for 99% confidence than for 95% confidence.
C. wider for a sample size of 100 than for a sample size of 50.
D. narrower for a population standard deviation of 1 than for 5.
25. As demonstrated in class, the results of simulations of sampling distributions confirmed that
- A. sampling distributions are more focused and compact than the population.
B. as more and more samples are drawn, the sampling distribution becomes more and more Normal in shape.
C. the dispersion of the sampling distribution is identical to the dispersion of the population.
D. the center of the sampling distribution is often far from the center of the population.
26. Suppose a population was distributed according to the Dr. Seuss distribution. Which of the following statements is correct?
- A. The distribution of means for samples of $n=10$ will be centered at μ_x .
B. The standard error for sample means of $n=10$ will be larger than the standard error for sample means of $n=25$.
C. Sample means from this distribution will be approximately normally distributed for $n \geq 30$.
D. All of the above are correct.
27. Why is the Central Limit Theorem so important to the study of sampling distributions?
- A. It allows us to disregard the shape of the sampling distribution when the size of the population is large.
B. It allows us to disregard the size of the population we are sampling from.
C. It allows us to disregard the shape of the population when n is large.
D. It allows us to disregard the size of the sample selected when the population is not normal.

28. Preliminary calculations have suggested a 99% confidence interval that you like a whole lot, but you can't afford the size of the sample that is required to produce it. If you wish to keep the same width interval, what could you do?
- A. decrease σ
 - B. increase α
 - C. increase $(1-\alpha)$
 - D. There is nothing you could do.

The following table contains partial output from Descriptive Statistics as calculated by Excel. The data were from a pilot study run by Gallup during the week of August 21, 2006. A pilot study is one performed on a subset of the persons surveyed on other topics for the purpose of evaluating the validity of the questions. If the questions are deemed valid, they will be included in a future full size poll. The pilot study questioned selected individuals about the size of any donation made in support of a political candidate and the values reported were in \$US.

<u>Campaign Donations</u>	
Mean	
Median	36.78
Standard Deviation	
Sample Variance	136.89
Skewness	
Range	75
Minimum	0
Sum	657
Count	18

29. A 92% confidence interval for mean campaign donations is calculated by
- A. $=36.50 \pm (\text{NORM.S.INV}(1-0.08/2))*2.76$
 - B. $=36.78 \pm (\text{NORM.S.INV}(1-0.08))*32.27$
 - C. $=36.50 \pm \text{T.INV}(1-(0.08/2), 17)*2.76$
 - D. $=36.78 \pm \text{T.INV}(1-(0.08/2), 18)*32.27$
30. We know nothing about the distribution from which this sample was drawn, however, we can say that the sampling distribution of mean campaign donations is
- A. normally distributed.
 - B. unknown by the Central Limit Theorem.
 - C. uniformly distributed by the Central Limit Theorem.
 - D. approximately normal by the Central Limit Theorem.

31. Which of the following is true?
- A. The number of males in a sample of five students taken without replacement from a class of 9 females and 18 males has a binomial distribution.
 - B. The diameters of 10 randomly selected bolts have a binomial distribution.
 - C. The number of gasoline customers who pay cash during a one hour period has a binomial distribution.
 - D. All of the above are true.
32. The area under one standard normal between -0.1 and -0.5 is _____ the area under another standard normal between -0.3 and -0.7 .
- A. always equal to
 - B. always larger than
 - C. always smaller than
 - D. The standard deviation is required to answer this question.
33. A 97% confidence interval means
- A. that randomness will cause about 3% of possible confidence intervals to not include the parameter.
 - B. that 97% of the observations in the sample will be found within the interval.
 - C. that the interval has a 97% chance of including the parameter.
 - D. that 97% of the parameters will be found within the interval.

ANSWERS

1	B	6	A	11	B	16	C	21	A	26	D	31	C
2	D	7	A	12	C	17	C	22	D	27	C	32	B
3	D	8	C	13	B	18	D	23	C	28	B	33	A
4	A	9	B	14	D	19	B	24	D	29	C		
5	A	10	B	15	D	20	B	25	A	30	B		