Practice Chapters 18-23 Questions 1-54 are on Ch.18-23, and the last questions are on Ch.24 and 25.
Practice also showing steps while building the intervals (finding critical z- or t-value, SE, ME and the endpoins of the interval, checking conditions, setting up the hypotheses, finding test statistic by the formula, finding the P-value or critical region, illustrating them on bell curve, and making correct conclusions, referring to the claim.

Answer the question.

1) In a large statistics class, the professor has each student toss a coin 12 times and calculate the proportion of his or her tosses that were tails. The students then report their results, and the professor plots a histogram of these several proportions. Should a Normal model be used here?

A) A Normal model should not be used because the sample size is not large enough to satisfy the success/failure condition. For this sample size, $np = 6 < 10$.
B) A Normal model should not be used because the sample size, 12, is larger than 10% of the population of all coins.
C) A Normal model should not be used because the population distribution is not Normal.
D) A Normal model should be used because the 12 coin tosses can be thought of as a random sample of coin tosses and are fewer than 10% of the population of all coins. The success/failure condition is also satisfied because $n = 12 \geq 10$.
E) A Normal model should be used because the samples are random and independent. Also, the sample size, 12, is less than 10% of the population.

2) A 1000-acre farm historically averages 185 bushels per acre with a standard deviation of 18 bushels per acre. Fifty acres are sampled and the mean yield determined. If we imagined all the possible random samples of 50 acres we could take and looked at all the sample means, is it appropriate to assume this data will be well modeled by a Normal distribution?

A) The Normal distribution can be used since the original population has a Normal distribution.
B) The Normal distribution cannot be used since the sample size is not large enough for the Central Limit Theorem to apply.
C) The Normal distribution can be used since the samples can be assumed to be random and independent. However, there could be some doubt since weather conditions could affect all samples. The sample size, 50, is no more than 10% of the population of all acres on the farm.
D) The Normal distribution cannot be used. The distribution in the sample should resemble that in the population, which may be skewed by some acres with extremely low yields.
E) The Normal distribution can be used since the sample size, 50, is no more than 10% of the population of all acres on the farm.

Describe the indicated sampling distribution model.

3) Assume that 26% of students at a university wear contact lenses. We randomly pick 300 students. Describe the sampling distribution model of the proportion of students in this group who wear contact lenses.

A) Binom(300, 26)
B) N(26%, 2.5%)
C) There is not enough information to describe the distribution.
D) N(74%, 2.5%)
E) N(26%, 1.1%)

In a large class, the professor has each person toss a coin several times and calculate the proportion of his or her tosses that were heads. The students then report their results, and the professor plots a histogram of these several proportions. Use the 68-95-99.7 Rule to provide the appropriate response.

4) If the students toss the coin 200 times each, about 68% should have proportions between what two numbers?
   A) 0.16 and 0.84
   B) 0.465 and 0.535
   C) 0.4975 and 0.5025
   D) 0.34 and 0.67
   E) 0.035 and 0.07

Find the specified probability, use calculator

5) Based on past experience, a bank believes that 4% of the people who receive loans will not make payments on time. The bank has recently approved 300 loans. What is the probability that over 6% of these clients will not make timely payments?
   A) 0.096 B) 0.038 C) 0.904 D) 0.962 E) 0.017

6) When a truckload of oranges arrives at a packing plant, a random sample of 125 is selected and examined. The whole truckload will be rejected if more than 8% of the sample is unsatisfactory. Suppose that in fact 12% of the oranges on the truck do not meet the desired standard. What's the probability that the shipment will be rejected?
   A) 0.0521 B) 0.0838 C) 0.9479 D) 0.9162 E) 0.1676

Answer the question.

7) A national study reported that 75% of high school graduates pursue a college education immediately after graduation. A private high school advertises that 156 of their 196 graduates last year went on to college. Does this school have an unusually high proportion of students going to college?
   A) This school can boast an unusually high proportion of students going to college. Their proportion is 1.78 standard deviations above the mean.
   B) This school cannot boast an unusually high proportion of students going to college. Their proportion is only 0.89 standard deviations above the mean.
   C) This school cannot boast an unusually high proportion of students going to college. Their proportion is only 1.19 standard deviations above the mean.
   D) This school cannot boast an unusually high proportion of students going to college. Their proportion is only 1.48 standard deviations above the mean.
   E) This school can boast an unusually high proportion of students going to college. Their proportion is 1.19 standard deviations above the mean.

Describe the indicated sampling distribution model.

8) Statistics from a weather center indicate that a certain city receives an average of 25 inches of snow each year, with a standard deviation of 7 inches. Assume that a Normal model applies. A student lives in this city for 4 years. Let $\bar{y}$ represent the mean amount of snow for those 4 years. Describe the sampling distribution model of this sample mean.
   A) N(25, 7)
   B) Binom(25, 7)
   C) There is not enough information to describe the distribution.
   D) N(25, 3.5)
   E) N(25, 1.75)

At a large university, students have an average credit card debt of $2500, with a standard deviation of $1200. A random sample of students is selected and interviewed about their credit card debt. Use the 68-95-99.7 Rule to answer the question about the mean credit card debt for the students in this sample.

9) If we imagine all the possible random samples of 250 students at this university, 99.7% of the samples should have means between what two numbers?

A) $2272.33 and $2727.67
B) $250.00 and $2575.89
C) $250.00 and $2651.78
D) $300 and $4900
E) $2348.22 and $2651.78

Find the specified probability, from a table of Normal probabilities.

10) A restaurant's receipts show that the cost of customers' dinners has a skewed distribution with a mean of $54 and a standard deviation of $18. What is the probability that the next 100 customers will spend an average of at least $58 on dinner?

A) 0.9868 B) 0.0562 C) 0.4121 D) 0.5879 E) 0.0132

Find the margin of error for the given confidence interval.

11) In a survey of 280 adults over 50, 75% said they were taking vitamin supplements. Find the margin of error for this survey if we want a 99% confidence in our estimate of the percent of adults over 50 who take vitamin supplements.

A) 13.3% B) 10.1% C) 6.66% D) 5.07% E) 18.6%

12) A recent poll of 500 residents in a large town found that only 36% were in favor of a proposed referendum to build a new high school. Find the margin of error for this poll if we want 95% confidence in our estimate of the percent of residents in favor of this proposed referendum.

A) 5% B) 4.21% C) 5.53% D) 8.42% E) 2.5%

Use the given degree of confidence and sample data to construct a confidence interval for the population proportion.

13) Of 346 items tested, 12 are found to be defective. Construct a 98% confidence interval for the percentage of all such items that are defective.

A) (1.18%, 5.76%)
B) (0.93%, 6.00%)
C) (1.85%, 5.09%)
D) (0.13%, 6.80%)
E) (3.34%, 3.59%)

Solve the problem.

14) A pollster wishes to estimate the true proportion of U.S. voters who oppose capital punishment. How many voters should be surveyed in order to be 95% confident that the true proportion is estimated to within 2%?

A) 3382
B) 1692
C) 4145
D) 2401
E) Not enough information is given.

15) A survey of shoppers is planned to see what percentage use credit cards. Prior surveys suggest 63% of shoppers use credit cards. How many randomly selected shoppers must we survey in order to estimate the proportion of shoppers who use credit cards to within 4% with 95% confidence?

A) 394 B) 1513 C) 560 D) 504 E) 967

Provide an appropriate response.

16) The real estate industry claims that it is the best and most effective system to market residential real estate. A survey of randomly selected home sellers in Illinois found that a 95% confidence interval for the proportion of homes that are sold by a real estate agent is 69% to 81%. Interpret the interval in this context.

A) We are 95% confident that between 69% and 81% of homes in this survey are sold by a real estate agent.
B) If you sell a home in Illinois, you have an 75% ± 6% chance of using a real estate agent.
C) In 95% of the years, between 69% and 81% of homes in Illinois are sold by a real estate agent.
D) 95% of all random samples of home sellers in Illinois will show that between 69% and 81% of homes are sold by a real estate agent.
E) We are 95% confident, based on this sample, that between 69% and 81% of all homes in Illinois are sold by a real estate agent.

17) The real estate industry claims that it is the best and most effective system to market residential real estate. A survey of randomly selected home sellers in Illinois found that a 99% confidence interval for the proportion of homes that are sold by a real estate agent is 70% to 80%. Explain what "99% confidence" means in this context.

A) About 99% of all random samples of home sellers in Illinois will find that between 70% and 80% of homes are sold by a real estate agent.
B) In 99% of the years, between 70% and 80% of homes in Illinois are sold by a real estate agent.
C) About 99% of all random samples of home sellers in Illinois will produce a confidence interval that contains the true proportion of homes sold by a real estate agent.
D) There is a 99% chance that the true proportion of home sellers in Illinois who sell their home with a real estate agent is between 70% and 80%.
E) 99% of home sellers in Illinois will sell their home with a real estate agent between 70% and 80% of the time.

18) In a survey of 1,000 television viewers, 40% said they watch network news programs. For a 90% confidence level, the margin of error for this estimate is 2.5%. If we want to be 95% confident, how will the margin of error change?

A) Since more confidence requires a wider interval, the margin of error will be larger.
B) Since more confidence requires a more narrow interval, the margin of error will be smaller.
C) Since more confidence requires a more narrow interval, the margin of error will be larger.
D) Since more confidence requires a wider interval, the margin of error will be smaller.
E) There is not enough information to determine the effect on the margin of error.

Write the null and alternative hypotheses you would use to test the following situation.

19) At a local university, only 62% of the original freshman class graduated in four years. Has this percentage changed?

A) H_0: $p \neq 0.62$, H_A: $p = 0.62$
B) H_0: $p < 0.62$, H_A: $p > 0.62$
C) H_0: $p < 0.62$, H_A: $p = 0.62$
D) H_0: $p = 0.62$, H_A: $p < 0.62$
E) H_0: $p = 0.62$, H_A: $p \neq 0.62$

20) A weight loss center provided a loss for 72% of its participants. The center's leader decides to test a new weight loss strategy to see if it's better. What are the null and alternative hypotheses?

A) H_0: $p = 0.72$ H_A: $p > 0.72$
B) H_0: $p = 0.72$ H_A: $p < 0.72$
C) H_0: $p > 0.72$ H_A: $p < 0.72$
D) H_0: $p = 0.72$ H_A: $p \neq 0.72$
E) H_0: $p > 0.72$ H_A: $p = 0.72$

21) The city management company claims that 75% of all low income housing is 1500 sq. ft. The tenants believe the proportion of housing this size is smaller than the claim, and hire an independent engineering firm to test an appropriate hypothesis. What are the null and alternative hypotheses?

A) H_0: $p = 0.75$ H_A: $p \neq 0.75$
B) H_0: $p > 0.75$ H_A: $p < 0.75$
C) H_0: $p = 0.75$ H_A: $p > 0.75$
D) H_0: $p = 0.75$ H_A: $p < 0.75$
E) H_0: $p < 0.75$ H_A: $p = 0.75$

Provide an appropriate response.

22) A state university wants to increase its retention rate of 4% for graduating students from the previous year. After implementing several new programs during the last two years, the university reevaluated its retention rate using a random sample of 352 students and found the retention rate at 5%. Test an appropriate hypothesis and state your conclusion. Be sure the appropriate assumptions and conditions are satisfied before you proceed.

A) H_0: $p = 0.04$; H_A: $p < 0.04$; $z = -1.07$; P-value = 0.8577. This data shows that more than 4% of students are retained; the university should continue with the new programs.
B) H_0: $p = 0.04$; H_A: $p > 0.04$; $z = 0.96$; P-value = 0.1685. This data does not show that more than 4% of students are retained; the university should not continue with the new programs.
C) H_0: $p = 0.04$; H_A: $p > 0.04$; $z = -1.07$; P-value = 0.1423. This data does not show that more than 4% of students are retained; the university should not continue with the new programs.
D) H_0: $p = 0.04$; H_A: $p < 0.04$; $z = 1.07$; P-value = 0.8577. This data shows that more than 4% of students are retained; therefore, the university should continue with the new programs.
E) H_0: $p = 0.04$; H_A: $p \neq 0.04$; $z = 1.07$; P-value = 0.2846. This data does not show that more than 4% of students are retained; the university should not continue with the new programs.

23) The U.S. Department of Labor and Statistics released the current unemployment rate of 5.3% for the month in the U.S. and claims the unemployment has not changed in the last two months. However, the states statistics reveal that there is a decrease in the U.S. unemployment rate. A test on unemployment was done on a random sample size of 1000 and found unemployment at 3.8%. Test an appropriate hypothesis and state your conclusion. Be sure the appropriate assumptions and conditions are satisfied before you proceed.

A) H_0: $p = 0.053$; H_A: $p < 0.053$; $z = 2.12$; P-value = 0.017. This data does not show that the unemployment rate has decreased in the last two months.
B) H_0: $p = 0.053$; H_A: $p > 0.053$; $z = 2.12$; P-value = 0.983. This data shows that the unemployment rate has decreased in the last two months.
C) H_0: $p = 0.053$; H_A: $p > 0.053$; $z = -2.12$; P-value = 0.983. This data does not show that the unemployment rate has decreased in the last two months.
D) H_0: $p = 0.053$; H_A: $p < 0.053$; $z = -2.12$; P-value = 0.017. This data shows that the unemployment rate has decreased in the last two months.
E) H_0: $p = 0.053$; H_A: $p \neq 0.053$; $z = -2.12$; P-value = 0.034. This data shows that the unemployment rate has decreased in the last two months.

Explain what the P-value means in the given context.

24) A state university wants to increase its retention rate of 4% for graduating students from the previous year. After implementing several new programs during the last two years, the university reevaluates its retention rate and comes up with a P-value of 0.075. What is reasonable to conclude about the new programs using α = 0.06?

A) We can say there is a 7.5% chance of seeing the new programs having no effect on retention in the results we observed from natural sampling variation. There is no evidence the new programs are more effective, but we cannot conclude the new programs have no effect on retention.
B) We can say there is a 7.5% chance of seeing the new programs having an effect on retention in the results we observed from natural sampling variation. We conclude the new programs are more effective.
C) There is a 92.5% chance of the new programs having no effect on retention.
D) There's only a 7.5% chance of seeing the new programs having no effect on retention in the results we observed from natural sampling variation. We conclude the new programs are more effective.
E) There is a 7.5% chance of the new programs having no effect on retention.

25) A weight loss center provided a loss for 72% of its participants. The center's leader decides to test a new weight loss strategy to see if it's better and receives a P-value of 0.23. What is reasonable to conclude about the new strategy using α = 0.1?

A) There's only a 23% chance of seeing the strategies being equally effective in the results we observed from natural sampling variation. We conclude the new strategy is more effective.
B) We can say there is a 23% chance of not seeing the strategies being equally effective in the results we observed from natural sampling variation. We conclude the new strategy is more effective.
C) There is a 77% chance of the strategies being equally effective.
D) There is a 23% chance of the strategies being equally effective.
E) We can say there is a 23% chance of seeing the strategies being equally effective in the results we observed from natural sampling variation. There is no evidence the new strategy is more effective, but we cannot conclude the strategies are equally effective.

26) The seller of a loaded die claims that it will favor the outcome 6. We don't believe that claim, and roll the die 350 times to test an appropriate hypothesis. Our P-value turns out to be 0.01. Provide an appropriate conclusion using α = 0.02?

A) There is a 99% chance of a fair die.
B) There's only a 1% chance of seeing a fair die in the results we observed from natural sampling variation. We conclude the die is loaded.
C) We can say there is a 1% chance of not seeing a fair die in the results we observed from natural sampling variation. We conclude the die is loaded.
D) We can say there is a 1% chance of seeing a fair die in the results we observed from natural sampling variation. There is no evidence the die is loaded, but we can not conclude the die is fair.
E) There is a 1% chance of a fair die.

Provide an appropriate response.

27) A diesel engine company that is developing a new engine has concluded that the updated engine provides better fuel economy than the current engine. They made this decision using α = 0.01. Would they have made the same decision at α = 0.10 and α = 0.05?

28) An entomologist writes an article in a scientific journal which claims that fewer than 3% of male fireflies are unable to produce light due to a genetic mutation. Identify the Type I error in this context.

A) The error of rejecting the claim that the true proportion is less than 3% when it really is less than 3%.
B) The error of supporting the claim that the true proportion is at least 3% when it really is at least 3%.
C) The error of rejecting the claim that the true proportion is at least 3% when it really is at least 3%.
D) The error of failing to support the claim that the true proportion is at least 3% when it is actually less than 3%.
E) The error of failing to reject the claim that the true proportion is at least 3% when it is actually less than 3%.

29) A psychologist claims that more than 6.3% of the population suffers from professional problems due to extreme shyness. Identify the Type II error in this context.

A) The error of failing to reject the claim that the true proportion is at most 6.3% when it is actually more than 6.3%.
B) The error of supporting the claim that the true proportion is more than 6.3% when it really is more than 6.3%.
C) The error of rejecting the claim that the true proportion is at most 6.3% when it really is at most 6.3%.
D) The error of failing to support the claim that the true proportion is at most 6.3% when it is actually more than 6.3%.
E) The error of rejecting the claim that the true proportion is more than 6.3% when it really is more than 6.3%.

30) A weight loss center provided a loss for 72% of its participants. The center's leader decides to test a new weight loss strategy on a random sample size of 140 and found weight loss in 78% of the participants. Test an appropriate hypothesis and state your conclusion. Be sure the appropriate assumptions and conditions are satisfied before you proceed.

A) H_0: $p = 0.72$; H_A: $p < 0.72$; $z = 1.54$; P-value = 0.9382. This data shows a weight loss in more than 72% of the participants in the weight loss strategy; the manager should continue strategies.
B) H_0: $p = 0.72$; H_A: $p \neq 0.72$; $z = 1.54$; P-value = 0.1236. This data does not show a weight loss in more than 72% of the participants in the weight loss strategy; the manager should continue strategies.
C) H_0: $p = 0.72$; H_A: $p < 0.72$; $z = -1.54$; P-value = 0.9382. This data shows a weight loss in more than 72% of the participants in the weight loss strategy; the manager should continue strategies.
D) H_0: $p = 0.72$; H_A: $p > 0.72$; $z = 1.58$; P-value = 0.0571. This data does not show a weight loss in more than 72% of the participants in the weight loss strategy; the manager should change strategies.
E) H_0: $p = 0.72$; H_A: $p > 0.72$; $z = -1.54$; P-value = 0.0618. This data does not show a weight loss decrease in more than 72% of the participants in the weight loss strategy; the manager should change strategies.

31) A state survey investigates whether the proportion of 8% for employees who commute by car to work is higher than it was five years ago. A test on employee commuting by car was done on a random sample size of 1000 and found 120 commuters by car. Test an appropriate hypothesis using $\alpha = 0.01$ and state your conclusion. Be sure the appropriate assumptions and conditions are satisfied before you proceed.

A) z = -4.66; P-value > 0.00001. The change is statistically significant. A 98% confidence interval is (9.6%, 14.4%). This is clearly lower than 8%. The chance of observing 120 or more commuters by car of 1000 is greater than 0.001% if the commuting by car is really 8%.

B) z = 4.66; P-value < 0.99999. The change is statistically significant. A 90% confidence interval is (10.6%, 13.4%). This is clearly higher than 8%. The chance of observing 120 or more commuters by car of 1000 is less than 99.9% if the commuting by car is really 8%.

C) z = 4.66; P-value < 0.99999. There is a 99.9% chance of having 120 or less of 1000 people in a random sample be commute by car if in fact 8% do.

D) z = -4.66; P-value > 0.99999. There is a 99.9% chance of having 120 or less of 1000 people in a random sample be commute by car if in fact 8% do.

E) z = 4.66; P-value < 0.00001. The change is statistically significant. A 98% confidence interval is (9.6%, 14.4%). This is clearly higher than 8%. The chance of observing 120 or more commuters by car of 1000 is less than 0.001% if the commuting by car is really 8%. The P-value is less than the alpha level of 0.01.

32) Suppose that a manufacturer is testing one of its machines to make sure that the machine is producing more than 97% good parts (H_0 : p = 0.97 and H_A : p > 0.97) . The test results in a P-value of 0.102. In reality, the machine is producing 99% good parts. What probably happens as a result of our testing?

A) We fail to reject H_0, making a Type I error.

B) We fail to reject H_0, making a Type II error.

C) We correctly fail to reject H_0.

D) We correctly reject H_0.

E) We reject H_0, making a Type I error.

33) Which is true about a 98% confidence interval for a population proportion based on a given sample?

I. We are 98% confident that the sample proportion is in our interval.

II. There is a 98% chance that our interval contains the population proportion.

III. The interval is wider than a 95% confidence interval would be.

A) None B) I only C) III only D) I and II E) II only

Construct the indicated confidence interval for the difference in proportions. Assume that the samples are independent and that they have been randomly selected.

34) A marketing survey involves product recognition in New York and California. Of 558 New Yorkers surveyed, 193 knew the product while 196 out of 614 Californians knew the product. Construct a 99% confidence interval for the difference in the proportions of New Yorkers and Californians who knew the product.

A) (0.0247, 0.0286)

B) (-0.0443, 0.0566)

C) (-0.0442, 0.0975)

D) (-0.0443, 0.0976)

E) (-0.0034, 0.0566)

35) In a random sample of 500 people aged 20-24, 22% were smokers. In a random sample of 450 people aged 25-29, 14% were smokers. Construct a 95% confidence interval for the difference in smoking rates for the two groups.
A) (0.035, 0.125)
B) (0.032, 0.112)
C) (0.025, 0.135)
D) (0.048, 0.112)
E) (0.032, 0.128)

A two-sample z-test for two population proportions is to be performed using the P-value approach. The null hypothesis is $H_0: p_1 = p_2$ and the alternative is $H_a: p_1 \neq p_2$. Use the given sample data to find the P-value for the hypothesis test. Give an interpretation of the p-value.

36) A state university found it retained 25 students out of 352 in 2003 and 36 students out of 334 in 2004.
A) P-value = 0. 0455; There is about a 4.55% chance that the two proportions are equal.
B) P-value = 0.0455; If there is no difference in the proportions, there is about a 4.55% chance of seeing the observed difference or larger by natural sampling variation.
C) P-value = 0.091; If there is no difference in the proportions, there is about a 9.1% chance of seeing the observed difference or larger by natural sampling variation.
D) P-value = 0. 091; There is about a 9.1% chance that the two proportions are equal.
E) P-value = 0.9545; If there is no difference in the proportions, there is about a 95.45% chance of seeing the observed difference or larger by natural sampling variation.

37) Absorption rates into the body are important considerations when manufacturing a generic version of a brand-name drug. A pharmacist read that the absorption rate into the body of a new generic drug (G) is the same as its brand-name counterpart (B). She has a researcher friend of hers run a small experiment to test H_0: $\mu_G - \mu_B = 0$ against the alternative H_A: $\mu_G - \mu_B \neq 0$. Which of the following would be a Type I error?
A) Deciding that the absorption rates are the same, when in fact they are not.
B) Deciding that the absorption rates are different, when in fact they are not.
C) Deciding that the absorption rates are the same, when in fact they are.
D) Deciding that the absorption rates are different, when in fact they are.
E) The researcher cannot make a Type I error, since he has run an experiment.

Using the t-tables, software, or a calculator, estimate the critical value of t for the given confidence interval and degrees of freedom.

38) 99% confidence interval with df = 24
A) 2.779 B) 2.797 C) 2.492 D) 1.711 E) 2.807

Use the t-tables, software, or a calculator to estimate the indicated P-value.

39) P-value for $t \geq 1.44$ with 45 degrees of freedom
A) 0.1569 B) 0.9215 C) 0.0915 D) 0.9085 E) 0.0784

40) P-value for $|t| > 1.76$ with 24 degrees of freedom
A) 0.1562 B) 0.0781 C) 0.0456 D) 0.9544 E) 0.0911

Provide an appropriate response.

41) You want to determine if the average gas price in your city has exceeded $2.15 per gallon for regular gas. You take a random sample of prices from 8 gas stations , recording the following prices: $2.13, $2.10, $1.80, $2.09, $2.17, $2.12, $2.10, $2.11. Have the conditions and assumptions for inference been met?
   A) No, the nearly normal condition is not met.
   B) Yes, all conditions and assumptions have been met.
   C) No, the sample is not random.
   D) No, the sample is not representative.
   E) No, the sample is more than 10% of the population.

42) A researcher wants to estimate the mean cholesterol level of people in his city. He sets up a walk-in clinic, and measures the cholesterol of 85 people, finding a mean level of 224 and a standard deviation of 8. Have the conditions and assumptions for inference been met?
   A) Yes, all conditions and assumptions have been met.
   B) No, the sample is not random.
   C) No, the sample is more than 10% of the population.
   D) No, the the sample data is likely to be skewed.
   E) No, the sample does not meet the Nearly Normal condition.

Construct the requested confidence interval from the supplied information.

43) How much fat do reduced fat cookies typically have? You take a random sample of 51 reduced-fat cookies and test them in a lab, finding a mean fat content of 3.2 grams and a standard deviation of 1.1 grams of fat. Create a 99% confidence interval for the mean grams of fat.
   A) (3.1422, 3.2577)
   B) (2.7810, 3.6169)
   C) (2.8032, 3.5968)
   D) (2.100, 4.300)
   E) (2.7875, 3.6125)

44) A researcher wants to estimate the mean cholesterol level of people in his city.A random sample of 21 people yields a mean cholesterol level of 224 and a standard deviation of 12. Construct a 95% confidence interval.
   A) (223.014, 224.986)
   B) (218.538, 229.462)
   C) (219.598, 228.402)
   D) (214.967, 233.033)
   E) (219.693, 228.307)

Interpret the confidence interval.

45) A researcher wants to estimate the mean cholesterol level of people in his city.A random sample of 21 people yields an average cholesterol level of 219, with a margin of error of ±12. Assume the researcher used a confidence level of 90%.
   A) About 9 out of 10 people in the researcher's city have cholesterol levels between 207 and 231.
   B) 90% of the people sampled have cholesterol levels between 207 and 231.
   C) If we took many random samples of people in the city, about 9 out of 10 of them could produce a confidence interval of (207,231).
   D) We are 90% confident that 90% of people in the city have a cholesterol level between 207 and 231.
   E) The researcher can be 90% confident that the mean cholesterol level for people in his city is between 207 and 231.

Determine the margin of error in estimating the population parameter.

46) A scientist in Smallville tested the cholesterol of a random sample of 35 town residents. He constructed the following confidence interval:

t-interval for μ: with 99.00% Confidence,

$188 < \mu(\text{Cholesterol}) < 206$

A) 1.09
B) 197
C) 18
D) 9
E) Not enough information is given.

Classify the hypothesis test as lower-tailed, upper-tailed, or two-sided.

47) Quality control engineers are trying to improve the number of unpopped kernels in their company's microwave popcorn. Changes to the oil have recently been made, so the engineers are testing the hypothesis H_0: $\mu = 25$ against H_A: $\mu < 25$.

A) Lower-tailed
B) Two-sided
C) Upper-tailed

Write the null and alternative hypothesis.

48) Has the introduction of more music download services changed the number of college students stealing music on the Web? Two years ago, approximately 50,000 college students admitted to illegally downloading music from the internet.

A) H_0: $\mu = 50{,}000$
H_A: $\mu \neq 50{,}000$
B) H_0: $\mu < 50{,}000$
H_A: $\mu = 50{,}000$
C) H_0: $\mu = 50{,}000$
H_A: $\mu > 50{,}000$
D) H_0: $\mu > 50{,}000$
H_A: $\mu = 50{,}000$
E) H_0: $\mu = 50{,}000$
H_A: $\mu < 50{,}000$

Use a hypothesis test to test the given claim.

49) A large software company gives job applicants a test of programming ability, and the mean for the test has been 160 in the past. Twenty-five applicants are randomly selected from one large university and they produce a mean score of 165, with a standard deviation of 13. At a significance level of 0.05, does this indicate that the sample comes from a population with a mean score greater than 160?

A) Yes. With a P-value of 0.0332, we reject the null hypothesis of μ=160.
B) No. With a P-value of 0.9336, we fail to reject the null hypothesis of μ=160.
C) No. With a P-value of 0.9668, we fail to reject the null hypothesis of μ=160.
D) Yes. With a P-value of 0.0024, we reject the null hypothesis of μ=160.
E) No. With a P-value of 0.0664, we fail to reject the null hypothesis of μ=160.

For the given hypothesis test, explain the meaning of a Type I error or a Type II error, as specified.

50) The average diastolic blood pressure of a group of men suffering from high blood pressure is 99 mm Hg. During a clinical trial, the men receive a medication which it is hoped will lower their blood pressure. After three months, the researcher wants to perform a hypothesis test to determine whether the average diastolic blood pressure of the men has decreased. The hypotheses are:

$H_0: \mu = 99$ mm Hg

$H_A: \mu < 99$ mm Hg

Explain the result of a Type II error.

A) The researcher will conclude that the average diastolic blood pressure of the men has decreased when in fact it has increased.
B) The researcher will conclude that the average diastolic blood pressure of the men has increased when in fact it has decreased.
C) The researcher will conclude that the average diastolic blood pressure of the men is the same when in fact it has decreased.
D) The researcher will conclude that the average diastolic blood pressure of the men is the same when in fact it is the same.
E) The researcher will conclude that the average diastolic blood pressure of the men has decreased when in fact it is the same.

51) A manufacturer claims that the mean amount of juice in its 16-ounce bottles is 16.1 ounces. A consumer advocacy group wants to perform a hypothesis test to determine whether the mean amount is actually less than this. The hypotheses are:

$H_0: \mu = 16.1$ ounces

$H_A: \mu < 16.1$ ounces

Explain the result of a Type I error.

A) The advocacy group will conclude that the mean amount of juice is less than 16.1 ounces when in fact it is less than 16.1 ounces.
B) The advocacy group will conclude that the mean amount of juice is less than 16.1 ounces when in fact it is 16.1 ounces.
C) The advocacy group will conclude that the mean amount of juice is greater than 16.1 ounces when in fact it is 16.1 ounces.
D) The advocacy group will conclude that the mean amount of juice is 16.1 ounces when in fact it is 16.1 ounces.
E) The advocacy group will conclude that the mean amount of juice is 16.1 ounces when in fact it is less than 16.1 ounces.

Provide an appropriate response.

52) A researcher wants to determine if the average cholestorel level in his city is different from the national average of 195.Use the provided computer output to draw a conclusion about the cholesterol levels in the researcher's city, at a significance level of 0.10.

Test of H_0: $\mu = 195$ vs H_A: $\mu \neq 195$.

N	Mean	StDev	t	P-value
50	198	12	1.768	0.0833

A) Reject the null- there is evidence to say that the average cholesterol level in the researcher's city is different from the national average.
B) Fail to reject the null- there is evidence to say that the average cholesterol level in the city is different from the national average.
C) Fail to reject the null- there is not enough evidence to say that the average cholesterol level in the researcher's city is different from the national average.
D) Reject the null- there is not sufficient evidence to say that the average cholesterol level in the researcher's city is different from the national average
E) There is insufficient information to draw a conclusion.

53) A manufacturer claims that the mean weight of flour in its 32-ounce bags is 32.1 ounces. A t-test is performed to determine whether the mean weight is actually less than this. The hypotheses are

H_0 : $\mu = 32.1$ ounces

H_A : $\mu < 32.1$ ounces.

The mean weight for a sample of 45 bags of flour was 30.7 ounces. Suppose that the P-value corresponding to this sample data is 0.001. What does the P-value tell you?

A) If the mean weight of the bags were really 32.1 ounces, the probability of getting a sample mean of 30.7 ounces or below would be 0.001.
B) We should fail to reject the null. The bags contain an average of 32.1 ounces.
C) Not enough information is given.
D) If the null hypothesis were true, the probability of observing a sample mean of 30.7 ounces would be 0.001.
E) If the null hypothesis were true, the probability of having a sample mean of 30.7 ounces or above is 0.001.

54) A *P*-value indicates

A) the probability that the alternative hypothesis is true.
B) the probability that the null hypothesis is true.
C) the probability of the observed statistic given that the null hypothesis is true.
D) the probability of the observed statistic given that the alternative hypothesis is true.
E) None of the above.

Construct the indicated confidence interval for the difference between the two population means. Assume that the assumptions and conditions for inference have been met.

55) A grocery store is interested in determining whether or not a difference exists between the shelf life of two different brands of doughnuts. A random sample of 100 boxes of each brand was selected and the shelf life in days was determined for each box. The sample results are given below.

Brand A	Brand B
$\bar{x} = 2.1$	$\bar{x} = 2.9$
$s = 0.8$	$s = 1.1$
$n = 100$	$n = 100$

Find a 90% confidence interval for $\mu_A - \mu_B$, the difference in mean shelf life between brand A and brand B.

A) (2.1, 2.9)
B) (-1.03, -0.58)
C) (-1.53, -0.08)
D) (0.08, 1.53)
E) (0.58, 1.03)

56) A researcher wishes to determine whether people with high blood pressure can reduce their blood pressure by following a particular diet. Use the sample data below to construct a 99% confidence interval for $u_1 - u_2$ where u_1 and u_2 represent the mean for the treatment group and the control group respectively.

Treatment Group	Control Group
$n_1 = 85$	$n_2 = 75$
$\bar{x}_1 = 189.1$	$\bar{x}_2 = 203.7$
$s_1 = 38.7$	$s_2 = 39.2$

A) (-30.7, 1.5)
B) (-29.0, -0.2)
C) (-26.8, -2.4)
D) (-1.5, 30.7)
E) (-1.3, 30.5)

Interpret the given confidence interval.

57) A researcher was interested in comparing the salaries of female and male employees of a particular company. Independent random samples of female employees (sample 1) and male employees (sample 2) were taken to calculate the mean salary, in dollars per week, for each group. A 90% confidence interval for the difference, $\mu_1 - \mu_2$, between the mean weekly salary of all female employees and the mean weekly salary of all male employees was determined to be (-\$110, \$10).

A) Based on these data, with 90% confidence, female employees at this company average between \$110 less and \$10 more per week than the male employees.
B) We know that 90% of all random samples done on the employees at this company will show that the average female salary is between \$110 less and \$10 more per week than the average male salary.
C) Based on these data, with 90% confidence, male employees at this company average between \$110 less and \$10 more per week than the female employees.
D) We are 90% confident that a randomly selected female employee at this company makes between \$110 less and \$10 more per week than a randomly selected male employee.
E) We know that 90% of female employees at this company make between \$110 less and \$10 more than the male employees.

58) A survey was conducted to determine the difference in gasoline mileage for two types of trucks. A random sample was taken for each model of truck, and the mean gasoline mileage, in miles per gallon, was calculated. A 98% confidence interval for the difference in the mean mileage for model A trucks and the mean mileage for model B trucks, $\mu_A - \mu_B$, was determined to be (2.5, 4.7).

A) Based on this sample, we are 98% confident that the average mileage for model A trucks is between 2.5 and 4.7 miles per gallon higher than the average mileage for model B trucks.
B) We know that 98% of model A trucks get mileage that is between 2.5 and 4.7 miles per gallon higher than model B trucks.
C) We know that 98% of all random samples done on the population of trucks will show that the average mileage for model A trucks is between 2.5 and 4.7 miles per gallon higher than the average mileage for model B trucks.
D) Based on this sample, we are 98% confident that the average mileage for model B trucks is between 2.5 and 4.7 miles per gallon higher than the average mileage for model A trucks.
E) We are 98% confident that a randomly selected model A truck will get mileage that is between 2.5 and 4.7 miles per gallon higher than a randomly selected model B truck.

Indicate the correct test procedure and reasoning.

59) A researcher wishes to compare how students at two different schools perform on a math test. He randomly selects 40 students from each school and obtains their test scores.
A) Not enough information is given to determine the correct type of test.
B) Paired t-test, since the students at the two schools can be paired together.
C) Pooled t-test, since the standard deviations of the two populations are likely to be the same.
D) Two-sample t-test, since the samples are independent.
E) Either two-sample or paired t-tests will work equally well.

60) A manufacturer has designed athletic footwear which it hopes will improve the performance of athletes running the 100-meter sprint. It wishes to perform a hypothesis test to compare the times of athletes at the 100 meters with these shoes and with their usual shoes.
A) Not enough information is given.
B) Either two-sample or paired t-test would be equally accurate.
C) Two-sample t-test, since the experiment has two samples.
D) Paired t-test, since a natural pairing exists, and would detect differences between the population means better.
E) Pooled t-test, since the standard deviations of the two populations are likely to be the same.

61) To construct a confidence interval for the mean of paired data, we
A) find the proportion of the data pairs with increases and construct a one-proportion z interval.
B) cannot do anything to construct a confidence interval.
C) find the differences between the data and construct a one-sample t-interval.
D) treat the data as if it is two independent samples and construct a two-sample t-interval.

Use the paired t-interval procedure to obtain the required confidence interval for the mean difference. Assume that the conditions and assumptions for inference are satisfied.

62) Ten different families are tested for the number of gallons of water a day they use before and after viewing a conservation video. Construct a 90% confidence interval for the mean of the difference of the "before" minus the "after" times if $\bar{d}$(after-before) = -4.8 and s_d=5.2451

Before	33	33	38	33	35	35	40	40	40	31
After	34	28	25	28	35	33	31	28	35	33

A) (1.5,8.1) B) (3.8,5.8) C) (2.1,7.5) D) (2.5,7.1) E) (1.8,7.8)

Answer Key
Testname: PRACTICE TEST 3 19-25

1) A
2) C
3) B
4) B
5) B
6) D
7) D
8) D
9) A
10) E
11) C
12) B
13) A
14) D
15) C
16) E
17) C
18) A
19) E
20) A
21) D
22) B
23) D
24) A
25) E
26) B
27) $\alpha = 0.10$ and 0.05: Yes. The P-value is < 0.01, so it's less than both 0.05 and 0.10.
28) C
29) A
30) D
31) E
32) B
33) C
34) D
35) E
36) C
37) B
38) B
39) E
40) E
41) A
42) B
43) E
44) B
45) E
46) D
47) A
48) A

49) A
50) C
51) B
52) A
53) A
54) C
55) B
56) A
57) A
58) A
59) D
60) D
61) C
62) E