Practice Problems Part # 4 Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Which of the following would be an appropriate null hypothesis? 1) _____
A) The mean of a sample is equal to 55.
B) The mean of a population is greater than 55.
C) The mean of a population is equal to 55.
D) Only A and C are true.

2) Which of the following would be an appropriate alternative hypothesis? 2) _____
A) The mean of a sample is greater than 55.
B) The mean of a population is greater than 55.
C) The mean of a population is equal to 55.
D) The mean of a sample is equal to 55.

3) A Type I error is committed when 3) _____
A) we don't reject a null hypothesis that is true.
B) we reject a null hypothesis that is false.
C) we reject a null hypothesis that is true.
D) we don't reject a null hypothesis that is false.

4) The power of a test is measured by its capability of 4) _____
A) rejecting a null hypothesis that is false.
B) rejecting a null hypothesis that is true.
C) not rejecting a null hypothesis that is false.
D) not rejecting a null hypothesis that is true.

5) If an economist wishes to determine whether there is evidence that average family income in a community exceeds $25,000 5) _____
A) a one-tailed test should be utilized.
B) a two-tailed test should be utilized.
C) either a one-tailed or two-tailed test could be used with equivalent results.
D) None of the above.

6) You know that the probability of committing a Type II error (α) is 5%, you can tell that the power of the test is 6) _____
A) 95%. B) 2.5% C) unknown D) 97.5%

7) The power of a statistical test is 7) _____
A) the probability of rejecting H_0 when it is false.
B) the probability of rejecting H_0 when it is true.
C) the probability of not rejecting H_0 when it is false.
D) the probability of not rejecting H_0 when it is true.

8) The symbol for the power of a statistical test is 8) _____
A) $1 - \beta$. B) α. C) $1 - \alpha$. D) β.

9) Suppose we wish to test H_0: $\mu \leq 47$ versus H_1: $\mu > 47$. What will result if we conclude that the mean is greater than 47 when its true value is really 52? 9) _____
A) We have made a correct decision B) We have made a Type II error.
C) We have made a Type I error. D) None of the above are correct.

10) How many Kleenex should the Kimberly Clark Corporation package of tissues contain? Researchers determined that 60 tissues is the average number of tissues used during a cold. Suppose a random sample of 100 Kleenex users yielded the following data on the number of tissues used during a cold: $\overline{X} = 52$, $s = 22$. Give the null and alternative hypotheses to determine if the number of tissues used during a cold is less than 60. 10) _____

A) H_0: $\mu \leq 60$ and H_1: $\mu > 60$.
B) H_0: $\overline{X} = 60$ and H_1: $\overline{X} \neq 60$.
C) H_0: $\overline{X} \geq 60$ and H_1: $\overline{X} < 60$.
D) H_0: $\mu \geq 60$ and H_1: $\mu < 60$.

11) Suppose we want to test H_0: $\mu \geq 30$ versus H_1: $\mu < 30$. Which of the following possible sample results based on a sample of size 36 gives the strongest evidence to reject H_0 in favor of H_1? 11) _____

A) $\overline{X} = 27$, $s = 4$ B) $\overline{X} = 32$, $s = 2$ C) $\overline{X} = 28$, $s = 6$ D) $\overline{X} = 26$, $s = 9$

12) Which of the following statements is **not** true about the level of significance in a hypothesis test? 12) _____

A) The significance level is also called the α level.
B) The significance level is another name for Type II error.
C) The level of significance is the maximum risk we are willing to accept in making a Type I error.
D) The larger the level of significance, the more likely you are to reject the null hypothesis.

13) If, as a result of a hypothesis test, we reject the null hypothesis when it is false, then we have committed 13) _____

A) a Type I error.
B) no error.
C) an acceptance error.
D) a Type II error.

Formulate the null and alternative hypotheses for a hypothesis test.

14) An entomologist writes an article in a scientific journal which claims that less than 10 in ten thousand male fireflies are unable to produce light due to a genetic mutation. 14) _____

A) H_0: p = 0.001, H_a: p < 0.001
B) H_0: p > 0.001, H_a: p = 0.001
C) H_0: p = 0.001, H_a: p > 0.001
D) H_0: p < 0.001, H_a: p = 0.001

15) A car company claims that its new sedan will have a mean gas mileage greater than 30 miles per gallon in the city. 15) _____

A) H_0: μ = 30 mpg, H_a: μ > 30 mpg
B) H_0: μ > 30 mpg, H_a: μ = 30 mpg
C) H_0: μ = 30 mpg, H_a: μ < 30 mpg
D) H_0: μ < 30 mpg, H_a: μ = 30 mpg

16) A skeptical paranormal researcher claims that the proportion of Americans that have seen a UFO is less than 3 in every one thousand. 16) _____

A) H_0: p = 0.003, H_a: p > 0.003
B) H_0: p > 0.003, H_a: p = 0.003
C) H_0: p < 0.003, H_a: p = 0.003
D) H_0: p = 0.003, H_a: p < 0.003

17) The owner of a football team claims that the mean attendance at games is greater than 68,100. 17) _____

A) H_0: μ > 68,100, H_a: μ = 68,100
B) H_0: μ = 68,100, H_a: μ < 68,100
C) H_0: μ = 68,100, H_a: μ > 68,100
D) H_0: μ < 68,100, H_a: μ = 68,100

18) In 1990, the average duration of long-distance telephone calls originating in one town was 10.5 minutes. A long-distance telephone company wants to perform a hypothesis test to determine whether the average duration of long-distance phone calls has changed from the 1990 mean of 10.5 minutes. 18) _____

A) H_0: $\mu \neq 10.5$ minutes
H_a: $\mu = 10.5$ minutes

B) H_0: $\mu = 10.5$ minutes
H_a: $\mu > 10.5$ minutes

C) H_0: $\mu = 10.5$ minutes
H_a: $\mu \neq 10.5$ minutes

D) H_0: $\mu = 10.5$ minutes
H_a: $\mu < 10.5$ minutes

19) In 1990, the average math SAT score for students at one school was 503. Five years later, a teacher wants to perform a hypothesis test to determine whether the average math SAT score of students at the school has changed from the 1990 mean of 503. 19) _____

A) H_0: $\mu = 503$
H_a: $\mu < 503$

B) H_0: $\mu = 503$
H_a: $\mu \neq 503$

C) H_0:: $\mu \geq 503$
H_a: $\mu < 503$

D) H_0: $\mu = 503$
H_a: $\mu > 503$

20) A consumer advocacy group claims that the mean amount of juice in a 18 ounce bottled drink is not
18 ounces, as stated by the bottler. 20) _____

A) H_0: $\mu = 18$ ounces
H_a: $\mu < 18$ ounces

B) H_0: $\mu = 18$ ounces
H_a: $\mu > 18$ ounces

C) H_0: $\mu = 18$ ounces
H_a: $\mu \neq 18$ ounces

D) H_0: $\mu \neq 18$ ounces
H_a: $\mu = 18$ ounces

21) A manufacturer wishes to test the claim that one of its pancake mixes has a mean weight that does not equal 24 ounces as advertised. 21) _____

A) H_0: $\mu = 24$ ounces
H_a: $\mu \neq 24$ ounces

B) H_0: $\mu = 24$ ounces
H_a: $\mu < 24$ ounces

C) H_0: $\mu = 24$ ounces
H_a: $\mu > 24$ ounces

D) H_0: $\mu \neq 24$ ounces
H_a: $\mu = 24$ ounces

Solve the problem.

22) An entomologist writes an article in a scientific journal which claims that fewer than 7 in ten thousand male fireflies are unable to produce light due to a genetic mutation. Assuming that a hypothesis test of the claim has been conducted and that the conclusion is to reject the null hypothesis, state the conclusion in nontechnical terms. 22) _____

A) There is sufficient sample evidence to support the claim that the proportion is less than 7 in ten thousand.

B) There is not sufficient sample evidence to support the claim that the proportion is greater than 7 in ten thousand.

C) There is sufficient sample evidence to support the claim that the proportion is greater than 7 in ten thousand.

D) There is not sufficient sample evidence to support the claim that the proportion is less than 7 in ten thousand.

23) A psychologist claims that more than 78 percent of the population suffers from professional problems due to extreme shyness. Assuming that a hypothesis test of the claim has been conducted and that the conclusion is failure to reject the null hypothesis, state the conclusion in nontechnical terms. 23) _____

A) There is sufficient sample evidence to support the claim that the proportion is greater than 78 percent.
B) There is sufficient sample evidence to support the claim that the proportion is less than 78 percent.
C) There is not sufficient sample evidence to support the claim that the proportion is greater than 78 percent.
D) There is not sufficient sample evidence to support the claim that the proportion is less than 78 percent.

24) A cereal company claims that the mean weight of the cereal in its packets is at least 20 ounces. Assuming that a hypothesis test of the claim has been conducted and that the conclusion is to reject the null hypothesis, state the conclusion in nontechnical terms. 24) _____

A) There is sufficient sample evidence to warrant rejection of the claim that the mean weight is less than 20 ounces.
B) There is not sufficient sample evidence to to support the claim that the mean weight is at least 20 ounces.
C) There is not sufficient sample evidence to warrant rejection of the claim that the mean weight is less than 20 ounces.
D) There is sufficient sample evidence to support the claim that the mean weight is at least 20 ounces.

Identify the Type I error or Type II error as indicated.

25) In the past, the mean running time for a certain type of flashlight battery has been 9.5 hours. The manufacturer has introduced a change in the production method and wants to perform a hypothesis test to determine whether the mean running time has increased as a result. The hypotheses are: 25) _____

$H_0 : \mu = 9.5$ hours

$H_a : \mu > 9.5$ hours

Identify the Type II error.

A) Reject the claim that the mean running time is 9.5 hours when actually the mean running time is 9.5 hours.
B) Fail to reject the claim that the mean running time is 9.5 hours when actually the mean running time is 9.5 hours.
C) Fail to reject the claim that the mean running time is 9.5 hours when actually the mean running time is greater than 9.5 hours.
D) Reject the claim that the mean running time is 9.5 hours when actually the mean running time is greater than 9.5 hours.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

26) If a researcher rejects a false null hypothesis, she has made a _____ decision. 26) _____

27) If a researcher accepts a false null hypothesis, she has made a _____ error. 27) _____

28) If a researcher rejects a true null hypothesis, she has made a _____ error. 28) _____

29) If a researcher accepts a true null hypothesis, she has made a _____ decision. 29) _____

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

30) True or False: For a given level of significance, if the sample size is increased, the probability of committing a Type I error will increase. 30) _____

31) True or False: For a given level of significance, if the sample size is increased, the probability of committing a Type II error will increase. 31) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

32) A _____ is a numerical quantity computed from the data of a sample and is used in reaching a decision on whether or not to reject the null hypothesis. 32) _____

A) parameter B) significance level
C) test statistic D) critical value

Provide an appropriate response.

33) Suppose you want to test the claim that $\mu \geq 65.4$. Given a sample size of n = 35 and a level of significance of $\alpha = 0.05$, when should you reject H_0? 33) _____

A) Reject H_0 if the standardized test is less than -2.33.
B) Reject H_0 if the standardized test statistic is less than -1.645.
C) Reject H_0 if the standardized test statistic is less than -1.28.
D) Reject H_0 if the standardized test statistic is less than -2.575.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

34) Test the claim that $\mu > 24$, given that $\alpha = 0.05$ and the sample statistics are n = 50, $\bar{x} = 24.3$, and s = 1.2. 34) _____

35) Test the claim that $\mu \leq 41$, given that $\alpha = 0.01$ and the sample statistics are n = 40, $\bar{x} = 42.8$, and s = 4.3. 35) _____

36) Test the claim that $\mu \neq 22$, given that $\alpha = 0.05$ and the sample statistics are n = 35, $\bar{x} = 21.1$ and s = 2.7. 36) _____

37) A local brewery distributes beer in bottles labeled 32 ounces. A government agency thinks that the brewery is cheating its customers. The agency selects 50 of these bottles, measures their contents, and obtains a sample mean of 31.6 ounces with a standard deviation of 0.70 ounce. Use a 0.01 significance level to test the agency's claim that the brewery is cheating its customers. 37) _____

38) A local politician, running for reelection, claims that the mean prison time for car thieves is less than the required 6 years. A sample of 80 convicted car thieves was randomly selected, and the mean length of prison time was found to be 5 years and 6 months, with a standard deviation of 1 year and 3 months. At $\alpha = 0.05$, test the politician's claim. 38) _____

39) A local group claims that the police issue at least 60 speeding tickets a day in their area. To prove their point, they randomly select one month. Their research yields the number of tickets issued for each day. The data are listed below. At $\alpha = 0.01$, test the group's claim. 39) _____

70	48	41	68	69	55	70	57	60	83
32	60	72	58	88	48	59	60	56	65
66	60	68	42	57	59	49	70	75	63
44									

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

40) Determine whether the normal sampling distribution can be used. The claim is $p = 0.75$ and the sample size is $n = 18$. 40) _____
A) Do not use the normal distribution. B) Use the normal distribution.

41) Determine whether the normal sampling distribution can be used. The claim is $p \neq 0.300$ and the sample size is $n = 20$. 41) _____
A) Use the normal distribution. B) Do not use the normal distribution.

42) Determine the critical value, z_0, to test the claim about the population proportion $p \neq 0.325$ given $n = 42$ and $\hat{p} = 0.247$. Use $\alpha = 0.05$. 42) _____
A) ±2.33 B) ±1.645 C) ±1.96 D) ±2.575

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

43) A recent study claimed that at least 15% of junior high students are overweight. In a sample of 160 students, 18 were found to be overweight. At $\alpha = 0.05$, test the claim. 43) _____

44) The engineering school at a major university claims that 20% of its graduates are women. In a graduating class of 210 students, 58 were women. Does this suggest that the school is believable? Use $\alpha = 0.05$. 44) _____

45) A statistics teacher believes that students in an evening statistics class score higher than the students in a day class. The results of a special exam are shown below. Can the teacher conclude that the evening students have a higher score? Use $\alpha = 0.01$. 45) _____

Day Students	Evening Students
$n_1 = 36$	$n_2 = 41$
$\bar{x}_1 = 73$	$\bar{x}_2 = 76$
$s_1 = 5.8$	$s_2 = 6.3$

46) A local bank claims that the waiting time for its customers to be served is the lowest in the area. A competitor bank checks the waiting times at both banks. The sample statistics are listed below. Test the local bank's claim. Use $\alpha = 0.05$. 46) _____

Local Bank	Competitor Bank
$n_1 = 45$	$n_2 = 50$
$\bar{x}_1 = 4.6$ minutes	$\bar{x}_2 = 4.9$ minutes
$s_1 = 1.1$ minutes	$s_2 = 1.0$ minute

Use the traditional method of hypothesis testing to test the given claim about the means of two populations. Assume that two dependent samples have been randomly selected from normally distributed populations.

47) Five students took a math test before and after tutoring. Their scores were as follows. 47) _____

Subject	A	B	C	D	E
Before	71	66	75	78	66
After	75	75	73	81	78

Using a 0.01 level of significance, test the claim that the tutoring has an effect on the math scores.

48) A coach uses a new technique to train gymnasts. 7 gymnasts were randomly selected and their competition scores were recorded before and after the training. The results are shown below. 48) _____

Subject	A	B	C	D	E	F	G
Before	9.4	9.6	9.6	9.6	9.5	9.6	9.4
After	9.5	9.8	9.6	9.5	9.6	9.9	9.2

Using a 0.01 level of significance, test the claim that the training technique is effective in raising the gymnasts' scores.

Perform the indicated goodness-of-fit test.

49) In studying the occurrence of genetic characteristics, the following sample data were obtained. At the 0.05 significance level, test the claim that the characteristics occur with the same frequency. 49) _____

Characteristic	A	B	C	D	E	F
Frequency	28	30	45	48	38	39

50) Among the four northwestern states, Washington has 51% of the total population, Oregon has 30%, Idaho has 11%, and Montana has 8%. A market researcher selects a sample of 1000 subjects, with 450 in Washington, 340 in Oregon, 150 in Idaho, and 60 in Montana. At the 0.05 significance level, test the claim that the sample of 1000 subjects has a distribution that agrees with the distribution of state populations. 50) _____

51) Use a significance level of 0.01 to test the claim that workplace accidents are distributed on workdays as follows: Monday 25%, Tuesday: 15%, Wednesday: 15%, Thursday: 15%, and Friday: 30%.
In a study of 100 workplace accidents, 20 occurred on a Monday, 18 occurred on a Tuesday, 15 occurred on a Wednesday, 15 occurred on a Thursday, and 32 occurred on a Friday. 51) _____

52) You roll a die 48 times with the following results. 52) _____

Number	1	2	3	4	5	6
Frequency	13	3	12	15	2	3

Use a significance level of 0.05 to test the claim that the die is fair.