Names: _____

AP Stats Assignment 11.1 Hypothesis Testing:

1. What is the Null Hypothesis? What does it have to contain?

2. When writing the NULL hypothesis, are we comparing our sample mean against the population mean or another sample mean? Explain:

3. What is the Alternative Hypothesis? What does it have to contain?

4. What are the conditions that must be met in order to perform a test of inference? Explain:

5. What is a P-value? Explain

6. What is a significance level? Explain:

7. What does a significance level of 5% mean in context?

8. How is conditional probability used in stating the Null and Alternative Hypothesis?

9. What does it mean when the P-Value is less than the significance level?

10. What does it mean when the P-Value is less than the significance level?

11. If the P-value is less than the significance level, do you “reject” or “fail to reject” the null hypothesis? Explain:

12. Can you explain why you can’t just “accept” the Null Hypothesis when we “fail to reject” it?

13. With the Alternative Hypothesis, can you “accept it” or “fail to reject it”? Explain:

14. When performing a Hypothesis test, how do you tell the difference between a Z-test vs a T-test? Explain:

15. State the NULL and Hypothesis for each of the following. Indicate whether if it will be “ONE” or “TWO” Tail. Write the hypothesis both in notation and in context. Make sure to indicate your parameters

    a) To test whether if the use of A.I. will increase productivity in company operations, every employee was given a mobile phone with access to a A.I. database. Employee productivity was measured in a scale from 1 to 15, with one being very inefficient and 15 being at maximum efficiency. Before A.I. was introduced, the average efficiency for the company of 1200 employees was at efficiency rating of 10.4. A random sample of 45 employees were given the mobile phones with access to A.I. and their mean efficiencies was recorded after 6 months.

    b) Phentermine is a weight loss medication, where users begin to lose 5% of their weight after two months of use. Scientists want to test this claim by giving it to a random sample of 50 middle aged woman with a BMI of between 19 to 25. The average weight loss percentage of the sample were tallied after 2 months.

    c) A tutoring company claims that students will increase their average mark by at least 15% after two months of tutoring. A random of 120 students that attended the tutoring center were selected. The

percentage difference in mark were recorded.

d) Anabolic steroids are often used by athletes to increase muscle mass. One type of anabolic steroid claims to increase more than 7kg of muscles after 20 weeks of use for male athletes weighing between 150 to 170 lbs before use.

e) BIG 2 is a card game that is played with four players. First player to dish out all their cards win. It is believed in some groups that the player who deals in the game of BIG 2 have a better chance of winning than the other three players.

16. To test whether if the use of A.I. will increase productivity in company operations, every employee was given a mobile phone with access to a A.I. database. Employee productivity was measured in a scale from 1 to 15, with one being very inefficient and 15 being at maximum efficiency. Before A.I. was introduced, the average efficiency for the company of 1200 employees was at efficiency rating of 10.4 with a standard deviation of 1.8. A random sample of 45 employees were given the mobile phones with access to A.I. and their mean efficiencies rating was 14.3. Perform a test at a significance level of 5% to determine if giving employees access to A.I. increased their productivity.
    a) Indicate what test you are to perform? 1-sample Z-test? 1 sample T-test? Or 1 Sample Proportion Test

    b) Are the conditions required for a test of inference satisfied? Explain

    c) Find and interpret the P-value

    d) State the results of your test and interpret them in context

17. Phentermine is a weight loss medication, where users begin to lose 5% of their weight after two months of use. A random sample of 50 middle aged woman with a BMI of between 19 to 25 was given Phentermine

for 2 months and the average weight loss percentage was 3.5% with a sample standard deviation of 1.1%. Perform a test at a significance level of 5% to determine if female patients use Phentermine would lose 5% of their body weight.

a) Indicate what test you are to perform? 1-sample Z-test? 1 sample T-test? Or 1 Sample Proportion Test

b) Is this a ONE -tail or TWO – tail test? Explain:

c) Are the conditions required for a test of inference satisfied? Explain

d) Find and interpret the P-value

e) State the results of your test and interpret them in context

18. A tutoring company claims that students will increase their average mark by at least 15% after two months of tutoring. The difference in percentage change of 50 randomly students that attended the tutoring center is listed below. Perform a test with a significance level of 10% if student attending the tutoring company increased their average mark by at least 15%.

+ 10%	- 4%	+ 8%	+ 7%	+ 12%	+ 13%	- 5%	+ 14%	- 1%	+ 25%
- 7 %	+ 12%	+ 5%	+ 11%	+ 9%	+ 4%	- 4%	- 4%	- 8%	+ 15 %
+ 10%	- 5%	- 3%	+ 7%	+ 0%	- 2%	+ 14 %	- 10%	+14 %	+ 14 %
- 3%	- 4%	+ 7%	+ 9%	- 6%	- 3%	+ 13%	+ 10%	+13 %	+ 16 %
+ 16 %	+ 10%	+ 6%	- 3%	- 1%	+ 10%	+ 11%	+ 10%	+ 16%	- 10%

a) Are there any outliers in your sample? What does this mean in regards to the population distribution of difference in student percentages?

b) Since there is evidence to suggest the population distribution is not normal, what condition must be met in order to proceed with the test of inference? Explain:

c) Indicate what test you are to perform? 1-sample Z-test? 1 sample T-test? Or 1 Sample Proportion Test

d) Is this a ONE -tail or TWO – tail test? Explain:

e) What is the sample standard deviation? What will this be used for?

f) Find and interpret the P-value

g) State the results of your test and interpret them in context.

19. One type of anabolic steroid claims to increase male user (150 to 170 lbs) muscle mass by more than 7kg after 20 weeks of use, with a standard deviation of 2.2kg. A random sample of 15 males aged between 18 to 25 were selected and the mean average muscle weight gain was 5.5kg. Perform a test with significance level of 1% to determine if the anabolic steroid claims were true.
a) Indicate what test you are to perform? 1-sample Z-test? 1 sample T-test? Or 1 Sample Proportion Test

b) Is this a ONE -tail or TWO – tail test? Explain:

c) Are the conditions required for a test of inference satisfied? Explain

d) Find and interpret the P-value

e) State the results of your test and interpret them in context

20 Four players played 900 games of BIG 2 and the player that dealt the cards won 267 games. Perform a test at a significance level of 5% if players dealing the cards had a better chance of winning.
a) Indicate what test you are to perform? 1-sample Z-test? 1 sample T-test? Or 1 Sample Proportion Test

b) Is this a ONE -tail or TWO – tail test? Explain:

c) Are the conditions required for a test of inference satisfied? Explain

d) Show your work on how to find the P value. Interpret the P-value

e) State the results of your test and interpret them in context