Integrated Studies 8C Name:______________________________

Statistics Quiz

Each question is worth 10 points. If you need more space for any answer use the back of the page.

The following scenario applies to Questions 1 – 7: One hundred pairs of twins each participated in one remote viewing trial. One twin in each pair was designated as the sender, and was asked to bring four objects to the session but to make sure the other twin, the receiver, did not know what they were. After the receiver was taken to a secured room in another location, one of the objects was randomly selected to be the "target" for the session. Each of the four objects had the same probability of being selected as the target. The sender focused on that object during the remote viewing. At the end of the session the correct answer was shown to the receiver. Then the four objects and the receiver's drawings were shown to an independent judge, who determined which of the four objects matched the receiver's drawings the best. If the correct object was judged to match best, the session was scored as a "hit." The experiment resulted in 33 hits, and the *p*-value for the test is 0.032.

1. Is this a binomial experiment? If so, specify *n* and specify the probability of a "success" by chance alone, under the assumption that remote viewing does not work in this context. If you don't think it's a binomial experiment, explain why not.

   Yes, it's binomial with n = 100 and (under the assumption that remote viewing isn't working) p = .25. Note that this is true because the target is randomly selected. Thus, even if the receiver twin knew what all four choices were, all of the conditions for a binomial experiment would still be met.

2. Define the parameter of interest in this experiment and corresponding hypothesis test. Use the letter *p*.

   The parameter of interest is p = long-run probability of a hit for twins participating in this kind of study.

3. Write the null and alternative hypotheses in terms of the parameter *p* defined in Question 2.

   H_0: $p = 1/4$
   H_a: $p > 1/4$

4. Explain what probability was calculated to find the *p*-value of 0.032. Make your answer specific to this situation rather than a general definition of a *p*-value.

   This is the probability of getting 33 or more hits in a binomial experiment if the probability of a hit each time is .25.

5. Make a decision about the hypotheses using statistical terminology, and interpret in words what it means.

   Reject the null hypothesis (because the p-value of .032 < .05). In words, this means that we can reject the hypothesis that the probability of a hit is at the chance value of .25. Or, chance alone is not likely to be responsible for the study's results.

6. If the experiment were to be repeated with the same group of 100 pairs of twins, would each of the following possibly change, or would it stay the same? Circle the appropriate answer.
Anything computed from the data can change, anything based on the population values cannot.

The value of the parameter *p*:	Would change	**Would not change**
The value of the test statistic *z*:	**Would change**	Would not change
The power of the test if the true value of *p* is .30:	Would change	**Would not change**
A confidence interval for *p* computed from the results:	**Would change**	Would not change
The estimated effect size calculated from the results:	**Would change**	Would not change

7. If the experiment were to be repeated with 400 pairs of twins, would each of the following be likely to get larger, smaller, or stay about the same as in the first test of 100 pairs? Circle the appropriate answer.

The value of the test statistic *z*:	**Larger**	Smaller	About the same
The power of the test if the true value of *p* is .30:	**Larger**	Smaller	About the same
The width of a confidence interval for *p*:	Larger	**Smaller**	About the same
The estimated effect size:	Larger	Smaller	**About the same**
The *p*-value for the test:	Larger	**Smaller**	About the same

The following scenario applies to Questions 8 and 9. An online experiment is conducted in which two colors are displayed on cards on a computer screen. One has been randomly selected to be the "right answer" (the two colors are equally likely to be chosen) and the participant is asked to guess which one it is by clicking on that card. The answer is then revealed. A participant plays the game 200 times and is successful 110 times.

8. A 95% confidence interval for the probability of a success based on these results is .48 to .62. Interpret this interval by writing a few sentences explaining what it means.

We can be 95% confident (or fairly certain) that the true long-run probability of a success for this experiment is between .48 and .62. You could also say that in 95 out of 100 times that we used this procedure, we would get an interval that covers the true long-run probability. We don't know if this interval does so, but we can be fairly certain that it does.

9. If a one-tailed hypothesis test were to be done in this situation, the participant would need to get 113 or more correct for the test to be "statistically significant." If the person is really capable of getting the answer right 54% of the time in the long run, the power for this test is about .30 or 30%. Explain what this means.

Power is the probability that the experiment will succeed if the true probability of success on each try is .54. We are told that in order for the experiment to be "statistically significant", there would need to be 113 correct out of 200 tries. Therefore, the power in this case is the probability of getting 113 or more correct for a binomial experiment with n=200 and p=.54.

10. Two conditions are required for a psi experiment to be amenable to statistical evaluation. One is that ordinary means of guessing the answer are ruled out, such as allowing someone in the room to know the right answer. What is the other required condition?

The other condition is that there is a known probability of getting the correct answer by chance alone.