65 total possible points. Show ALL work for any calculations performed to receive full credit. Students must work independently.

1. Suppose that the success rate for standard induction chemotherapy in adults with leukemia is 50%. A team of researchers is designing a new treatment for these subjects and feels that a 65% target is obtainable and would be clinically relevant. The team is interested in a two-sided test of difference in the success rates of the standard treatment versus the new intervention. They wish their study to have 90% power to detect the effect of interest with an α= 0.05 significance level test. Let *pc* be the control (standard) group success rate and *pI* be the intervention (new) group success rate.
2. Write out the Null and Alternative hypotheses for the study (5 points).
3. What is the specific effect size of interest for this study (5 points)?
4. The team desires independent samples of equal allocation between groups. Using the method of your choice (e.g., PS, SAS, by hand), calculate the required sample size for the study and formulate a statement conveying this information in the context of the effect size, power, and significance level. State the method of calculation used (if by hand, you must show work to receive full credit) (15 points).
5. As part of a sensitivity analysis, the team would like power estimates over a range of possible intervention group success rates. Assuming the control rate (*pc*) is 0.5 and a sample size equal to the one calculated in part c, create a table of attainable power levels under true intervention rate (*pI*) assumptions of *pI* *=* 0.60, 0.65, and 0.70. State the method of calculation used (if by hand, you must show work to receive full credit) (15 points).

Example table:

|  |  |  |  |
| --- | --- | --- | --- |
| Intervention success rate | 0.60 | 0.65 | 0.70 |
| Power |  |  |  |

1. The head researcher is a ‘Visual Learner’ and requests a plot of Power (y-axis) by Intervention success rate (x-axis) over the range considered in part d. Using power software (such as PS) or Excel, plot these values for the research group to inspect (15 points).
2. The team expects 20% of enrollees to randomly drop out before evaluation can occur. Adjust the sample size calculation from part c to account for this: How many should be enrolled? (10 points).
3. *BONUS (5 points possible):* What is the power of the study (at the sample size from part c) when the true Intervention success rate is 0.5 (equal to the control group rate) and why is this the case? What would the power be at *pI* = 0.50 if instead of the sample size from part c, the sample size was 10,000 per group and why is this the case?