**Practice Problems**

**(Comparison between means and proportions)**

Prema Kumari is trying to test the innovativeness in different industries. She has developed an Industrial Innovative Index (popularly known as 3I), which is based on weighted average of 12 different components obtained through a survey instrument. She obtained the data from 12 units from software industry and 10 units in automobile industry. She calculated 3I for each of the units and then summarized the same for the respective industry. The summarized data is presented below:

|  |  |  |
| --- | --- | --- |
|  | sample mean | Sample Standard Deviation |
| Software | 273 | 52 |
| Automobile | 317 | 50 |

1. Prema Kumari calculated a 95% confidence interval for the mean difference between the two industries (µS – µA) assuming that σ12=σ22. The interval calculated thus was ( – 82, –6). This confidence interval indicates that
2. 95% of the companies in the Automobile industry will have higher 3I score as compared to 95% of companies in Software industry
3. Prema Kumari is 95% confident that 2.5% of the companies in software industry will have higher 3I score whereas another 2.5% will have lower 3I score as compared to the companies in Automobile industry
4. Prema Kumari is 95% confident that the population mean 3I score of companies in software industry will be lower than that of the Automobile industry$
5. Prema Kumari is 95% confident that the population mean 3I score of companies in software industry will be higher than that of the Automobile industry

Prema Kumari conducted a hypothesis test to see if there a significant difference in the population means of 3I between the two industries (H0: µS =µA).

1. What is the degrees of freedom used by Prema Kumari in testing the above hypothesis?
2. 22
3. 20$
4. 2
5. 19.54
6. The standard error that she used in the above hypothesis test is
7. 51.11
8. 9.37
9. 21.88$
10. 102.00
11. The p-value corresponding to the above hypothesis test is
12. Between 0.05 and 0.10$
13. Between 0.01 and 0.05
14. Less than 0.01
15. Greater than 0.10

Questions 5 to 6

Prof. A K Rao who is the mentor for Prema Kumari, suggested that she should use a proportion test because, the 3I is not exactly “measurable” or “quantifiable”. He also suggested that she should increase the sample sizes considerably. Prema Kumari obtained data from 28 more units from software industry and 40 more units from automobile industry. She calculated the overall average 3I for all the units (combining both the industries). Those units whose 3I is more than this average are termed as High Innovators and others as Low Innovators. The Software industry had 15 High Innovators and Automobile industry had 30 High Innovators.

Prema Kumari calculated 95% confidence intervals for the Population proportion of High Innovators for each of the two industries separately and the results are given below:

|  |  |  |
| --- | --- | --- |
| Software |  | Automobile |
| 40 | n | 50 |
| 0.375 | Proportion | 0.6 |
| 0.0765 | SE | 0.0693 |
| 0.2250 | Lower Limit (95%) | 0.5250 |
| 0.4642 | Upper Limit (95%) | 0.7358 |

1. Prema Kumari calculated a 90% confidence interval for the difference between the two population proportions (πS – πA). the standard error that she used in her calculations is
2. 0.0729
3. 0.1032$
4. 0.1458
5. 0.0073
6. Prema Kumari calculated a 95% confidence interval for (πS – πA) as (0.0226, 0.4274). She also tested the following Hypothesis: H0: (πS – πA) = 0; HA: (πS – πA) ≠ 0. The conclusion of this hypothesis test is
7. Fail to reject H0 with α = 0.10
8. Fail to reject H0 at α = 0.10, but reject H0 at α = 0.05
9. Reject H0 at α = 0.05$
10. Cannot draw conclusions based on confidence intervals