PROBLEM 1

Q1) Null Hypothesis: population mean = 0.75
Alternative Hypothesis: population mean != 0.75

Q2)
Size is 937
Average is 0.7430304110448239
Standard error is 0.00415
The Z score is -1.679
The p-value is 0. 0931343

These results are significant at a level of 0.1 since the p-value is lower than that, which means we will reject Ho. They are not significant however at levels of 0.05 and 0.01.

Q3) The Standard Error would be of 0.003556 with a sample size of 1276 students.

Q4)
Null Hypothesis: The means are the same for both student populations
Alternative Hypothesis: The mean of the engaged students is different from the others.
To test this hypothesis, we can use the two-sample z-test.

Q5)
Sample Size 0: 1977
Sample Size 1: 937

Sample mean 0: 0.6399545077035914
Sample mean 1: 0.7430304110448239

Standard Error: 0. 00706412

Z-Score: -14.59

P-Value: Approximately 0

The results are significant in all of the since they lead us to reject the null hypothesis. Which means that the mean engagement between students who become knowledgeable and those who don't is indeed different.

PROBLEM 2:

Q1) Decided to use a t-test because the number of samples is less than 30.
Interval: (-14.538779208310618, 2.8721125416439532)
t-score: 1.7958848187036691
Std Error: 4.84744109661842
Mean: -5.833333333333333
Size: 12

Q2) Decided to use a t-test because the number of samples is less than 30.
Interval: (-16.50247925136669, 4.835812584700025)
t-score: 2.200985160082949
Std Error: 4.84744109661842
Mean: -5.833333333333333
Size: 12

When the above results are compared to the ones with a 90% confidence interval, we can see that the mean and standard error do not change, which is expected since the data itself remains the same. The t-score, however, becomes larges in the second confidence interval computed as does the interval, which makes sense because a 95% confidence interval would encompass more than a 90% one.

Q3) Decided to use a z-test because we now know the population's standard deviation.
With a confidence interval of 95%, we get the following:
Interval: (-15.359022042786549, 3.692355376119882)
z-score: 1.959963984540054
Std Error: 4.860134566038269
Mean: -5.833333333333333
Size: 12

When the above results are compared to the other one with a 95% confidence interval, we see that the mean remained the same, but that the standard error now has become disparate since the standard deviation's value changed. The confidence interval has become narrower than the 95% one with a t-test, the reason for that is because we now have a different standard deviation value, which is more accurate.

4) We can expect the team to lose on average 74.59% of the time. To compute this, I found the t-score using the known values of standard deviation, sample size, and that the maximum should be zero. After finding the t-score, I found the p-value, which I subtracted from 1 to find the confidence level aforementioned.