Groups	Sample	Mean	STDV	Spent	No of Conversion Successes	Conversions	Conversion rate in %	Difference in Conversion rates: (treatment - control)
CONTROL	24343	3.375	25.93639056	82146	955	0.03923099043	3.92%	0.00706982258
TREATMENT	24600	3.391	25.4141096	83415	1139	0.04630081301	4.63%	
Total	48943	3.383	25.67494579	165561	2094	0.04278446356	4.28%	

Q-3: What is the 95% confidence interval for the average amount spent per user in the contro? Use the t distribution.

					95% confidence interval for the average amount spent per user	
Groups	Sample	Mean	STDV	Spent	Lower Bound	Upper Bound
CONTROL	24341	3.375	25.93743808	82146	3.04869	3.70035
TREATMENT	24596	3.391	25.41613933	83415	3.07327	3.70846
Total	48937	3.383	25.67649241	165561	3.15527	3.61021

Q-4: Conduct a hypothesis test to see whether there is a difference in the average amount spent per user between the two groups. What are the resulting p-value and conclusion? Use the t distribution and a 5% significance level. Assume unequal variance.

H0: μ1 = μ2	Control Mean (AVERAGE(C2:C24345))	3.374518468	Treatment Mean (AVERAGE (F2:F)	3.390866946
Ha: μ1 ≠ μ2	Control Stdev (STDEV (C2:C24345)	25.936390557	Treatment Stdev (STDEV(F2: F)	25.414109599
	n1-sample control	24343	n2-sample treatment	24600
	T Test	0.943384262		

p = 0.944, statistically _insignificant_. We _fail to reject_ the null hypothesis that there is no difference in the mean amount spent per user between the control and treatment. We are using a two-sided t-test for a difference in means. Assuming unequal variance, we use the unpooled standard error.

Q-5: What is the 95% confidence interval for the difference in the average amount spent per user between the treatment and the control (treatment-control)? Use the t distribution and assume unequal variance.

standard error of the difference between the two sample means: SQRT((K3^2/K4)+(I3^2/I4))	0.232140559
margin of error: T.INV.2T(0.025,K4+I4-2)*I9	0.520336493
Upper bound: (mean_b - mean_a) + 1.96*se	0.471343973
Lower bound: (mean_b - mean_a) - 1.96*se	-0.438647017

(-0.439, 0.471) We are using a two-sample t-interval for a difference in means. Assuming unequal variance, we use the unpooled standard error.

Q-7: What is the 95% confidence interval for the conversion rate of users in the control? Use the normal distribution.

Conversion rate of control group - "A"	0.039230990
The standard error (SE) for the sample proportion in the control group would be: = sqrt(p*(1-p)/n)	0.001244334
Sample size: n = 24343	
Sample proportion (control group): p = 0.0392	
Critical value for 95% confidence level: z* = 1.96	
CI = p ± z* * SE (Upper bound)	0.04167
CI = p ± z* * SE (Lower bound)	0.036792095

Therefore, we can be 95% confident that the true conversion rate of users in the control group is between 3.68% and 4.16%. We are using a one-sample z-interval for proportions.

Q-8: What is the 95% confidence interval for the conversion rate of users in the treatment? Use the normal distribution.

Conversion rate of Treatment group - "B"	0.046300813
The standard error (SE) for the sample proportion in the control group would be: = sqrt(p*(1-p)/n)	0.001339777
Sample size: n = 24600	
Sample proportion (control group): p = 0.0392	
Critical value for 95% confidence level: z* = 1.96	
CI = p ± z* * SE (Upper bound)	0.048926776
CI = p ± z* * SE (Lower bound)	0.043674850

Therefore, we can be 95% confident that the true conversion rate of users in the treatment group is between 4.37% and 4.89%. We are using a one-sample z-interval for proportions.

Q-9: Conduct a hypothesis test to see whether there is a difference in the conversion rate between the two groups. What are the resulting p-value and conclusion? Use the normal distribution and a 5% significance level. Use the pooled proportion for the standard error.

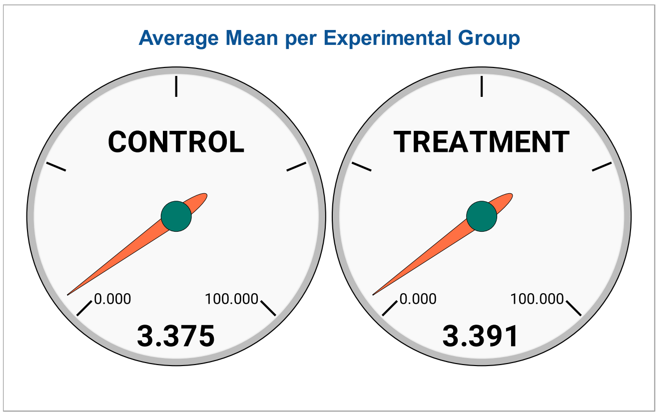
H0: p1 - p2 = 0	CONTROL	TREATMENT
Ha: p1 - p2 ≠ 0	X1	X2
The number of successes represents the number of users who converted in each group. In the context of a hypothesis test, a success is defined as the event of interest, such as a user making a purchase, signing up for a service, or clicking on a button.	955	1139
The Pooled proportion: p^ = x1+x2/n1+n2 // OR	0.042784464	
P^ = (p1*n1 + p2*n2) / (n1 + n2)	0.0427845	
where p1 is the conversion rate of the control group, and p2 is the conversion rate of the treatment group.		
The standard error:	0.001829526	
SE = sqrt(P^ * (1 - P^) * ((1/n1) + (1/n2)))		
The test statistic is t = (p1 - p2) / SE	-3.864291770	
The p-value can be calculated using a two-tailed t-distribution with degrees of freedom equal to n1 + n2 - 2:		
df = n1 + n2 - 2	48941	
Using this degrees of freedom, the p-value can be calculated as:		
p-value = 2 * T.DIST(t, df, 1)	0.000111556	

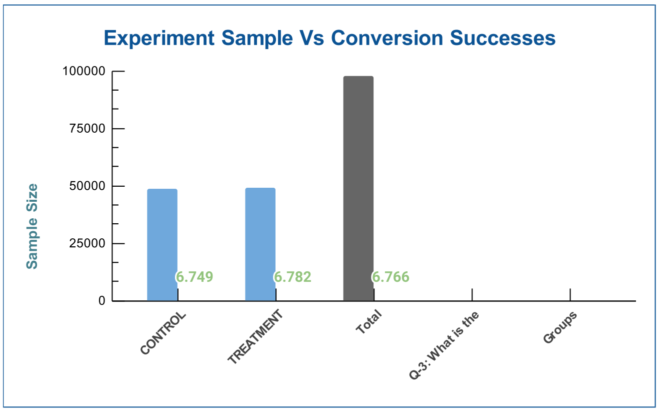
Since the p-value is less than 0.05, i.e. p = 0.0001, we can reject the null hypothesis and conclude that there is evidence of a statistically significant difference in conversion rates between the control and treatment groups. We are using a two-sample two-sided z-interval for a difference in proportions. Assuming equal proportions, we use the pooled standard error.

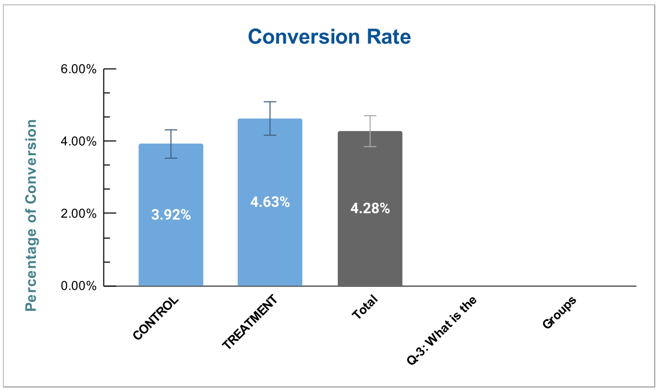
Q-10: What is the 95% confidence interval for the difference in the conversion rate between the treatment and control (treatment-control)? Use the normal distribution and unpooled proportions for the standard error.

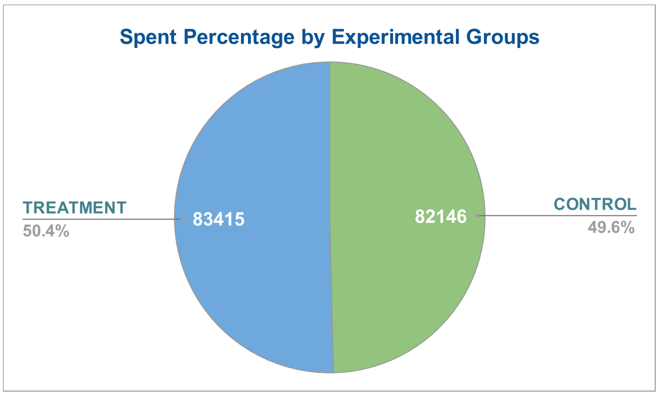
Difference in Conversion rates: (treatment - control)	0.007069823
Using unpooled proportions for the standard error, we can calculate the standard error as:	
SE = sqrt(p1*(1-p1)/n1 + p2*(1-p2)/n2)	0.001828488
To calculate the 95% confidence interval, we can use the formula:	
CI = (p1 - p2) ± z*SE	
Upper Bound	0.010653660
Lower Bound	0.003485985

Therefore, we can say with 95% confidence that the true difference in conversion rates between the treatment and control lies between 0.0035 and 0.0107. Since the interval does not contain zero, we can conclude that there is a statistically significant difference in the conversion rates between the treatment and control groups.


Average Mean per Experimental Group
CONTROL
0.000
100.000
3.375
TREATMENT
0.000
100.000
3.391


Experiment Sample Vs Conversion Successes
Sample Size
100000
75000
50000
25000
0
6.749
6.782
6.766
CONTROL
TREATMENT
Total
Q-3: What is the
Groups


Conversion Rate
Percentage of Conversion
6.00%
4.00%
2.00%
0.00%
3.92%
4.63%
4.28%
CONTROL
TREATMENT
Total
Q-3: What is the
Groups


Spent Percentage by Experimental Groups
TREATMENT
50.4%
83415
82146
CONTROL
49.6%