Double-click (or enter) to edit

```
import pandas as pd
df = pd.read_csv("customer_journey.csv")

df['Group'] = df['ReferralSource'].apply(lambda x: 'Test' if x == 'Social Media' else 'Control')
print(df['Group'].value_counts())
```

```
Group
Control    9604
Test       3115
Name: count, dtype: int64
```

```
print(df.groupby('Group')['TimeOnPage_seconds'].mean())
print(df.groupby('Group')['ItemsInCart'].mean())

print(df.groupby('Group')['Purchased'].mean())
```

Show hidden output

```
import pandas as pd
import numpy as np
df = pd.read_csv("customer_journey.csv")
df['Group'] = df['ReferralSource'].apply(lambda x: 'Test' if x == 'Social Media' else 'Control')
successes = df.groupby('Group')['Purchased'].sum()
nobs = df.groupby('Group')['Purchased'].count()

success_control = successes['Control']
success_test = successes['Test']
n_control = nobs['Control']
n_test = nobs['Test']
p_control = success_control / n_control
p_test = success_test / n_test
p_pool = (success_control + success_test) / (n_control + n_test)
se = np.sqrt(p_pool * (1 - p_pool) * (1/n_control + 1/n_test))
z = (p_control - p_test) / se
from scipy.stats import norm
pval = 2 * (1 - norm.cdf(abs(z)))

print("Z-statistic:", z)
print("p-value:", pval)

alpha = 0.05
if pval < alpha:
    print("Reject H0: Significant difference")
else:
    print("Fail to reject H0: No significant difference")
```

```
Z-statistic: 1.7611500596761331
p-value: 0.0782130080814818
Fail to reject H0: No significant difference
```

```
import pandas as pd
df = pd.read_csv("customer_journey.csv")
df['Group'] = df['ReferralSource'].apply(lambda x: 'Test' if x == 'Social Media' else 'Control')
group_metrics = df.groupby('Group').agg({
    'TimeOnPage_seconds': 'mean',
    'ItemsInCart': 'mean',
    'Purchased': 'mean'
})

print(group_metrics)
```

```
         TimeOnPage_seconds  ItemsInCart  Purchased
Group
Control           96.638484     1.139525   0.401395
Test              99.860995     1.135474   0.383628
```

```
import pandas as pd
from scipy.stats import ttest_ind, chi2_contingency
df = pd.read_csv("customer_journey.csv")
df['Group'] = df['ReferralSource'].apply(lambda x: 'Test' if x == 'Social Media' else 'Control')
time_control = df[df['Group'] == 'Control']['TimeOnPage_seconds']
time_test = df[df['Group'] == 'Test']['TimeOnPage_seconds']
```

```
t_stat_time, p_val_time = ttest_ind(time_control, time_test, equal_var=False)

cart_control = df[df['Group'] == 'Control']['ItemsInCart']
cart_test = df[df['Group'] == 'Test']['ItemsInCart']
t_stat_cart, p_val_cart = ttest_ind(cart_control, cart_test, equal_var=False)

print("T-test TimeOnPage: stat =", t_stat_time, "p-value =", p_val_time)
print("T-test ItemsInCart: stat =", t_stat_cart, "p-value =", p_val_cart)
contingency = pd.crosstab(df['Group'], df['Purchased'])
chi2, p_val_chi, dof, expected = chi2_contingency(contingency)

print("Chi-square Conversion: chi2 =", chi2, "p-value =", p_val_chi)
```

```
T-test TimeOnPage: stat = -3.2297597297841887 p-value = 0.0012466042292675005
T-test ItemsInCart: stat = 0.11621506193014616 p-value = 0.9074865219763619
Chi-square Conversion: chi2 = 3.0278761218412478 p-value = 0.0818450868158776
```

```
import pandas as pd
from scipy.stats import ttest_ind, chi2_contingency

df = pd.read_csv("customer_journey.csv")
df['Group'] = df['ReferralSource'].apply(lambda x: 'Test' if x == 'Social Media' else 'Control')

time_control = df[df['Group'] == 'Control']['TimeOnPage_seconds']
time_test = df[df['Group'] == 'Test']['TimeOnPage_seconds']
t_stat_time, p_val_time = ttest_ind(time_control, time_test, equal_var=False)

cart_control = df[df['Group'] == 'Control']['ItemsInCart']
cart_test = df[df['Group'] == 'Test']['ItemsInCart']
t_stat_cart, p_val_cart = ttest_ind(cart_control, cart_test, equal_var=False)

contingency = pd.crosstab(df['Group'], df['Purchased'])
chi2, p_val_chi, dof, expected = chi2_contingency(contingency)

print("p-value (TimeOnPage):", p_val_time)
print("p-value (ItemsInCart):", p_val_cart)
print("p-value (Conversion):", p_val_chi)
```

```
p-value (TimeOnPage): 0.0012466042292675005
p-value (ItemsInCart): 0.9074865219763619
p-value (Conversion): 0.0818450868158776
```

```
alpha = 0.05
p_val_time = 0.0012466042292675005
p_val_cart = 0.9074865219763619
p_val_conv = 0.0818450868158776

def interpret_result(metric, pval):
    if pval < alpha:
        print(f"{metric}: Significant difference (p = {pval:.4f} < {alpha})")
    else:
        print(f"{metric}: Not significant (p = {pval:.4f} >= {alpha})")

interpret_result("TimeOnPage", p_val_time)
interpret_result("ItemsInCart", p_val_cart)
interpret_result("Conversion", p_val_conv)
```

```
TimeOnPage: Significant difference (p = 0.0012 < 0.05)
ItemsInCart: Not significant (p = 0.9075 >= 0.05)
Conversion: Not significant (p = 0.0818 >= 0.05)
```

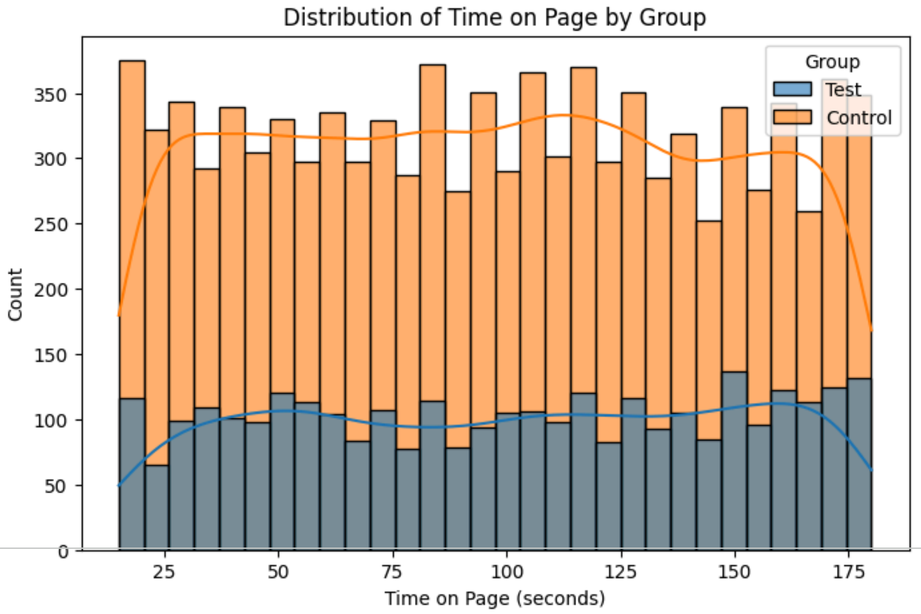
```
import pandas as pd
import numpy as np
from scipy.stats import norm
df = pd.read_csv("customer_journey.csv")
df['Group'] = df['ReferralSource'].apply(lambda x: 'Test' if x == 'Social Media' else 'Control')
uccesses = df.groupby('Group')['Purchased'].sum()
nobs = df.groupby('Group')['Purchased'].count()
success_control = successes['Control']
success_test = successes['Test']
n_control = nobs['Control']
n_test = nobs['Test']
p_control = success_control / n_control
p_test = success_test / n_test
diff = p_control - p_test
se = np.sqrt((p_control*(1-p_control))/n_control + (p_test*(1-p_test))/n_test)
z_critical = norm.ppf(1 - 0.05/2)  # two-tailed
ci_lower = diff - z_critical * se
ci_upper = diff + z_critical * se
```

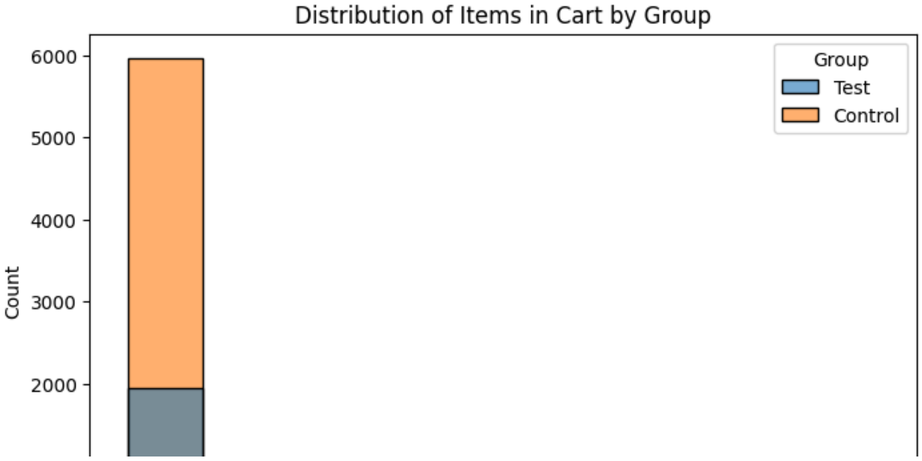
```
print("Difference in conversion rates:", diff)
print("95% Confidence Interval: (", ci_lower, ",", ci_upper, ")")
```

```
Difference in conversion rates: 0.017767643631632912
95% Confidence Interval: ( -0.001922703132474727 , 0.03745799039574055 )
```

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

df = pd.read_csv("customer_journey.csv")
df['Group'] = df['ReferralSource'].apply(lambda x: 'Test' if x == 'Social Media' else 'Control')
plt.figure(figsize=(8,5))
sns.histplot(data=df, x="TimeOnPage_seconds", hue="Group", kde=True, bins=30, alpha=0.6)
plt.title("Distribution of Time on Page by Group")
plt.xlabel("Time on Page (seconds)")
plt.ylabel("Count")
plt.show()
plt.figure(figsize=(8,5))
sns.histplot(data=df, x="ItemsInCart", hue="Group", kde=False, bins=10, alpha=0.6)
plt.title("Distribution of Items in Cart by Group")
plt.xlabel("Items in Cart")
plt.ylabel("Count")
plt.show()
conversion_rates = df.groupby('Group')['Purchased'].mean().reset_index()
plt.figure(figsize=(6,4))
sns.barplot(data=conversion_rates, x="Group", y="Purchased")
plt.title("Conversion Rate by Group")
plt.ylabel("Conversion Rate")
plt.show()
```


Distribution of Time on Page by Group
Count
0
50
100
150
200
250
300
350
25
50
75
100
125
150
175
Time on Page (seconds)
Group
Test
Control


Distribution of Items in Cart by Group
Count
2000
3000
4000
5000
6000
Group
Test
Control