In [3]:
```
!pip install plotly
```

```
Requirement already satisfied: plotly in c:\users\admin 1\.conda\lib\site-pac
kages (5.15.0)
Requirement already satisfied: packaging in c:\users\admin 1\.conda\lib\site-
packages (from plotly) (21.3)
Requirement already satisfied: tenacity>=6.2.0 in c:\users\admin 1\.conda\li
b\site-packages (from plotly) (8.0.1)
Requirement already satisfied: pyparsing!=3.0.5,>=2.0.2 in c:\users\admin 1\.
conda\lib\site-packages (from packaging->plotly) (3.0.4)
```

In [4]:
```
import pandas as pd
import datetime
from datetime import date, timedelta
import plotly.graph_objects as go
import plotly.express as px
import plotly.io as pio
pio.templates.default = "plotly_white"

control_data = pd.read_csv("control_group.csv", sep = ";")
test_data = pd.read_csv("test_group.csv", sep = ";")
```

In [5]:
```
print(control_data.head())
```

```
      Campaign Name       Date  Spend [USD]  # of Impressions     Reach  \
0  Control Campaign  1.08.2019         2280           82702.0   56930.0
1  Control Campaign  2.08.2019         1757          121040.0  102513.0
2  Control Campaign  3.08.2019         2343          131711.0  110862.0
3  Control Campaign  4.08.2019         1940           72878.0   61235.0
4  Control Campaign  5.08.2019         1835               NaN       NaN

   # of Website Clicks  # of Searches  # of View Content  # of Add to Cart  \
0               7016.0         2290.0             2159.0            1819.0
1               8110.0         2033.0             1841.0            1219.0
2               6508.0         1737.0             1549.0            1134.0
3               3065.0         1042.0              982.0            1183.0
4                  NaN            NaN                NaN               NaN

   # of Purchase
0         618.0
1         511.0
2         372.0
3         340.0
4           NaN
```

In [6]:
```
1 print(test_data.head())
```

```
   Campaign Name       Date  Spend [USD]  # of Impressions  Reach  \
0  Test Campaign  1.08.2019         3008             39550  35820
1  Test Campaign  2.08.2019         2542            100719  91236
2  Test Campaign  3.08.2019         2365             70263  45198
3  Test Campaign  4.08.2019         2710             78451  25937
4  Test Campaign  5.08.2019         2297            114295  95138

   # of Website Clicks  # of Searches  # of View Content  # of Add to Cart  \
0                 3038           1946               1069               894
1                 4657           2359               1548               879
2                 7885           2572               2367              1268
3                 4216           2216               1437               566
4                 5863           2106                858               956

   # of Purchase
0            255
1            677
2            578
3            340
4            768
```

In [8]:
```
1 control_data.columns = ["Campaign Name", "Date", "Amount Spent",
2                         "Number of Impressions", "Reach", "Website Clicks"
3                         "Searches Received", "Content Viewed", "Added to C
4                         "Purchases"]
5
6 test_data.columns = ["Campaign Name", "Date", "Amount Spent",
7                         "Number of Impressions", "Reach", "Website Clicks"
8                         "Searches Received", "Content Viewed", "Added to C
9                         "Purchases"]
```

In [9]:
```
1 print(control_data.isnull().sum())
```

```
Campaign Name            0
Date                     0
Amount Spent             0
Number of Impressions    1
Reach                    1
Website Clicks           1
Searches Received        1
Content Viewed           1
Added to Cart            1
Purchases                1
dtype: int64
```

In [28]:
```
print(test_data.isnull().sum())
```

```
Campaign Name            0
Date                     0
Amount Spent             0
Number of Impressions    0
Reach                    0
Website Clicks           0
Searches Received        0
Content Viewed           0
Added to Cart            0
Purchases                0
dtype: int64
```

In [11]:
```
control_data["Number of Impressions"].fillna(value=control_data["Number of
                                             inplace=True)
control_data["Reach"].fillna(value=control_data["Reach"].mean(),
                             inplace=True)
control_data["Website Clicks"].fillna(value=control_data["Website Clicks"]
                                      inplace=True)
control_data["Searches Received"].fillna(value=control_data["Searches Rece
                                         inplace=True)
control_data["Content Viewed"].fillna(value=control_data["Content Viewed"]
                                      inplace=True)
control_data["Added to Cart"].fillna(value=control_data["Added to Cart"].m
                                     inplace=True)
control_data["Purchases"].fillna(value=control_data["Purchases"].mean(),
                                 inplace=True)
```

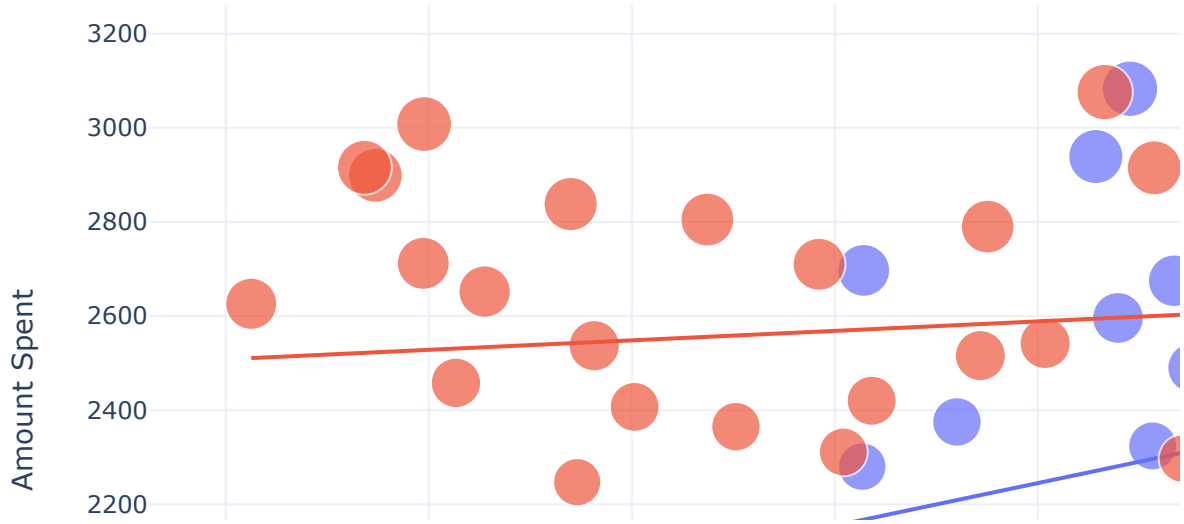
In [12]:
```
ab_data = control_data.merge(test_data,
                             how="outer").sort_values(["Date"])
ab_data = ab_data.reset_index(drop=True)
print(ab_data.head())
```

```
      Campaign Name        Date  Amount Spent  Number of Impressions    Reach
\
0  Control Campaign   1.08.2019          2280                82702.0  56930.0
1     Test Campaign   1.08.2019          3008                39550.0  35820.0
2     Test Campaign  10.08.2019          2790                95054.0  79632.0
3  Control Campaign  10.08.2019          2149               117624.0  91257.0
4     Test Campaign  11.08.2019          2420                83633.0  71286.0

   Website Clicks  Searches Received  Content Viewed  Added to Cart  Purchase
s
0          7016.0             2290.0          2159.0         1819.0      618.
0
1          3038.0             1946.0          1069.0          894.0      255.
0
2          8125.0             2312.0          1804.0          424.0      275.
0
3          2277.0             2475.0          1984.0         1629.0      734.
0
4          3750.0             2893.0          2617.0         1075.0      668.
0

C:\Users\ADMIN 1\.conda\lib\site-packages\pandas\core\reshape\merge.py:1205:
UserWarning: You are merging on int and float columns where the float values
are not equal to their int representation.
  warnings.warn(
```

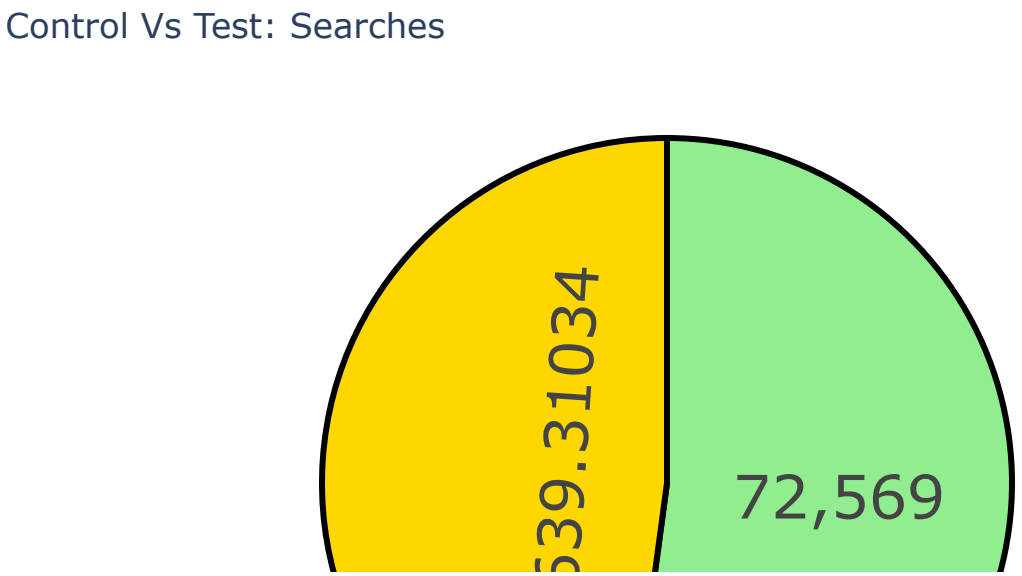
In [13]:
```
print(ab_data["Campaign Name"].value_counts())
```

```
Control Campaign    30
Test Campaign       30
Name: Campaign Name, dtype: int64
```

In [14]:
```
figure = px.scatter(data_frame = ab_data,
                    x="Number of Impressions",
                    y="Amount Spent",
                    size="Amount Spent",
                    color= "Campaign Name",
                    trendline="ols")
figure.show()
```

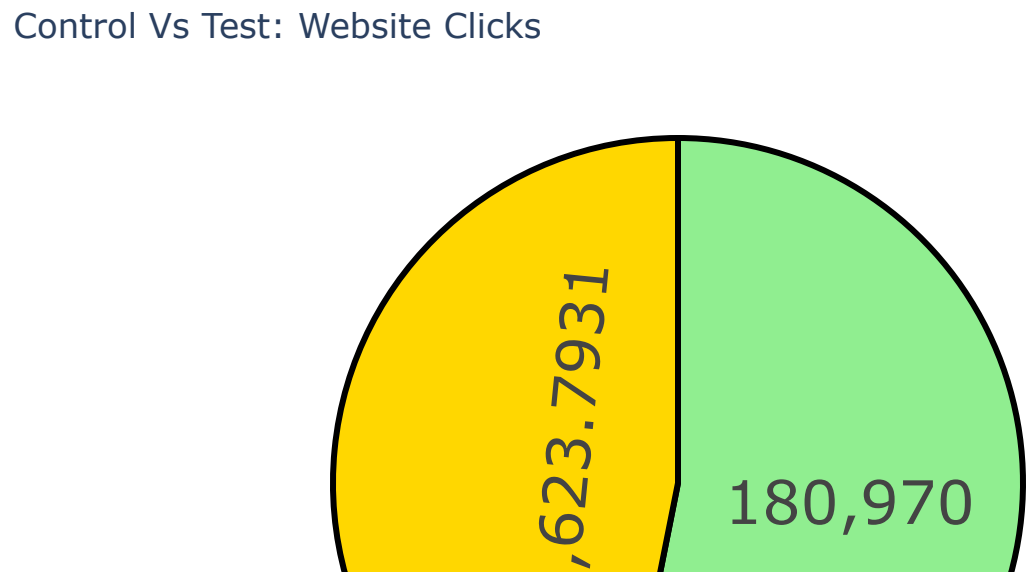


In [15]:
```
label = ["Total Searches from Control Campaign",
         "Total Searches from Test Campaign"]
counts = [sum(control_data["Searches Received"]),
          sum(test_data["Searches Received"])]
colors = ['gold','lightgreen']
fig = go.Figure(data=[go.Pie(labels=label, values=counts)])
fig.update_layout(title_text='Control Vs Test: Searches')
fig.update_traces(hoverinfo='label+percent', textinfo='value',
                  textfont_size=30,
                  marker=dict(colors=colors,
                              line=dict(color='black', width=3)))
fig.show()
```

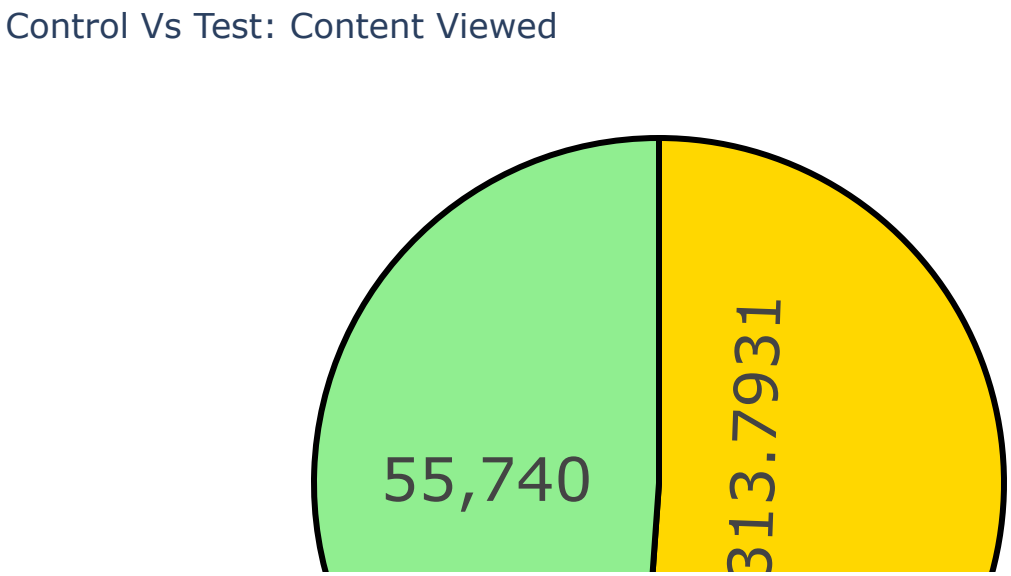


In [16]:

```
label = ["Website Clicks from Control Campaign",
         "Website Clicks from Test Campaign"]
counts = [sum(control_data["Website Clicks"]),
          sum(test_data["Website Clicks"])]
colors = ['gold','lightgreen']
fig = go.Figure(data=[go.Pie(labels=label, values=counts)])
fig.update_layout(title_text='Control Vs Test: Website Clicks')
fig.update_traces(hoverinfo='label+percent', textinfo='value',
                  textfont_size=30,
                  marker=dict(colors=colors,
                              line=dict(color='black', width=3)))
fig.show()
```

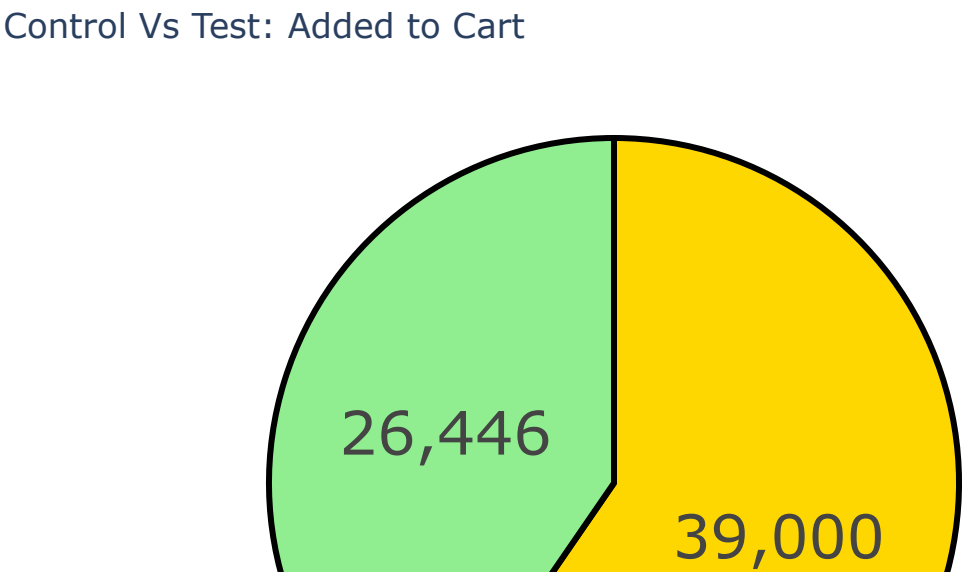


In [17]:
```
label = ["Content Viewed from Control Campaign",
         "Content Viewed from Test Campaign"]
counts = [sum(control_data["Content Viewed"]),
          sum(test_data["Content Viewed"])]
colors = ['gold','lightgreen']
fig = go.Figure(data=[go.Pie(labels=label, values=counts)])
fig.update_layout(title_text='Control Vs Test: Content Viewed')
fig.update_traces(hoverinfo='label+percent', textinfo='value',
                  textfont_size=30,
                  marker=dict(colors=colors,
                              line=dict(color='black', width=3)))
fig.show()
```



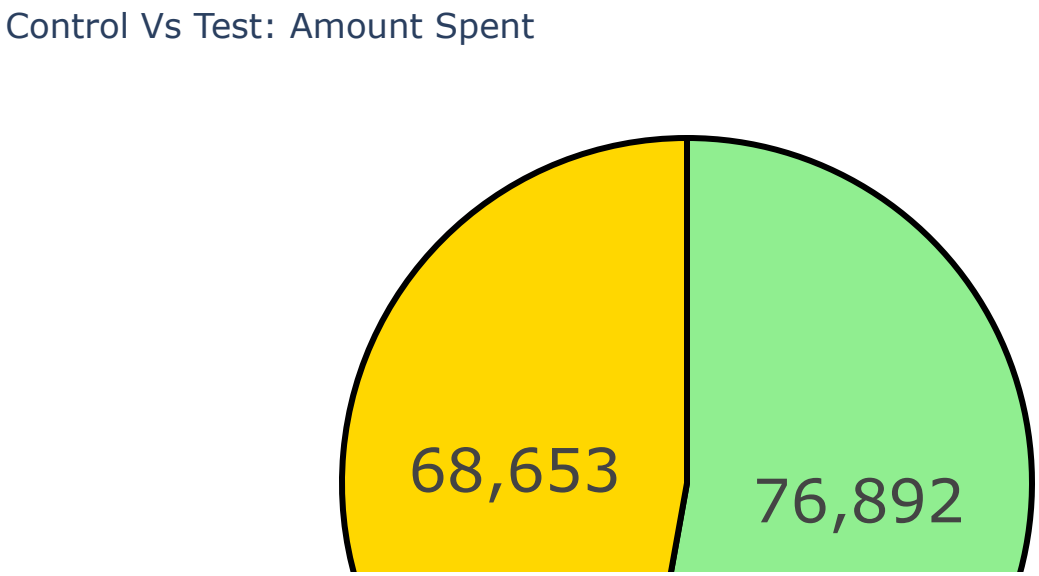
In [18]:

```
label = ["Products Added to Cart from Control Campaign",
         "Products Added to Cart from Test Campaign"]
counts = [sum(control_data["Added to Cart"]),
          sum(test_data["Added to Cart"])]
colors = ['gold','lightgreen']
fig = go.Figure(data=[go.Pie(labels=label, values=counts)])
fig.update_layout(title_text='Control Vs Test: Added to Cart')
fig.update_traces(hoverinfo='label+percent', textinfo='value',
                  textfont_size=30,
                  marker=dict(colors=colors,
                              line=dict(color='black', width=3)))
fig.show()
```



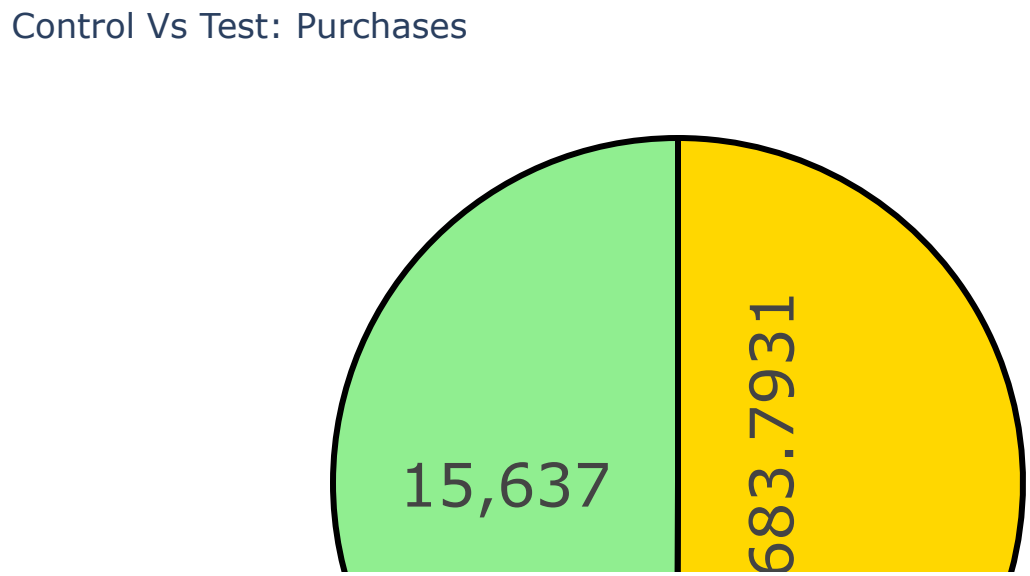
In [19]:

```
label = ["Amount Spent in Control Campaign",
         "Amount Spent in Test Campaign"]
counts = [sum(control_data["Amount Spent"]),
          sum(test_data["Amount Spent"])]
colors = ['gold','lightgreen']
fig = go.Figure(data=[go.Pie(labels=label, values=counts)])
fig.update_layout(title_text='Control Vs Test: Amount Spent')
fig.update_traces(hoverinfo='label+percent', textinfo='value',
                  textfont_size=30,
                  marker=dict(colors=colors,
                              line=dict(color='black', width=3)))
fig.show()
```

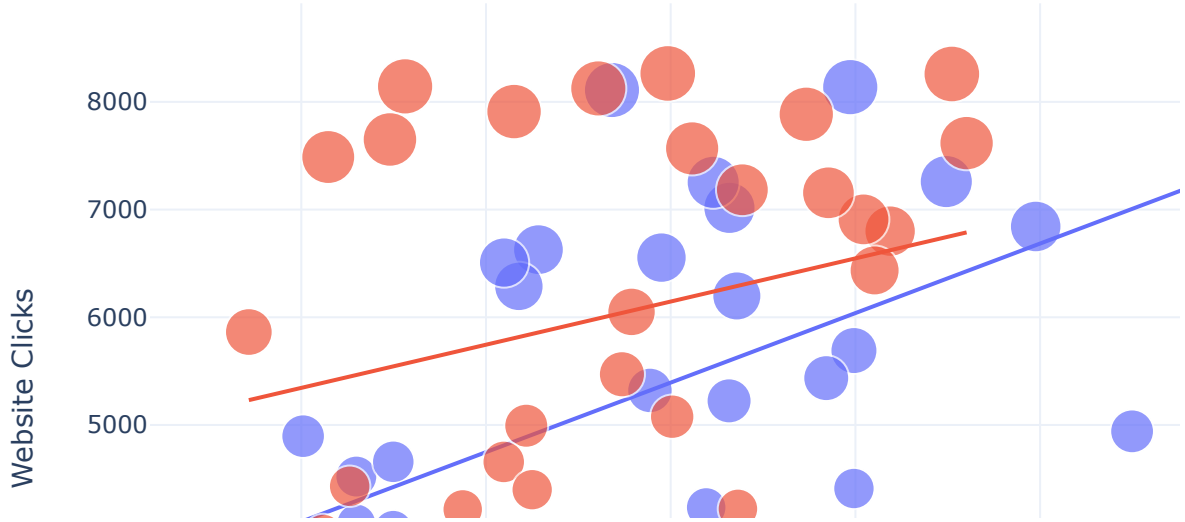


In [20]:

```
label = ["Purchases Made by Control Campaign",
         "Purchases Made by Test Campaign"]
counts = [sum(control_data["Purchases"]),
          sum(test_data["Purchases"])]
colors = ['gold','lightgreen']
fig = go.Figure(data=[go.Pie(labels=label, values=counts)])
fig.update_layout(title_text='Control Vs Test: Purchases')
fig.update_traces(hoverinfo='label+percent', textinfo='value',
                  textfont_size=30,
                  marker=dict(colors=colors,
                              line=dict(color='black', width=3)))
fig.show()
```

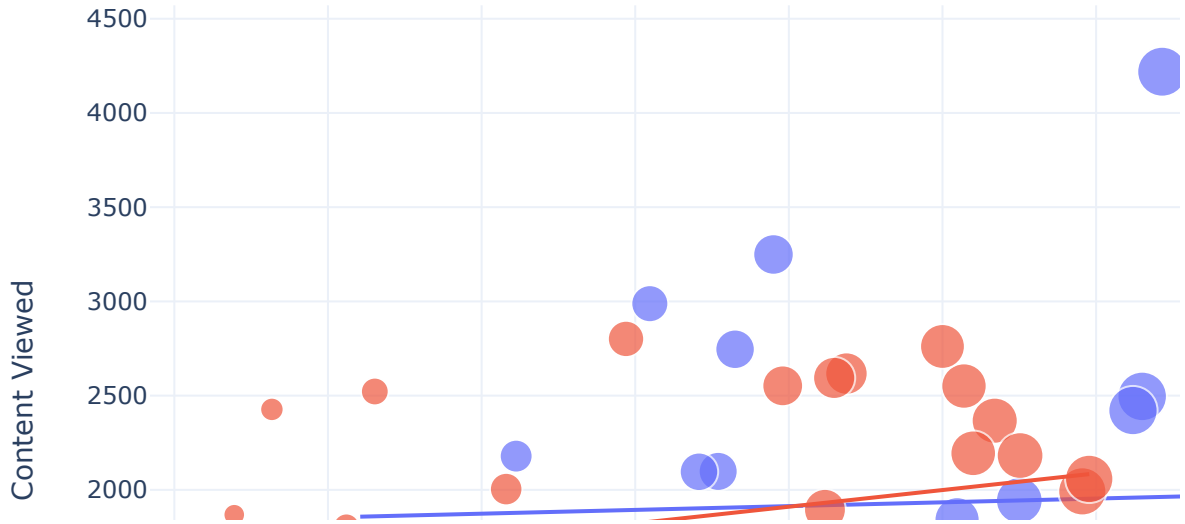


In [21]:
```
figure = px.scatter(data_frame = ab_data,
                    x="Content Viewed",
                    y="Website Clicks",
                    size="Website Clicks",
                    color= "Campaign Name",
                    trendline="ols")
figure.show()
```

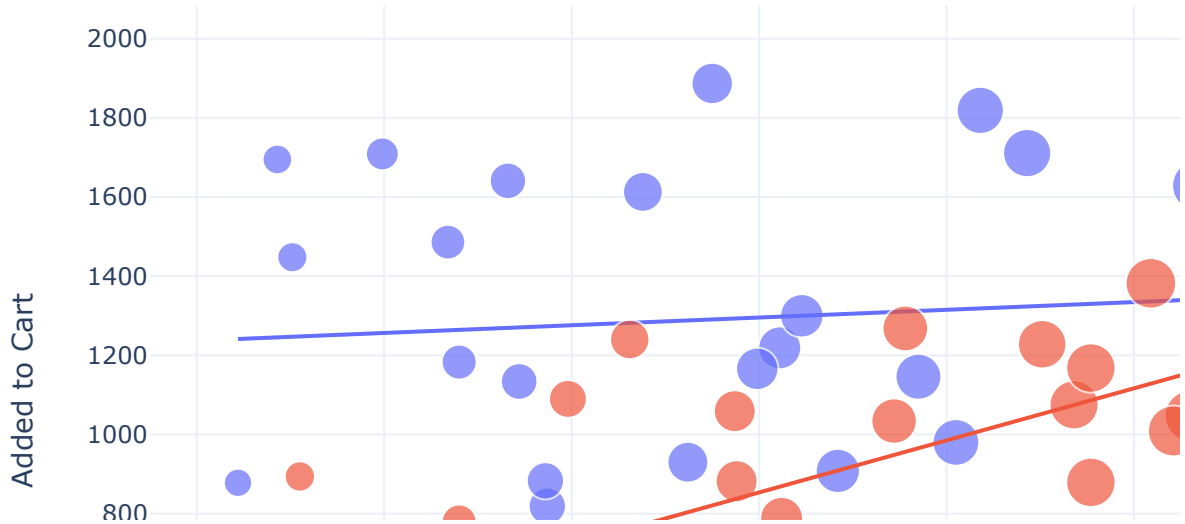


In [22]:

```
figure = px.scatter(data_frame = ab_data,
                    x="Added to Cart",
                    y="Content Viewed",
                    size="Added to Cart",
                    color= "Campaign Name",
                    trendline="ols")
figure.show()
```



In [23]:
```
figure = px.scatter(data_frame = ab_data,
                    x="Purchases",
                    y="Added to Cart",
                    size="Purchases",
                    color= "Campaign Name",
                    trendline="ols")
figure.show()
```



In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```

In [ ]:
```
1
```