In [ ]:
```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

pd.options.mode.chained_assignment = None  # default='warn'
```

Trip activity - Analysis

VEMO

Iber Ismael Piovani

Cargamos los datos de los viajes en un dataframe

In [ ]:
```
df_trips = pd.read_csv('data/trips_activity.csv')
```

Analisis previo de los datos para empezar a interpretar la conformacion de los mismos buscando nulos y valores atipicos.

Pre analysis of the data to start interpreting the conformation of the same looking for nulls and atypical values.

In [ ]:
```
# Dataset composition

df_trips.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 21486 entries, 0 to 21485
Data columns (total 16 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   Unnamed: 0         21486 non-null  int64  
 1   id_week            21486 non-null  int64  
 2   id_driver          21486 non-null  int64  
 3   id_unit            21486 non-null  int64  
 4   trip_status        21486 non-null  object 
 5   trip_rev           18889 non-null  float64
 6   trip_distance      21486 non-null  float64
 7   time_on_trip       18283 non-null  float64
 8   mean_speed         18259 non-null  float64
 9   id_shift           18259 non-null  float64
 10  request_datetime   21486 non-null  object 
 11  drop_datetime      21486 non-null  object 
 12  trips_per_hour     16712 non-null  float64
 13  shift_time         19173 non-null  object 
 14  rest_days          19173 non-null  object 
 15  shift_str_datetime 21486 non-null  object 
dtypes: float64(6), int64(4), object(6)
memory usage: 2.6+ MB
```

In [ ]:
```
df_trips.describe()
```

Out[ ]:

	Unnamed: 0	id_week	id_driver	id_unit	trip_rev	trip_distance	time_on_trip	mean_speed	id_shift	trips_per_hour
count	21486.000000	21486.0	21486.000000	21486.000000	18889.000000	21486.000000	18283.000000	18259.000000	18259.000000	16712.000000
mean	10742.500000	49.0	656.833845	106.434609	98.562022	10.832123	39.091735	19.981026	28106.821567	1.864612
std	6202.618278	0.0	252.931233	58.763279	63.986745	9.881230	20.839683	9.192492	8576.652177	1.176876
min	0.000000	49.0	6.000000	1.000000	-78.740000	0.000000	1.366667	0.000000	456.000000	0.171780
25%	5371.250000	49.0	506.000000	57.000000	52.590000	3.350000	24.008333	13.224229	25070.000000	1.094225
50%	10742.500000	49.0	720.000000	109.000000	85.390000	8.510000	35.100000	18.564461	31699.000000	1.582418
75%	16113.750000	49.0	862.000000	155.000000	128.480000	15.960000	49.233333	25.449924	34218.000000	2.310655
max	21485.000000	49.0	980.000000	211.000000	1626.290000	80.380000	207.483333	144.734695	35389.000000	43.902439

In [ ]:
```
df_trips.shape
```

Out[ ]:
```
(21486, 16)
```

In [ ]:
```
# Primero 5 filas que nos da un pantallazo muy general de los datos.
# First 5 rows that gives us a general overview of the data.

df_trips.head()
```

Out[ ]:

	Unnamed: 0	id_week	id_driver	id_unit	trip_status	trip_rev	trip_distance	time_on_trip	mean_speed	id_shift	request_datetime	drop_datetime
0	0	49	6	53	completed	70.35	9.36	43.116667	16.873310	457.0	2022-08-25 14:19	2022-08-25 15:02
1	1	49	6	19	completed	80.97	4.88	18.950000	18.205181	459.0	2022-08-27 16:09	2022-08-27 16:28
2	2	49	6	53	rider_cancelled	38.11	0.00	NaN	NaN	NaN	2022-08-25 13:08	NaT
3	3	49	6	19	completed	99.43	10.14	40.550000	16.216793	459.0	2022-08-27 10:27	2022-08-27 11:08
4	4	49	6	19	completed	640.89	27.97	111.433333	15.060125	456.0	2022-08-24 9:50	2022-08-24 11:42

In [ ]:

```python
# analizamos la existencia de valores nulos
# we analyze the existence of null values

df_trips.isnull().sum()
```

Out[ ]:

```
Unnamed: 0             0
id_week                0
id_driver              0
id_unit                0
trip_status            0
trip_rev            2597
trip_distance          0
time_on_trip        3203
mean_speed          3227
id_shift            3227
request_datetime       0
drop_datetime          0
trips_per_hour      4774
shift_time          2313
rest_days           2313
shift_str_datetime     0
dtype: int64
```

In [ ]:
```python
# Imprimimos solo los valores nulos para ver si hay una correlacion entre ellos
# We print only the null values to see if there is a correlation between them

df_trips[df_trips.isnull().any(axis=1)]
```

Out[ ]:

	Unnamed: 0	id_week	id_driver	id_unit	trip_status	trip_rev	trip_distance	time_on_trip	mean_speed	id_shift	request_datetime	drop_dat
2	2	49	6	53	rider_cancelled	38.11	0.00	NaN	NaN	NaN	2022-08-25 13:08	
11	11	49	6	19	completed	98.37	9.82	23.700000	25.506493	458.0	2022-08-26 17:01	2022-
13	13	49	6	19	driver_cancelled	20.78	0.00	NaN	NaN	NaN	2022-08-27 14:02	
29	29	49	6	53	rider_cancelled	NaN	0.00	NaN	NaN	NaN	2022-08-25 12:59	
30	30	49	6	11	completed	113.48	26.27	48.016667	36.248371	460.0	2022-08-28 16:01	2022-
...	...	...	...	...	...	...	...	...	...	...	...	
21481	21481	49	980	110	completed	51.26	6.39	24.616667	17.309256	35388.0	2022-08-27 17:08	2022-
21482	21482	49	980	110	completed	122.71	3.27	43.050000	4.561023	35387.0	2022-08-26 17:53	2022-
21483	21483	49	980	110	completed	104.91	8.38	47.483333	13.700273	35388.0	2022-08-27 21:19	2022-
21484	21484	49	980	110	completed	127.55	12.15	55.516667	13.131191	35387.0	2022-08-26 16:28	2022-
21485	21485	49	980	110	completed	34.33	5.49	18.333333	17.967272	35389.0	2022-08-28 16:38	2022-

6629 rows × 16 columns

In [ ]:
```
# pasamos las variables con fechas a formato datetime
# we pass the variables with dates to datetime format

df_trips['request_datetime'] = pd.to_datetime(df_trips['request_datetime'])
df_trips['drop_datetime'] = pd.to_datetime(df_trips['drop_datetime'])
df_trips['shift_str_datetime'] = pd.to_datetime(df_trips['shift_str_datetime'])
```

Vamos a obtener la informacion referente a distintos periodos registrados tales como cantidad de viaje por dia de semana, hora con mas viajes, etc. Para eso creamos nuevas variables que nos permitan analizar los datos de forma mas sencilla.

We are going to obtain the information referring to different registered periods such as number of trips per day of the week, hour with more trips, etc. For that we create new variables that allow us to analyze the data in a simpler way.

In [ ]:
```
# Primero vemos que tipo de datos tiene la columna trip_start_timestamp
# First we see what type of data the trip_start_timestamp column has

df_trips['request_datetime'].dtype

# Convertimos la columna a tipo datetime
# We convert the column to datetime type

df_trips['request_datetime'] = pd.to_datetime(df_trips['request_datetime'])

# Creamos una nueva columna con el dia de la semana
# We create a new column with the day of the week

df_trips['day_of_week'] = df_trips['request_datetime'].dt.day_name()

# Creamos una nueva columna con semana del año
# We create a new column with the week of the year

df_trips['week_of_year'] = df_trips['request_datetime'].dt.isocalendar().week

# Creamos una nueva columna con el mes
# We create a new column with the month

df_trips['month'] = df_trips['request_datetime'].dt.month_name()
```

```
# Creamos una nueva columna con el año
# We create a new column with the year

df_trips['year'] = df_trips['request_datetime'].dt.year

# Creamos una nueva columna con la hora
# We create a new column with the hour

df_trips['hour'] = df_trips['request_datetime'].dt.hour

# Creamos una nueva columna con el dia del mes
# We create a new column with the day of the month

df_trips['day'] = df_trips['request_datetime'].dt.day

# Creamos una nueva columna con el dia del año
# We create a new column with the day of the year

df_trips['day_of_year'] = df_trips['request_datetime'].dt.dayofyear



# Creamos un nuevo dataframe con las columnas que nos interesan
# We create a new dataframe with the columns that interest us

df_trips_day = df_trips[['request_datetime','trip_rev', 'day_of_week','week_of_year', 'month','year','hour','day','day_of_year
df_trips_day.head()
```

Out[ ]:

	request_datetime	trip_rev	day_of_week	week_of_year	month	year	hour	day	day_of_year	trip_status
0	2022-08-25 14:19:00	70.35	Thursday	34	August	2022	14	25	237	completed
1	2022-08-27 16:09:00	80.97	Saturday	34	August	2022	16	27	239	completed
2	2022-08-25 13:08:00	38.11	Thursday	34	August	2022	13	25	237	rider_cancelled
3	2022-08-27 10:27:00	99.43	Saturday	34	August	2022	10	27	239	completed
4	2022-08-24 09:50:00	640.89	Wednesday	34	August	2022	9	24	236	completed

In [ ]:
```
# vemos valores unicos de la columna trip_status
# we see unique values of the trip_status column

df_trips_day['trip_status'].unique()
```

Out[ ]:
```
array(['completed', 'rider_cancelled', 'driver_cancelled',
       'delivery_failed', 'fare_split', 'failed'], dtype=object)
```

1) How many trips are completed each day of the week?

1) Cuantos viajes son completados cada dia de la semana?

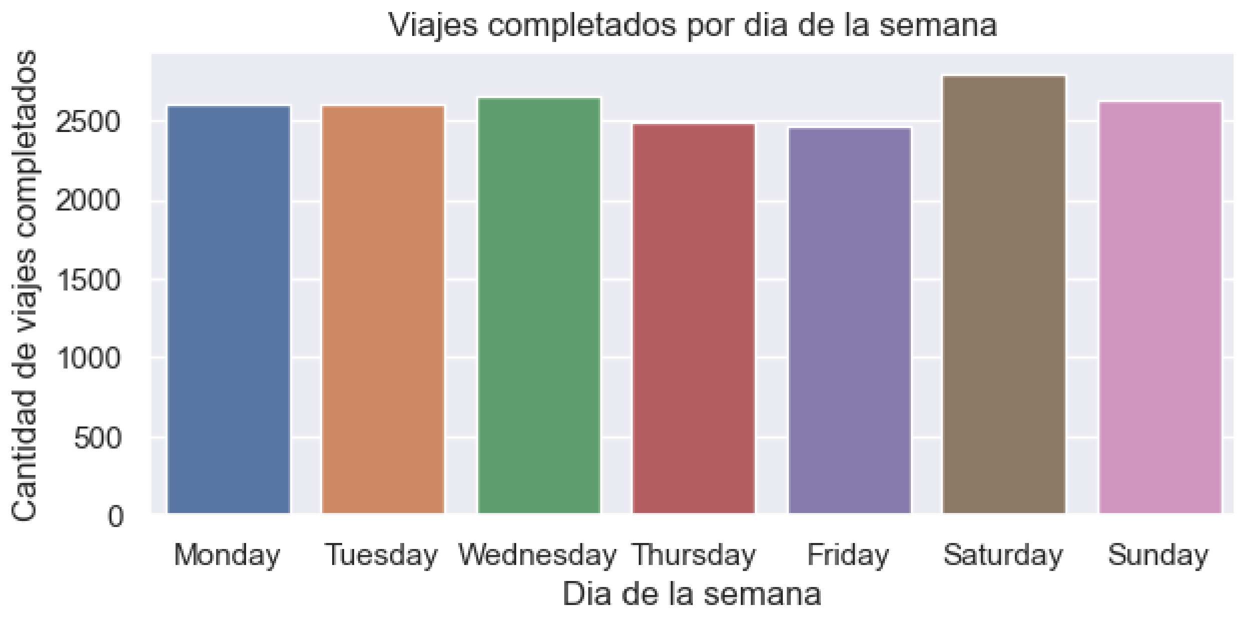
In [ ]:
```
# Sacamos la media de viajes completados por dia de la semana durante todo el año
# We take the average of completed trips per day of the week throughout the year

df_trips_day[df_trips_day['trip_status'] == 'completed'].groupby('day_of_week')['trip_status'].count().sort_values(ascending=F
```

Out[ ]:
```
day_of_week
Saturday     53.711538
Wednesday    51.153846
Sunday       50.538462
Tuesday      50.173077
Monday       50.076923
Thursday     47.961538
Friday       47.519231
Name: trip_status, dtype: float64
```

In [ ]:
```
# total viajes completados por dia de la semana
# total trips completed per day of the week

df_trips_day_completed = df_trips_day[df_trips_day['trip_status'] == 'completed']
df_trips_day_completed['day_of_week'].value_counts().sort_values(ascending=False)
```

```
Out[ ]: Saturday     2793
        Wednesday    2660
        Sunday       2628
        Tuesday      2609
        Monday       2604
        Thursday     2494
        Friday       2471
        Name: day_of_week, dtype: int64
```

```
In [ ]: # grafico de viajes completados por dia de la semana
        # graph of trips completed per day of the week

        sns.set(rc={'figure.figsize':(7,3)})

        sns.countplot(x='day_of_week', data=df_trips_day_completed, order=['Monday','Tuesday','Wednesday','Thursday','Friday','Saturda

        plt.title('Viajes completados por dia de la semana')
        plt.xlabel('Dia de la semana')
        plt.ylabel('Cantidad de viajes completados')
        plt.show()
```

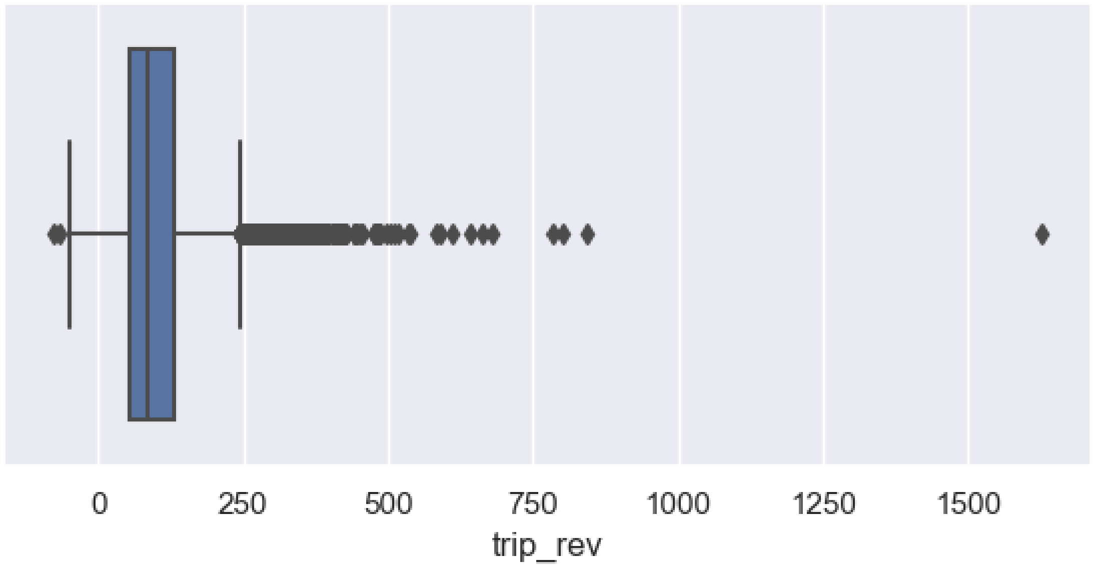


2) Which hour of the day generates the most revenue?

2) ¿Qué hora del día genera más ingresos?

In [ ]:
```
# Buscamos outliers en la columna revenue
# We look for outliers in the revenue column

sns.boxplot(x=df_trips_day['trip_rev'])
```

Out[ ]:
```
<AxesSubplot: xlabel='trip_rev'>
```



In [ ]:
```
# Porcentaje de outliers en la columna revenue
# Percentage of outliers in the revenue column

df_trips_day[df_trips_day['trip_rev'] > 750]['trip_rev'].count()/df_trips_day['trip_rev'].count()*100
```

Out[ ]:
```
0.02117634602149399
```

El porcentaje de outliers es muy bajo, por lo que no se considera necesario eliminarlos.

The percentage of outliers is very low, so it is not considered necessary to eliminate them.

In [ ]:
```
# No parece significativos los outliers, por lo que los dejamos.
# The outliers do not seem significant, so we leave them.

# Cantidad de ganancias por hora del dia con indice por hora
# Amount of earnings per hour of the day with index per hour

reve_by_hour = df_trips_day.groupby('hour')['trip_rev'].sum().sort_values(ascending=False)
reve_by_hour
```

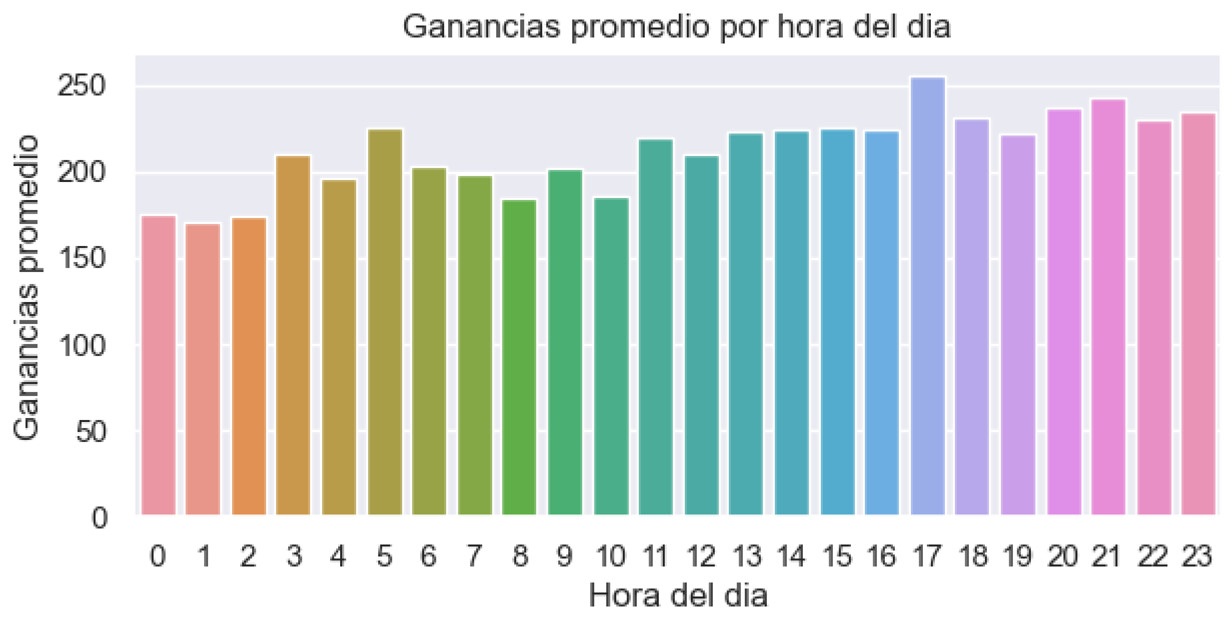
Out[ ]:
```
hour
17    93066.20
21    88358.05
20    86388.81
23    85504.48
18    84438.21
22    83886.19
5     82330.40
15    82003.86
16    81920.10
14    81627.18
13    81443.23
19    80748.67
11    79882.07
3     76598.14
12    76512.34
6     74250.66
9     73520.06
7     72410.69
4     71772.02
10    67921.53
8     67392.22
0     64020.58
2     63512.41
1     62229.94
Name: trip_rev, dtype: float64
```

In [ ]:
```
# sacamos la media de ganancias por hora del dia y ordenamos por hora del dia
# we take the average earnings per hour of the day and sort by hour of the day
```

```
reve_by_hour_mean = reve_by_hour/365
reve_by_hour_mean
```

Out[ ]:
```
hour
17    254.975890
21    242.076849
20    236.681671
23    234.258849
18    231.337562
22    229.825178
5     225.562740
15    224.668110
16    224.438630
14    223.636110
13    223.132137
19    221.229233
11    218.854986
3     209.857918
12    209.622849
6     203.426466
9     201.424822
7     198.385452
4     196.635671
10    186.086384
8     184.636219
0     175.398849
2     174.006603
1     170.492986
Name: trip_rev, dtype: float64
```

In [ ]:
```
# grafico de ganancias promedio por hora del dia
# graph of average earnings per hour of the day

sns.set(rc={'figure.figsize':(7,3)})
sns.barplot(x=reve_by_hour_mean.index, y=reve_by_hour_mean.values)


plt.title('Ganancias promedio por hora del dia')
plt.xlabel('Hora del dia')
plt.ylabel('Ganancias promedio')
plt.show()
```



La hora del dia que genera mas ganancia es las 17hs, seguido por las 20hs y 21hs.

Hacemos un grafico de lineas y barras mostrando viajes por hora completados y revenue por hora de los viajes completados.

We make a line and bar chart showing trips per hour completed and revenue per hour of completed trips.

In [ ]:
```
df_trips_day_completed_hour = df_trips[['hour','trip_rev','trip_status']]

df_trips_day_completed_hour.isnull().sum()

df_trips_day_completed_hour = df_trips_day_completed_hour[df_trips_day_completed_hour['trip_status'] == 'completed']

df_trips_day_completed_hour.isnull().sum()
```

Out[ ]:
```
hour           0
trip_rev       0
trip_status    0
dtype: int64
```

In [ ]:
```
# creamos el dataset con las columnas que nos interesan, en este caso "hour", "trip_rev" y "trip_status".
# we create the dataset with the columns that interest us, in this case "hour", "trip_rev" and "trip_status".

df_trips_day_completed_hour = df_trips[['hour','trip_rev','trip_status']]

# agrupamos por hora y sumamos las ganancias y status
# we group by hour and add earnings and status

df_trips_day_completed_hour = df_trips_day_completed_hour.groupby('hour').agg({'trip_rev':'sum','trip_status':'count'})

# creamos una nueva columna con el promedio de ganancias por hora del dia
# we create a new column with the average earnings per hour of the day

df_trips_day_completed_hour['trip_rev_mean'] = df_trips_day_completed_hour['trip_rev']/365

# creamos una nueva columna con el de viajes con ganancia por hora del dia
# we create a new column with the number of trips with earnings per hour of the day

df_trips_day_completed_hour['trip_status_mean'] = df_trips_day_completed_hour['trip_status']/365

df_trips_day_completed_hour
```

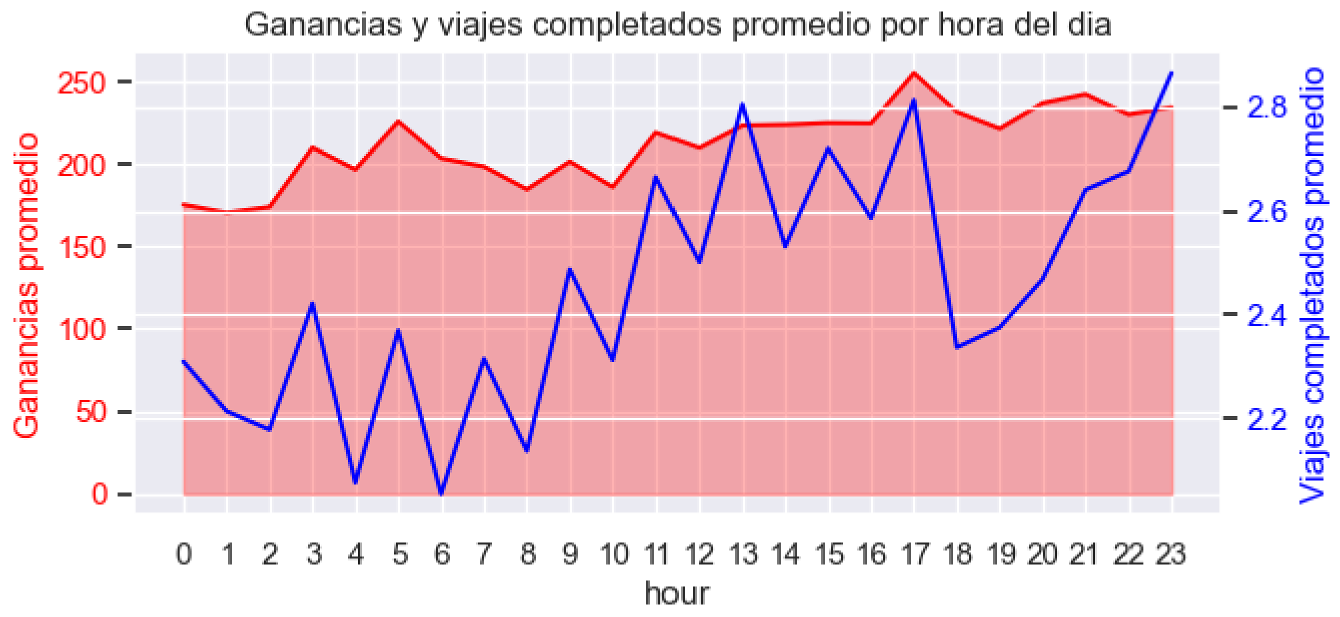
Out[ ]:

	trip_rev	trip_status	trip_rev_mean	trip_status_mean
hour				
0	64020.58	843	175.398849	2.309589
1	62229.94	808	170.492986	2.213699
2	63512.41	795	174.006603	2.178082
3	76598.14	884	209.857918	2.421918
4	71772.02	758	196.635671	2.076712
5	82330.40	865	225.562740	2.369863
6	74250.66	750	203.426466	2.054795
7	72410.69	845	198.385452	2.315068
8	67392.22	780	184.636219	2.136986
9	73520.06	908	201.424822	2.487671
10	67921.53	844	186.086384	2.312329
11	79882.07	973	218.854986	2.665753
12	76512.34	913	209.622849	2.501370
13	81443.23	1024	223.132137	2.805479
14	81627.18	924	223.636110	2.531507
15	82003.86	993	224.668110	2.720548
16	81920.10	944	224.438630	2.586301
17	93066.20	1027	254.975890	2.813699
18	84438.21	853	231.337562	2.336986
19	80748.67	867	221.229233	2.375342
20	86388.81	901	236.681671	2.468493
21	88358.05	964	242.076849	2.641096
22	83886.19	977	229.825178	2.676712

	trip_rev	trip_status	trip_rev_mean	trip_status_mean
hour				
23	85504.48	1046	234.258849	2.865753

Graficamos

In [ ]:
```python
# Generamos un grafico de doble eje para comparar ganancias y viajes completados por hora del dia
# We generate a double axis graph to compare earnings and trips completed per hour of the day

# Ganancias promedio por hora del dia
# Average earnings per hour of the day

grafico = sns.lineplot(data=df_trips_day_completed_hour, x=df_trips_day_completed_hour.index, y='trip_rev_mean', color='red')
grafico.set_ylabel('Ganancias promedio', color='red')
grafico.tick_params(axis='y', labelcolor='red')

grafico.fill_between(df_trips_day_completed_hour.index, df_trips_day_completed_hour['trip_rev_mean'], alpha=0.3, color='red')


# Viajes completados promedio por hora del dia
# Average trips completed per hour of the day

grafico2 = grafico.twinx()
sns.lineplot(data=df_trips_day_completed_hour, x=df_trips_day_completed_hour.index, y='trip_status_mean', color='blue', ax=gra
grafico2.set_ylabel('Viajes completados promedio', color='blue')
grafico2.tick_params(axis='y', labelcolor='blue')

grafico.set_xticks(df_trips_day_completed_hour.index)


plt.title('Ganancias y viajes completados promedio por hora del dia')

plt.show()
```



3) For the driver ID: 673 determine the mean time between trips (from one trip's drop_datetime, to the next trip's request_datetime).

3) Para el ID del conductor: 673 determine el tiempo medio entre viajes (desde el drop_datetime de un viaje, hasta el request_datetime del siguiente viaje).

Para obtener con precision el tiempo entre viajes debemos identificar los viajes realizados cada dia o cada turno del conductor para no obtener datos erroneos como tiempos entre viajes de mas de 24 horas. Otro factor a tener en cuenta es que el conductor puede tener una request de viaje durante la realizacion de otro viaje por lo que en ese caso no hay tiempo de espera.

To accurately obtain the time between trips, we must identify the trips made each day or each shift of the driver so as not to obtain erroneous data such as times between trips of more than 24 hours. Another factor to consider is that the driver may have a trip request while making another trip, so in that case there is no waiting time.

In [ ]:
```
# Creamos un dataframe con los datos del conductor 673 para poder analizarlos
# We create a dataframe with the data of driver 673 in order to analyze them
```

```
driver_673 = df_trips[df_trips['id_driver'] == 673]

driver_673 = driver_673[['id_driver','request_datetime','drop_datetime', 'id_shift']]


# pasamos las columnas dropoff_datetime y request_datetime a formato datetime
# we pass the dropoff_datetime and request_datetime columns to datetime format

driver_673['drop_datetime'] = pd.to_datetime(driver_673['drop_datetime'])
driver_673['request_datetime'] = pd.to_datetime(driver_673['request_datetime'])

# Ordenamos el dataframe por fecha de request_datetime
# We sort the dataframe by request_datetime date

driver_673 = driver_673.sort_values(by='request_datetime')

# reset index


driver_673 = driver_673.reset_index(drop=True)


# creamos una columna con la diferencia de tiempo entre el viaje anterior y el actual solo si el viaje es del mismo dia
# we create a column with the time difference between the previous trip and the current one only if the trip is on the same da

driver_673['diff_time'] = driver_673['request_datetime'].shift(-1) -driver_673['drop_datetime']

for i in range(len(driver_673['diff_time'])):

    if i != len(driver_673['diff_time'])-1:
        if (driver_673['id_shift'][i] == driver_673['id_shift'][i+1]):
           if (driver_673['diff_time'][i].days == -1):
                driver_673['diff_time'][i] = pd.NaT
        else:
            driver_673['diff_time'][i] = pd.NaT
    else:
        driver_673['diff_time'][i] = pd.NaT


driver_673.head(20)
```

Out[ ]:

	id_driver	request_datetime	drop_datetime	id_shift	diff_time
0	673	2022-08-22 05:10:00	2022-08-22 05:31:00	30477.0	NaT
1	673	2022-08-22 05:25:00	2022-08-22 05:55:00	30477.0	0 days 00:05:00
2	673	2022-08-22 06:00:00	2022-08-22 06:22:00	30477.0	0 days 00:08:00
3	673	2022-08-22 06:30:00	2022-08-22 06:58:00	30477.0	0 days 00:09:00
4	673	2022-08-22 07:07:00	2022-08-22 07:56:00	30477.0	NaT
5	673	2022-08-22 07:52:00	2022-08-22 08:32:00	30477.0	NaT
6	673	2022-08-22 08:29:00	2022-08-22 08:59:00	30477.0	NaT
7	673	2022-08-22 08:52:00	2022-08-22 09:35:00	30477.0	0 days 00:12:00
8	673	2022-08-22 09:47:00	2022-08-22 10:08:00	30477.0	0 days 00:07:00
9	673	2022-08-22 10:15:00	2022-08-22 10:37:00	30477.0	NaT
10	673	2022-08-22 10:31:00	2022-08-22 11:13:00	30477.0	0 days 00:07:00
11	673	2022-08-22 11:20:00	2022-08-22 11:47:00	30477.0	0 days 00:20:00
12	673	2022-08-22 12:07:00	2022-08-22 12:16:00	30477.0	0 days 00:03:00
13	673	2022-08-22 12:19:00	2022-08-22 12:44:00	30477.0	NaT
14	673	2022-08-22 12:42:00	2022-08-22 13:25:00	30477.0	NaT
15	673	2022-08-23 05:29:00	NaT	NaN	NaT
16	673	2022-08-23 05:50:00	2022-08-23 06:30:00	30478.0	0 days 00:18:00
17	673	2022-08-23 06:48:00	2022-08-23 07:54:00	30478.0	NaT
18	673	2022-08-23 07:46:00	2022-08-23 08:26:00	30478.0	0 days 00:06:00
19	673	2022-08-23 08:32:00	2022-08-23 08:47:00	30478.0	NaT

In [ ]:

```
driver_673.describe()
```

Out[ ]:

	id_driver	id_shift	diff_time
count	75.0	65.000000	29
mean	673.0	30478.984615	0 days 00:09:12.413793103
std	0.0	1.484212	0 days 00:09:43.570629661
min	673.0	30477.000000	0 days 00:00:00
25%	673.0	30478.000000	0 days 00:01:00
50%	673.0	30479.000000	0 days 00:07:00
75%	673.0	30480.000000	0 days 00:14:00
max	673.0	30481.000000	0 days 00:37:00

In [ ]:

```
# Total tiempo de espera entre viajes del conductor 673
# Total waiting time between trips of driver 673

print(f"El total de tiempo de espera entre viajes del conductor 673 es de: {driver_673['diff_time'].sum()}")
print(f"Total time of waiting between trips of driver 673 is: {driver_673['diff_time'].sum()}\n")


# promedio
# average

print(f"El promedio de espera entre viajes del conducto 673 es de: {driver_673['diff_time'].mean()}")
print(f"Average waiting between trips of driver 673 is: {driver_673['diff_time'].mean()}")
```

```
El total de tiempo de espera entre viajes del conductor 673 es de: 0 days 04:27:00
Total time of waiting between trips of driver 673 is: 0 days 04:27:00

El promedio de espera entre viajes del conducto 673 es de: 0 days 00:09:12.413793103
Average waiting between trips of driver 673 is: 0 days 00:09:12.413793103
```

4) If you had to fire one driver, who would it be? Indicate the Id_driver and the reasons that support your decision.

4) Si tuvieras que despedir a un conductor, ¿quién sería? Indique el Id_driver y las razones que respaldan su decisión.

Analizo las variables que influyen en el rendimiento de los conductores, como cantidad de viajes, revenue, tiempo entre viajes, etc.

I analyze the variables that influence the performance of the drivers, such as number of trips, revenue, time between trips, etc.

In [ ]:
```
# Creamos un dataframe de conductores sumando revenue, tiempo de espera entre viajes, cantidad de viajes completados y cantida
# We create a dataframe of drivers adding revenue, waiting time between trips, number of completed trips and number of cancele

df_trips['drop_datetime'] = pd.to_datetime(df_trips['drop_datetime'])
df_trips['request_datetime'] = pd.to_datetime(df_trips['request_datetime'])

df_trips['driver_canceled'] = df_trips['trip_status'].apply(lambda x: 1 if x == 'driver_cancelled' else 0)
df_trips['completed'] = df_trips['trip_status'].apply(lambda x: 1 if x == 'completed' else 0)
df_trips['delivery_failed'] = df_trips['trip_status'].apply(lambda x: 1 if x == 'delivery_failed' else 0)
df_trips['failed'] = df_trips['trip_status'].apply(lambda x: 1 if x == 'failed' else 0)

df_drivers = df_trips.groupby('id_driver').agg({'trip_rev':'sum','completed':'sum','driver_canceled':'sum','delivery_failed':'
df_drivers['trip_rev_mean'] = df_drivers['trip_rev']/df_drivers['completed']
df_drivers
```

Out[ ]:

id_driver	trip_rev	completed	driver_canceled	delivery_failed	failed	trips_per_hour	trip_rev_mean
6	6210.09	56	1	0	0	1.903095	110.894464
12	4902.45	48	2	0	0	1.663235	102.134375
22	4929.61	54	1	0	0	1.905580	91.289074
26	5754.06	76	3	0	0	2.297025	75.711316
31	6098.73	55	3	1	0	1.702420	110.886000
...	...	...	...	...	...	...	...
976	4858.91	42	0	0	0	1.632537	115.688333
977	4159.95	39	0	0	0	1.771220	106.665385
978	2648.22	25	0	0	0	1.711082	105.928800
979	2413.40	21	1	1	0	1.553492	114.923810
980	3853.67	34	0	0	0	1.608328	113.343235

364 rows × 7 columns

In [ ]:

```
# sacamos el promedio de espera entre viajes para cada conductor.
# we take the average waiting time between trips for each driver.

df_drivers_time_between_trips = pd.DataFrame(columns=['id_driver','diff'])

for id_driver in df_trips['id_driver'].unique():
    driver = df_trips[df_trips['id_driver'] == id_driver]
    driver = driver.sort_values(by='request_datetime')
    driver['diff'] = driver['request_datetime'].shift(-1) - driver['drop_datetime']
    for i in range(len(driver['diff'])):
        if i != len(driver['diff'])-1:
            if (driver['id_shift'].iloc[i] == driver['id_shift'].iloc[i+1]):
                if (driver['diff'].iloc[i].days == -1):
                    driver['diff'].iloc[i] = pd.NaT
            else:
                driver['diff'].iloc[i] = pd.NaT
            else:
                driver['diff'].iloc[i] = pd.NaT
    df_drivers.loc[id_driver,'diff'] = driver['diff'].mean()
    df_drivers_time_between_trips.loc[id_driver,'id_driver'] = id_driver
    df_drivers_time_between_trips.loc[id_driver,'diff'] = driver['diff'].mean()


df_drivers_time_between_trips = df_drivers_time_between_trips.sort_values(by='diff')
df_drivers_time_between_trips
```

Out[ ]:

	id_driver	diff
924	924	0 days 00:01:35
703	703	0 days 00:02:00
949	949	0 days 00:02:10
506	506	0 days 00:03:00
336	336	0 days 00:03:12
...	...	...
61	61	0 days 00:48:33.750000
785	785	0 days 00:50:00
789	789	0 days 01:02:30
970	970	0 days 01:08:00
773	773	NaT

364 rows × 2 columns

In [ ]:

```
# Unimos los dataframes df_drivers y df_drivers_time_between_trips para tener toda la informacion de los conductores en un sol
# We join the df_drivers and df_drivers_time_between_trips dataframes to have all the information of the drivers in a single d

df_drivers = df_drivers.merge(df_drivers_time_between_trips, on='id_driver')
df_drivers.drop(columns='diff_x', inplace=True)
df_drivers.rename(columns={'diff_y':'time_between_trips'}, inplace=True)
df_drivers.reset_index(inplace=True)

df_drivers
```

Out[ ]:

	index	id_driver	trip_rev	completed	driver_canceled	delivery_failed	failed	trips_per_hour	trip_rev_mean	time_between_trips
0	0	6	6210.09	56	1	0	0	1.903095	110.894464	0 days 00:07:23.478260869
1	1	12	4902.45	48	2	0	0	1.663235	102.134375	0 days 00:21:12
2	2	22	4929.61	54	1	0	0	1.905580	91.289074	0 days 00:13:56.842105263
3	3	26	5754.06	76	3	0	0	2.297025	75.711316	0 days 00:15:00
4	4	31	6098.73	55	3	1	0	1.702420	110.886000	0 days 00:13:49.411764705
...	...	...	...	...	...	...	...	...	...	...
359	359	976	4858.91	42	0	0	0	1.632537	115.688333	0 days 00:15:41.052631578
360	360	977	4159.95	39	0	0	0	1.771220	106.665385	0 days 00:08:00
361	361	978	2648.22	25	0	0	0	1.711082	105.928800	0 days 00:07:20
362	362	979	2413.40	21	1	1	0	1.553492	114.923810	0 days 00:13:36
363	363	980	3853.67	34	0	0	0	1.608328	113.343235	0 days 00:10:43.636363636

364 rows × 10 columns

In [ ]:

```
# Sacamos el ratio de exito de viajes
# We take the success ratio of trips

df_drivers['success_ratio'] = df_drivers['completed']/(df_drivers['completed'] + df_drivers['driver_canceled'])

# ordenamos por menor ratio de exito
# we sort by lower success ratio

df_drivers = df_drivers.sort_values(by='success_ratio')

df_drivers.head(10)
```

```
# df_drivers[df_drivers['id_driver'] == 789]
```

Out[ ]:

	index	id_driver	trip_rev	completed	driver_canceled	delivery_failed	failed	trips_per_hour	trip_rev_mean	time_between_trips	success_ratio
206	206	789	2827.71	30	4	3	0	1.247760	94.257000	0 days 01:02:30	0.882353
358	358	975	1048.31	8	1	0	0	1.295591	131.038750	0 days 00:19:00	0.888889
95	95	559	4797.98	43	5	1	0	1.413070	111.580930	0 days 00:12:42.352941176	0.895833
205	205	785	2103.50	18	2	1	0	1.533157	116.861111	0 days 00:50:00	0.900000
338	338	954	890.99	9	1	0	0	1.298303	98.998889	0 days 00:11:42.857142857	0.900000
21	21	173	4950.21	50	5	0	0	1.519878	99.004200	0 days 00:06:00	0.909091
175	175	728	4244.50	31	3	0	0	1.331938	136.919355	0 days 00:12:42.857142857	0.911765
127	127	633	4594.39	44	4	0	0	1.493495	104.417955	0 days 00:34:16.363636363	0.916667
341	341	957	2680.32	23	2	0	0	1.511845	116.535652	0 days 00:10:20	0.920000
103	103	573	4866.36	61	5	0	0	1.772284	79.776393	0 days 00:06:26.086956521	0.924242

Graficamos para poder observar mejor los peores 10 desempeños

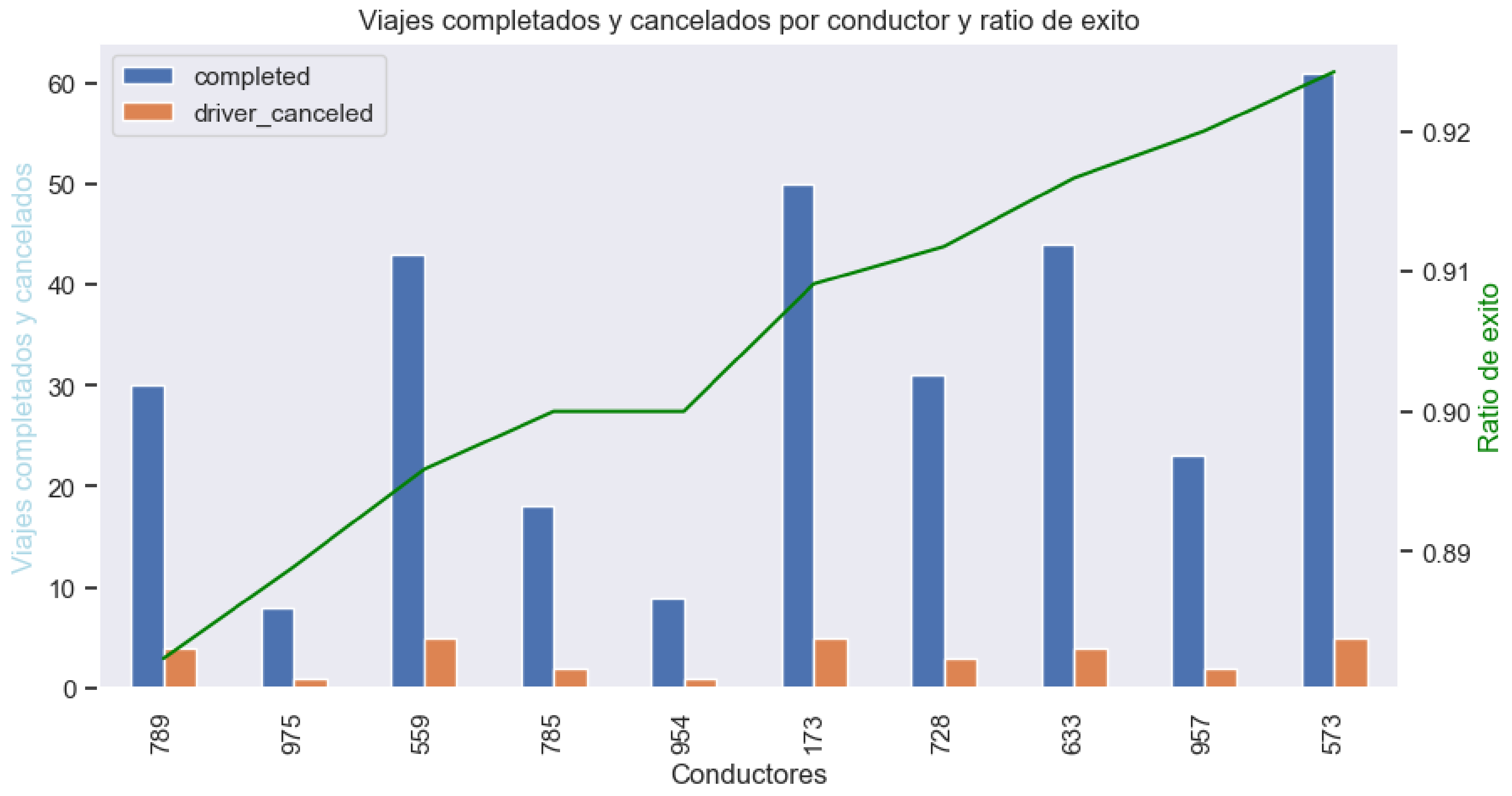
We graph to better observe the worst 10 performances

In [ ]:

```
# generamos un grafico de doble eje con el ratio de exito y los viajes completados y cancelados de los 10 peores conductores
# we generate a double axis graph with the success ratio and the completed and canceled trips of the 10 worst drivers

df_drivers_worst = df_drivers.head(10)
df_drivers_worst['id_driver'] = df_drivers_worst['id_driver'].astype(str)
```

```
# grafico de barras de cancelados y completados
# bar graph of canceled and completed

grafico_1 = df_drivers_worst.plot(x='id_driver', y=['completed','driver_canceled'], kind='bar', figsize=(10,5), title='10 peor


# grafico de linea de ratio de exito
# success ratio line graph

grafico_3 = grafico_1.twinx()
sns.lineplot(x=df_drivers_worst['id_driver'], y=df_drivers_worst['success_ratio'], color='green', ax=grafico_3)




grafico_1.grid(False)
grafico_3.grid(False)


grafico_3.set_ylabel('Ratio de exito', color='green')

grafico_1.set_xlabel('Conductores')

grafico_1.set_ylabel('Viajes completados y cancelados', color='lightblue')

grafico_1.set_title('Viajes completados y cancelados por conductor y ratio de exito')

# agrego valores de ratio a los puntos del grafico
```

```
Out[ ]: Text(0.5, 1.0, 'Viajes completados y cancelados por conductor y ratio de exito')
```



- Si tengo que despedir a un conductor optaria por el ID 789, no es el que menos viajes realiza o que menos revenue tiene pero es el que tiene un menor ratio de viajes completados y un mayor tiempo entre viajes. Estos factores nos indican que el conductor desgasta una unidad inecesarimente durante el tiempo de espera entre viajes por lo que no es eficiente.
- If i have to fire a driver i would choose the ID 789, it is not the one that makes the least trips or that has the least revenue but it is the one that has the lowest ratio of completed trips and the longest time between trips. These factors indicate that the driver unnecessarily wears out a unit during the waiting time between trips so it is not efficient.

Do you find any correlation between the parameters in the dataset that have caught your eye?

¿Encuentra alguna correlación entre los parámetros en el conjunto de datos que hayan llamado su atención?

Los conductores con mas viajes por hora son los que mas revenue generan menos viajes cancelan y generalmente menos viajes fallidos tienen. Esto les permite tener un mayor ratio de viajes completados y un menor tiempo entre viajes. Esto hace que estos conductores sean mas eficientes en la utilizacion de sus unidades.

In [ ]:
```python
df_drivers = df_drivers.sort_values(by='trips_per_hour', ascending=False)
df_drivers.head(10)
```

Out[ ]:

	index	id_driver	trip_rev	completed	driver_canceled	delivery_failed	failed	trips_per_hour	trip_rev_mean	time_between_trips	success_ratio
88	88	520	8850.49	107	4	0	0	3.101969	82.714860	0 days 00:09:37.090909090	0.963964
65	65	426	8170.42	101	1	0	0	2.983191	80.895248	0 days 00:06:58.983050847	0.990196
51	51	370	6766.16	62	0	1	0	2.723889	109.131613	0 days 00:09:39.130434782	1.000000
15	15	134	5750.69	78	0	1	0	2.713639	73.726795	0 days 00:13:01.200000	1.000000
231	231	825	912.23	13	1	0	0	2.536353	70.171538	0 days 00:10:40	0.928571
8	8	51	4338.89	51	0	0	0	2.532681	85.076275	0 days 00:06:40	1.000000
98	98	566	5970.85	87	2	1	0	2.480783	68.630460	0 days 00:07:48.813559322	0.977528
235	235	830	4066.57	65	0	0	0	2.444518	62.562615	0 days 00:12:06.382978723	1.000000
167	167	715	5624.47	73	1	0	0	2.417607	77.047534	0 days 00:10:30	0.986486
273	273	878	1311.52	17	0	0	0	2.399298	77.148235	0 days 00:09:24	1.000000

In [ ]:
```
df_drivers = df_drivers.sort_values(by='trip_rev', ascending=False)
df_drivers.head(10)
```

Out[ ]:

	index	id_driver	trip_rev	completed	driver_canceled	delivery_failed	failed	trips_per_hour	trip_rev_mean	time_between_trips	success_ratio
88	88	520	8850.49	107	4	0	0	3.101969	82.714860	0 days 00:09:37.090909090	0.963964
65	65	426	8170.42	101	1	0	0	2.983191	80.895248	0 days 00:06:58.983050847	0.990196
321	321	935	8003.72	61	0	0	0	1.857581	131.208525	0 days 00:13:32.727272727	1.000000
184	184	752	7857.63	58	0	1	0	1.615101	135.476379	0 days 00:19:06.666666666	1.000000
293	293	903	7799.88	51	3	1	0	1.427311	152.938824	0 days 00:13:54.285714285	0.944444
292	292	902	7787.79	69	0	1	0	2.105389	112.866522	0 days 00:12:10.909090909	1.000000
256	256	856	7729.13	70	0	0	0	1.971291	110.416143	0 days 00:07:15	1.000000
156	156	695	7652.69	60	0	0	0	1.492075	127.544833	0 days 00:21:30	1.000000
165	165	713	7619.78	62	0	0	0	1.854777	122.899677	0 days 00:13:54.193548387	1.000000
195	195	770	7548.49	58	1	0	0	1.584928	130.146379	0 days 00:08:18.461538461	0.983051

In [ ]:
```
df_drivers = df_drivers.sort_values(by='time_between_trips', ascending=False)
df_drivers.head(10)
```

Out[ ]:

	index	id_driver	trip_rev	completed	driver_canceled	delivery_failed	failed	trips_per_hour	trip_rev_mean	time_between_trips	success_ratio
353	353	970	1689.78	16	0	1	0	1.682942	105.611250	0 days 01:08:00	1.000000
206	206	789	2827.71	30	4	3	0	1.247760	94.257000	0 days 01:02:30	0.882353
205	205	785	2103.50	18	2	1	0	1.533157	116.861111	0 days 00:50:00	0.900000
9	9	61	4073.71	33	1	0	0	1.529569	123.445758	0 days 00:48:33.750000	0.970588
275	275	880	2502.37	26	0	1	0	1.900804	96.245000	0 days 00:45:50	1.000000
142	142	672	2616.46	25	0	0	0	1.488321	104.658400	0 days 00:42:13.333333333	1.000000
170	170	721	3405.88	25	1	0	0	1.601762	136.235200	0 days 00:42:00	0.961538
185	185	754	2290.19	20	0	0	0	1.457666	114.509500	0 days 00:41:25.714285714	1.000000
112	112	598	4204.26	44	3	2	0	1.539483	95.551364	0 days 00:40:13.846153846	0.936170
106	106	578	4911.90	47	1	0	0	1.585057	104.508511	0 days 00:40:00	0.979167