In [2]:
```
import pandas as pd
import numpy as np
from datetime import datetime, timedelta
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
import plotly.graph_objects as go
```

In [63]:
```
#file = pd.read_csv(r"https://raw.githubusercontent.com/logpai/loghub/master/HealthApp/HealthApp_2k.log_structured.csv"
```

In [8]:
```
file = pd.read_csv(r"D:\WORKOOPOLIS\NATWEST\HealthApp_2k.log_structured.csv")
```

In [9]:
```
file
```

Out[9]:

	LineId	Time	Component	Pid	Content	EventId	EventTemplate
0	1	20171223-22:15:29:606	Step_LSC	30002312	onStandStepChanged 3579	E42	onStandStepChanged <*>
1	2	20171223-22:15:29:615	Step_LSC	30002312	onExtend:1514038530000 14 0 4	E39	onExtend:<*> <*> <*> <*>
2	3	20171223-22:15:29:633	Step_StandReportReceiver	30002312	onReceive action: android.intent.action.SCREEN_ON	E41	onReceive action: android.intent.action.SCREEN_ON
3	4	20171223-22:15:29:635	Step_LSC	30002312	processHandleBroadcastAction action:android.in...	E43	processHandleBroadcastAction action:android.in...
4	5	20171223-22:15:29:635	Step_StandStepCounter	30002312	flush sensor data	E12	flush sensor data
...	...	...	...	...	...	...	...
1995	1996	20171224-0:58:53:985	Step_LSC	30002312	processHandleBroadcastAction action:android.in...	E44	processHandleBroadcastAction action:android.in...
1996	1997	20171224-0:59:7:581	Step_LSC	30002312	processHandleBroadcastAction action:android.in...	E44	processHandleBroadcastAction action:android.in...
1997	1998	20171224-1:0:0:794	Step_LSC	30002312	processHandleBroadcastAction action:android.in...	E44	processHandleBroadcastAction action:android.in...
1998	1999	20171224-1:1:0:935	Step_LSC	30002312	processHandleBroadcastAction action:android.in...	E44	processHandleBroadcastAction action:android.in...
1999	2000	20171224-1:2:35:789	Step_LSC	30002312	processHandleBroadcastAction action:android.in...	E44	processHandleBroadcastAction action:android.in...

2000 rows × 7 columns

Preprocessing

In [11]:
```
file['Time1'] = file['Time'].str.split('-').str.get(0)
file['Time1'] = pd.to_datetime(file['Time1'])
file['year'] = file['Time1'].dt.year
file['month'] = file['Time1'].dt.month
file['day'] = file['Time1'].dt.day
#file['week'] = file['Time1'].dt.weekofyear

file1 = file.drop(['Time'], axis=1)
```

In [12]:
```
file['Time2'] = file['Time'].str.split('-').str.get(1)
file['hour'] = file['Time2'].str.split(':').str.get(0)
file['minutes'] = file['Time2'].str.split(':').str.get(1)
file['seconds'] = file['Time2'].str.split(':').str.get(2)
file['Time2'] = pd.to_datetime(file['Time2'], format='%H:%M:%S:%f', errors='coerce')
file['hour_minute'] = file['Time2'].dt.strftime('%H:%M')
```

In [13]:
```
file1 = file.drop(['Time1','Time2'], axis=1)
```

In [14]:
```
file1['Component'].value_counts()
```

Out[14]:
```
Component
Step_LSC                      710
Step_SPUtils                  494
Step_ExtSDM                   482
Step_StandReportReceiver      171
HiH_HiSyncControl              42
Step_StandStepCounter          19
HiH_DataStatManager            17
HiH_HiHealthDataInsertStore    11
HiH_                           10
HiH_HiHealthBinder              9
HiH_HiAppUtil                   8
Step_FlushableStepDataCache     8
HiH_HiBroadcastUtil             5
Step_StandStepDataManager       5
HiH_ListenerManager             2
HiH_HiSyncUtil                  2
Step_HGNH                       2
Step_ScreenUtil                 1
Step_DataCache                  1
Step_NotificationUtil           1
Name: count, dtype: int64
```

In [15]:
```
list(file1['Content'])
```

```
'REPORT : 7007 5002 150089 240',
'onExtend:1514038530000 0 0 4',
'onStandStepChanged 3579',
'onStandStepChanged 3580',
'onExtend:1514038530000 1 0 4',
' getTodayTotalDetailSteps = 1514038440000##7007##548365##8661##12361##27173954',
'setTodayTotalDetailSteps=1514038440000##7008##548365##8661##12456##27174269',
'calculateCaloriesWithCache totalCalories=126797',
'calculateAltitudeWithCache totalAltitude=240',
'REPORT : 7008 5003 150111 240',
'onStandStepChanged 3581',
'onExtend:1514038531000 1 0 4',
' getTodayTotalDetailSteps = 1514038440000##7008##548365##8661##12456##27174269',
'setTodayTotalDetailSteps=1514038440000##7009##548365##8661##12551##27174951',
'calculateCaloriesWithCache totalCalories=126818',
'calculateAltitudeWithCache totalAltitude=240',
'REPORT : 7009 5004 150132 240',
'onStandStepChanged 3583',
'onExtend:1514038531000 2 0 4',
' getTodayTotalDetailSteps = 1514038440000##7009##548365##8661##12551##27174951',
```

In [16]:
```
file1['Con'] =file1['Content'].str.split('=').str.get(0)
file1['Con_log'] =file1['Content'].str.split('=').str.get(1)
file1['mix'] = file1['Content'].str.split('total').str.get(1)

file2 = file1[~file1['mix'].isnull()]
```

In [17]:
```
file2['mix1'] = file2['mix'].str.split('=').str.get(0)
file2['value'] = file2['mix'].str.split('=').str.get(1)
```

```
C:\Users\Dell\AppData\Local\Temp\ipykernel_18384\317096185.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  file2['mix1'] = file2['mix'].str.split('=').str.get(0)
C:\Users\Dell\AppData\Local\Temp\ipykernel_18384\317096185.py:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  file2['value'] = file2['mix'].str.split('=').str.get(1)
```

In [18]:
```
file3 = file2[file2['mix1']=='Calories']
```

In [19]:
```
file4 = file3.drop(['Content','Con','mix','EventTemplate','Con_log'], axis=1)
```

In [20]:
```
file5 = file4.reset_index().drop(['index'], axis=1)
```

In [21]:
```
print(file5[['hour', 'minutes', 'seconds']].isnull().any())
```

```
hour       False
minutes    False
seconds    False
dtype: bool
```

In [23]:
```
file5['value'] = pd.to_numeric(file5['value'])
file5['year'] = pd.to_numeric(file5['year'])
file5['month'] = pd.to_numeric(file5['month'])
file5['day'] = pd.to_numeric(file5['day'])
#file5['week'] = pd.to_numeric(file5['week'])
file5['hour'] = pd.to_numeric(file5['hour'])
file5['seconds'] = pd.to_numeric(file5['seconds'])
file5['minutes'] = pd.to_numeric(file5['minutes'])
```

In [24]:
```
file5.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 241 entries, 0 to 240
Data columns (total 14 columns):
 #   Column       Non-Null Count  Dtype 
---  ------       --------------  ----- 
 0   LineId       241 non-null    int64 
 1   Time         241 non-null    object
 2   Component    241 non-null    object
 3   Pid          241 non-null    int64 
 4   EventId      241 non-null    object
 5   year         241 non-null    int32 
 6   month        241 non-null    int32 
 7   day          241 non-null    int32 
 8   hour         241 non-null    int64 
 9   minutes      241 non-null    int64 
 10  seconds      241 non-null    int64 
 11  hour_minute  241 non-null    object
 12  mix1         241 non-null    object
 13  value        241 non-null    int64 
dtypes: int32(3), int64(6), object(5)
memory usage: 23.7+ KB
```

In [25]:
```
file6 = file5.drop(['Pid','LineId','Time','EventId'], axis=1)
```

In [26]:
```
file6
```

Out[26]:

	Component	year	month	day	hour	minutes	seconds	hour_minute	mix1	value
0	Step_ExtSDM	2017	12	23	22	15	29	22:15	Calories	126775
1	Step_ExtSDM	2017	12	23	22	15	29	22:15	Calories	126797
2	Step_ExtSDM	2017	12	23	22	15	30	22:15	Calories	126818
3	Step_ExtSDM	2017	12	23	22	15	31	22:15	Calories	126861
4	Step_ExtSDM	2017	12	23	22	15	32	22:15	Calories	126882
...	...	...	...	...	...	...	...	...	...	...
236	Step_ExtSDM	2017	12	24	0	11	57	00:11	Calories	0
237	Step_ExtSDM	2017	12	24	0	15	53	00:15	Calories	0
238	Step_ExtSDM	2017	12	24	0	25	16	00:25	Calories	0
239	Step_ExtSDM	2017	12	24	0	25	17	00:25	Calories	0
240	Step_ExtSDM	2017	12	24	0	28	25	00:28	Calories	0

241 rows × 10 columns

In [ ]:
```

```

In [27]:
```
file6['cal_Burned'] = file6['value'].diff()
```

In [28]:
```
file6['cal_Burned'].loc[217] = 0
```

```
C:\Users\Dell\AppData\Local\Temp\ipykernel_18384\3208568987.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  file6['cal_Burned'].loc[217] = 0
```

In [29]:
```
file6['cumulative_cal_Burned'] = file6['cal_Burned'].cumsum()
```

In [30]:
```
file6
```

Out[30]:

	Component	year	month	day	hour	minutes	seconds	hour_minute	mix1	value	cal_Burned	cumulative_cal_Burned
0	Step_ExtSDM	2017	12	23	22	15	29	22:15	Calories	126775	NaN	NaN
1	Step_ExtSDM	2017	12	23	22	15	29	22:15	Calories	126797	22.0	22.0
2	Step_ExtSDM	2017	12	23	22	15	30	22:15	Calories	126818	21.0	43.0
3	Step_ExtSDM	2017	12	23	22	15	31	22:15	Calories	126861	43.0	86.0
4	Step_ExtSDM	2017	12	23	22	15	32	22:15	Calories	126882	21.0	107.0
...	...	...	...	...	...	...	...	...	...	...	...	...
236	Step_ExtSDM	2017	12	24	0	11	57	00:11	Calories	0	0.0	4433.0
237	Step_ExtSDM	2017	12	24	0	15	53	00:15	Calories	0	0.0	4433.0
238	Step_ExtSDM	2017	12	24	0	25	16	00:25	Calories	0	0.0	4433.0
239	Step_ExtSDM	2017	12	24	0	25	17	00:25	Calories	0	0.0	4433.0
240	Step_ExtSDM	2017	12	24	0	28	25	00:28	Calories	0	0.0	4433.0

241 rows × 12 columns

TOTAL Calories Burned in mean time

In [31]:
```
time_str1 = '22:15'
time_str2 = '00:28'

datetime1 = datetime.strptime(time_str1, '%H:%M')
datetime2 = datetime.strptime(time_str2, '%H:%M')
```

In [32]:
```
time_difference = datetime2 - datetime1
```

In [33]:
```
time_difference
```

Out[33]:
```
datetime.timedelta(days=-1, seconds=7980)
```

```
# this whole analysis is going to be of 7980 seconds  or  2 hours,13 minutes
```

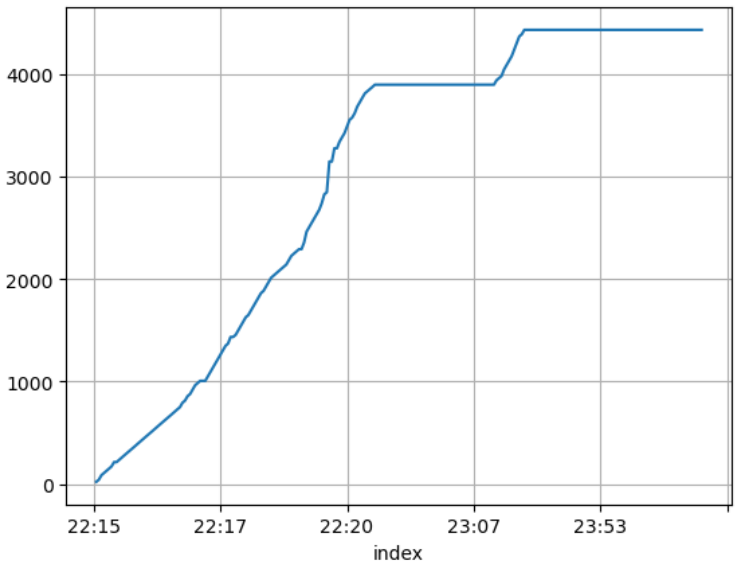
7980 seconds or 2 hours,13 minutes

In [ ]:
```

```

cumulative_cal_Burned vs hour_minute

In [34]:
```
df = pd.DataFrame()
df['index'] = file6['hour_minute']
df['cumulative_cal_Burned'] = file6['cumulative_cal_Burned']
df = df.set_index('index')
```

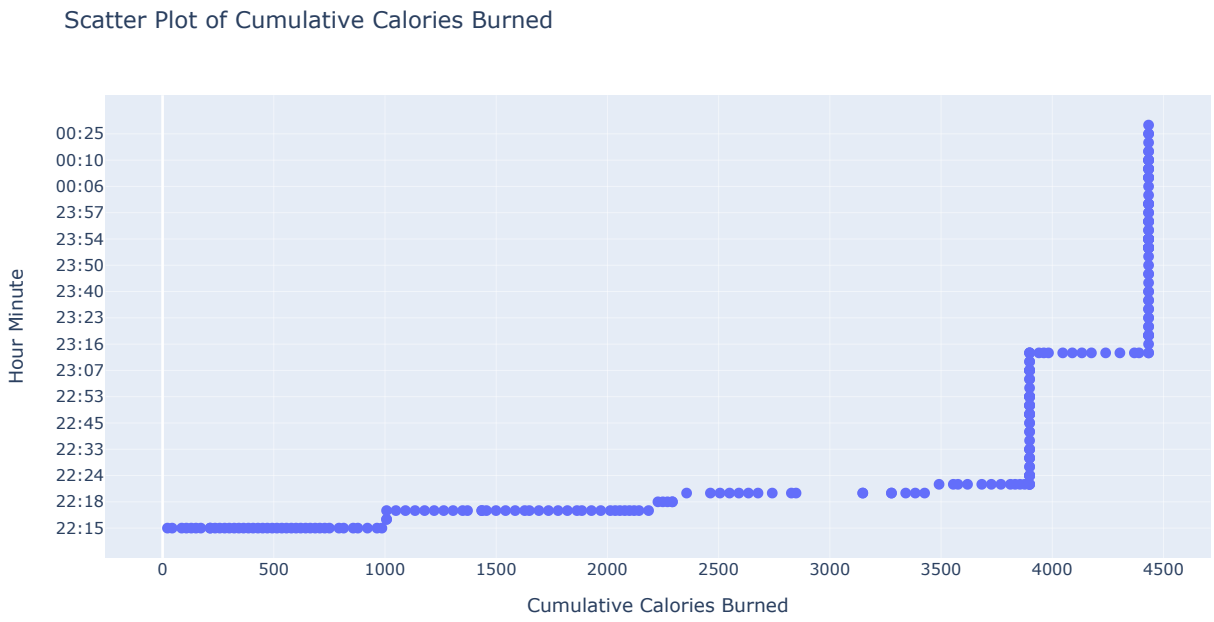
In [35]:
```
df['cumulative_cal_Burned'].plot(kind='line')
plt.grid(True)
```



```
# total Calories burned by person is around 4433.0 in 2 hour and 13 minutes
```

In [36]:

```
fig = go.Figure()

fig.add_trace(go.Scatter(
    x=file6['cumulative_cal_Burned'],
    y=file6['hour_minute'],
    mode='markers',
    marker=dict(size=8),
))


fig.update_layout(
    title='Scatter Plot of Cumulative Calories Burned',
    xaxis=dict(title='Cumulative Calories Burned'),
    yaxis=dict(title='Hour Minute'),

)


fig.show()
```



In [37]:

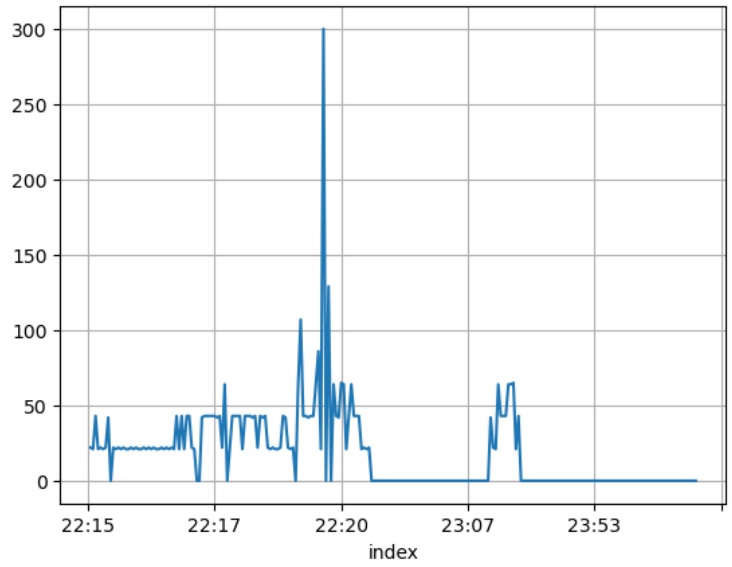
```
# as per above graph, the person has burned around 1371 calories which lap was around 2:00 mintues
# in second lap, after break person has burned 921 calories and lap was around 2.00

```

cal_Burned vs hour_minute

In [38]:

```
df1 = pd.DataFrame()
df1['index'] = file6['hour_minute']
df1['cal_Burned'] = file6['cal_Burned']
df1 = df1.set_index('index')
```

In [40]:
```
df1['cal_Burned'].plot(kind='line')
plt.grid(True)
```

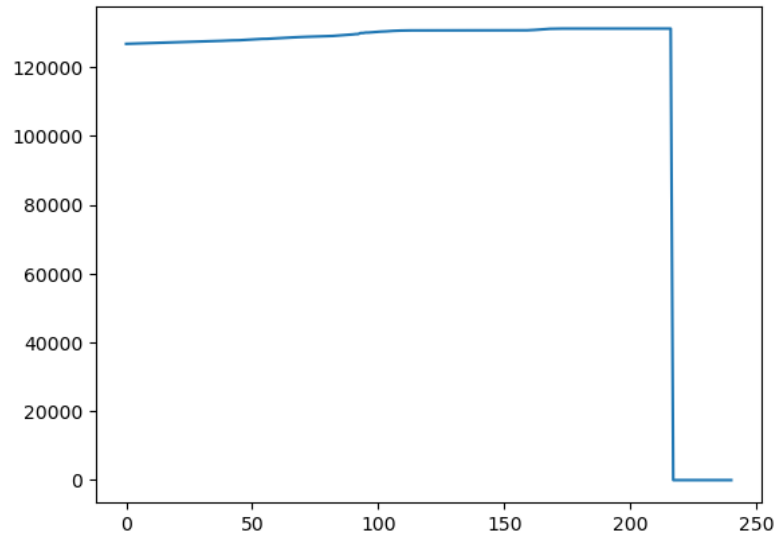



```
# there is fluctuation in Calories burn, it could be due to running fast and slow
# as you can see around 22.17 to 20:19, there is highest rate of Calories burn, may be person must be running fast
# in other cases, he must be running slow
# sometime it was 0, person must have stop running
```

value

In [41]:
```
file6['value'].plot()
```

Out[41]: <Axes: >




```
# as per old history person have burned 126775 before 22.15
```

in different time span cal burned

In [42]:
```
file6
```

Out[42]:

	Component	year	month	day	hour	minutes	seconds	hour_minute	mix1	value	cal_Burned	cumulative_cal_Burned
0	Step_ExtSDM	2017	12	23	22	15	29	22:15	Calories	126775	NaN	NaN
1	Step_ExtSDM	2017	12	23	22	15	29	22:15	Calories	126797	22.0	22.0
2	Step_ExtSDM	2017	12	23	22	15	30	22:15	Calories	126818	21.0	43.0
3	Step_ExtSDM	2017	12	23	22	15	31	22:15	Calories	126861	43.0	86.0
4	Step_ExtSDM	2017	12	23	22	15	32	22:15	Calories	126882	21.0	107.0
...	...	...	...	...	...	...	...	...	...	...	...	...
236	Step_ExtSDM	2017	12	24	0	11	57	00:11	Calories	0	0.0	4433.0
237	Step_ExtSDM	2017	12	24	0	15	53	00:15	Calories	0	0.0	4433.0
238	Step_ExtSDM	2017	12	24	0	25	16	00:25	Calories	0	0.0	4433.0
239	Step_ExtSDM	2017	12	24	0	25	17	00:25	Calories	0	0.0	4433.0
240	Step_ExtSDM	2017	12	24	0	28	25	00:28	Calories	0	0.0	4433.0

241 rows × 12 columns

In [ ]:
```

```

In [47]:
```
fd = pd.DataFrame()
fd
```

Out[47]:

—

In [48]:
```
fd['hour'] = file6['hour']
fd['minutes'] = file6['minutes']
fd['seconds'] = file6['seconds']
fd['cal_Burned'] = file6['cal_Burned']
fd['cumulative_cal_Burned'] = file6['cumulative_cal_Burned']
fd
```

Out[48]:

	hour	minutes	seconds	cal_Burned	cumulative_cal_Burned
0	22	15	29	NaN	NaN
1	22	15	29	22.0	22.0
2	22	15	30	21.0	43.0
3	22	15	31	43.0	86.0
4	22	15	32	21.0	107.0
...	...	...	...	...	...
236	0	11	57	0.0	4433.0
237	0	15	53	0.0	4433.0
238	0	25	16	0.0	4433.0
239	0	25	17	0.0	4433.0
240	0	28	25	0.0	4433.0

241 rows × 5 columns

In [49]:
```
fd['hourtime'] = fd['hour'].astype(str) + ':' + fd['minutes'].astype(str) + ':' + fd['minutes'].astype(str)
```

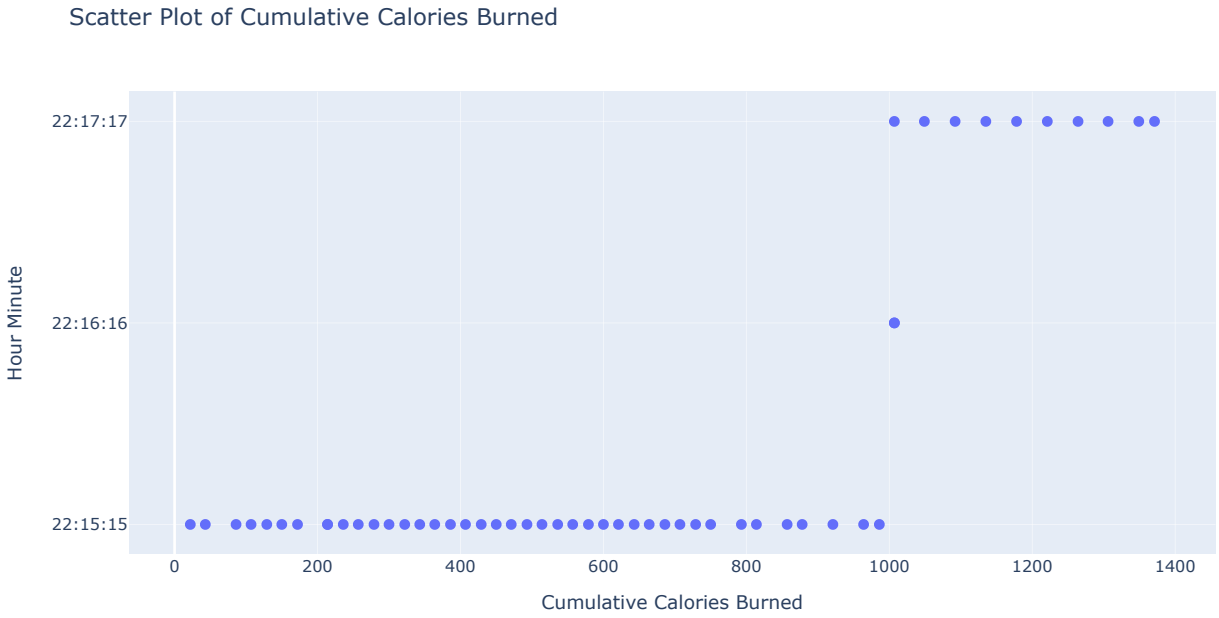
In [50]:
```
first_lap = fd[(fd['minutes'] <= 17) & (fd['cumulative_cal_Burned'] <= 1371)]
```

In [53]:
```
first_lap.head()
```

Out[53]:

	hour	minutes	seconds	cal_Burned	cumulative_cal_Burned	hourtime
1	22	15	29	22.0	22.0	22:15:15
2	22	15	30	21.0	43.0	22:15:15
3	22	15	31	43.0	86.0	22:15:15
4	22	15	32	21.0	107.0	22:15:15
5	22	15	32	22.0	129.0	22:15:15

In [54]:
```
fig = go.Figure()

fig.add_trace(go.Scatter(
    x=first_lap['cumulative_cal_Burned'],
    y=first_lap['hourtime'],
    mode='markers',
    marker=dict(size=8),
))


fig.update_layout(
    title='Scatter Plot of Cumulative Calories Burned',
    xaxis=dict(title='Cumulative Calories Burned'),
    yaxis=dict(title='Hour Minute'),

)


fig.show()
```




```
1. During the first lap person burned around 1371 calories inwhich in the first minute person has burned around
   1007 calories in the next minute during the first lap he has burned only 364 calories.The rate of calorie burn in
   the second minute of first lap reduced by 63.85 percent.

```

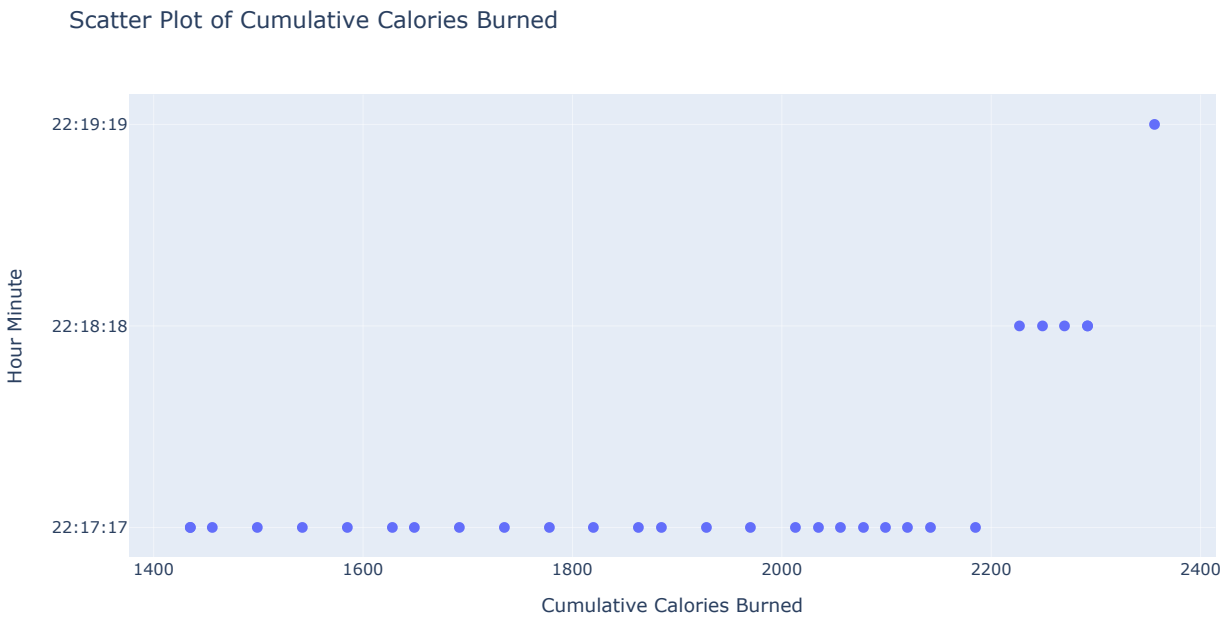
In [55]:
```
second_lap = fd[(fd['cumulative_cal_Burned'] <= 2356) & (fd['cumulative_cal_Burned'] > 1371)]
```

In [57]:
```
1 second_lap
```

Out[57]:

	hour	minutes	seconds	cal_Burned	cumulative_cal_Burned	hourtime
54	22	17	25	64.0	1435.0	22:17:17
55	22	17	28	0.0	1435.0	22:17:17
56	22	17	45	21.0	1456.0	22:17:17
57	22	17	45	43.0	1499.0	22:17:17
58	22	17	46	43.0	1542.0	22:17:17
59	22	17	46	43.0	1585.0	22:17:17
60	22	17	47	43.0	1628.0	22:17:17
61	22	17	47	21.0	1649.0	22:17:17
62	22	17	48	43.0	1692.0	22:17:17
63	22	17	48	43.0	1735.0	22:17:17
64	22	17	49	43.0	1778.0	22:17:17
65	22	17	49	42.0	1820.0	22:17:17
66	22	17	50	43.0	1863.0	22:17:17
67	22	17	50	22.0	1885.0	22:17:17
68	22	17	51	43.0	1928.0	22:17:17
69	22	17	51	42.0	1970.0	22:17:17
70	22	17	52	43.0	2013.0	22:17:17
71	22	17	53	22.0	2035.0	22:17:17
72	22	17	54	21.0	2056.0	22:17:17
73	22	17	55	22.0	2078.0	22:17:17
74	22	17	55	21.0	2099.0	22:17:17
75	22	17	56	21.0	2120.0	22:17:17
76	22	17	57	22.0	2142.0	22:17:17
77	22	17	58	43.0	2185.0	22:17:17
78	22	18	0	42.0	2227.0	22:18:18
79	22	18	1	22.0	2249.0	22:18:18
80	22	18	2	21.0	2270.0	22:18:18
81	22	18	5	22.0	2292.0	22:18:18
82	22	18	6	0.0	2292.0	22:18:18
83	22	19	8	64.0	2356.0	22:19:19

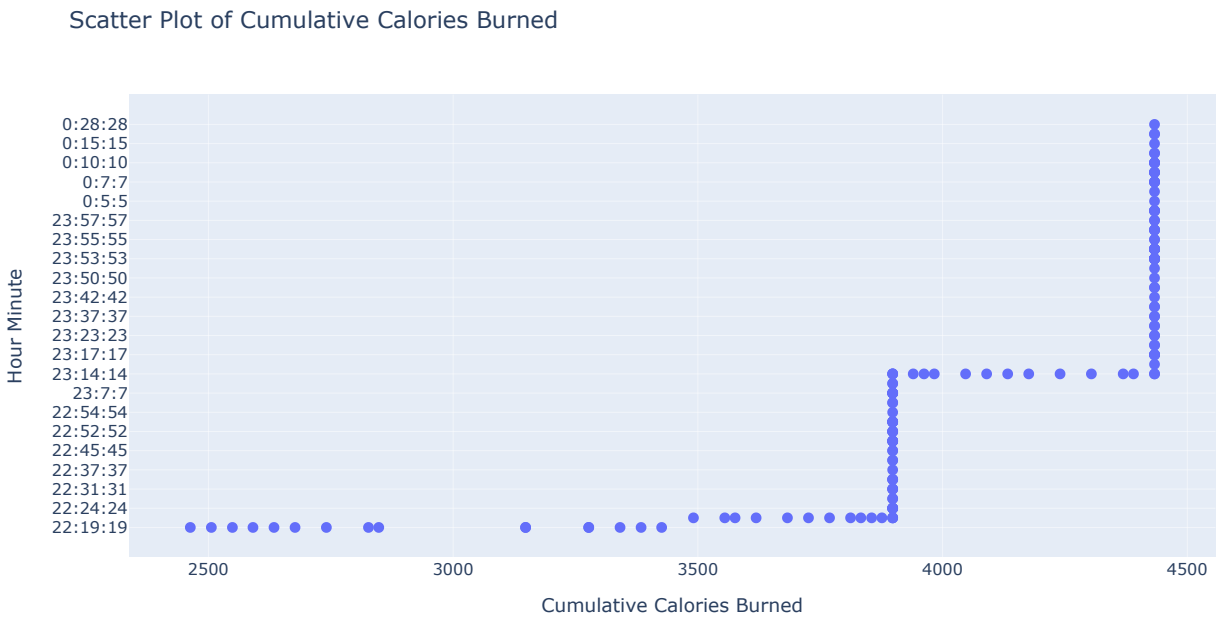
In [58]:
```
fig = go.Figure()

fig.add_trace(go.Scatter(
    x=second_lap['cumulative_cal_Burned'],
    y=second_lap['hourtime'],
    mode='markers',
    marker=dict(size=8),
))


fig.update_layout(
    title='Scatter Plot of Cumulative Calories Burned',
    xaxis=dict(title='Cumulative Calories Burned'),
    yaxis=dict(title='Hour Minute'),

)


fig.show()
```



In [ ]:
```
1. During the second lap person burned around 921 calories in which in the first minute person has burned around
   750 calories in the next minute during the second lap he has burned only 171 calories.The rate of calorie burn in
   the second minute of second lap reduced by 77.2 percent.
```

In [59]:
```
third_lap = fd[fd['cumulative_cal_Burned'] > 2356]
```

In [60]:
```
fig = go.Figure()

fig.add_trace(go.Scatter(
    x=third_lap['cumulative_cal_Burned'],
    y=third_lap['hourtime'],
    mode='markers',
    marker=dict(size=8),
))


fig.update_layout(
    title='Scatter Plot of Cumulative Calories Burned',
    xaxis=dict(title='Cumulative Calories Burned'),
    yaxis=dict(title='Hour Minute'),

)


fig.show()
```



In [ ]:
```
1. During the third lap person burned around 1970 calories in the first minute person has burned around
    1435 calories in the second minute during the third lap he has burned only 535 calories.The rate of calorie burn in
    the second minute of third lap reduced by 62.71 percent.
```

Over all Report

```
Title: "Comprehensive Fitness Analysis: Unveiling Caloric Expenditure Patterns Over 2 Hours and 13 Minutes"

In the span of 7980 seconds, equivalent to 2 hours and 13 minutes, a detailed examination of the fitness analytics
reveals intriguing insights. According to the graphical representation, the individual expended approximately 1371
calories in a lap lasting around 2:00 minutes.

Notably, in the second lap, following a brief break, the caloric burn reached 921 calories within a 2-minute span. The
data suggests fluctuations in caloric expenditure, potentially attributed to variations in running pace—highlighted
prominently between 22:17 and 20:19, indicating a period of heightened caloric burn, possibly indicative of vigorous
running. Conversely, instances of zero caloric burn suggest moments of halted running.

A closer look at the second lap unveils a significant reduction in calorie burn rate, dropping by 77.2 percent from
750 calories in the first minute to 171 calories in the subsequent minute. Similarly, in the third lap, despite an
overall caloric expenditure of 1970 calories, there was a 62.71 percent reduction in the calorie burn rate between the
first and second minutes, from 1435 to 535 calories.

This comprehensive analysis not only sheds light on the overall caloric burn but also dissects minute-by-minute
trends, offering valuable insights into the individual's varying running intensities and potential periods of rest.
```

In [ ]:
```
```