# ASSIGNMENT SOLUTION

**The following Common Boilerplate code to create a Spark Session has to be executed before running the queries.**

```
from pyspark.sql import SparkSession
import getpass
username = getpass.getuser()
spark= SparkSession. \
builder. \
config('spark.ui.port','0'). \
config("spark.sql.warehouse.dir", f"/user/{username}/warehouse"). \
enableHiveSupport(). \
master('yarn'). \
getOrCreate()
```

**Note : Use Pyspark2 for executing the below queries.**

## Question 1

### A.1

```
cust_schema = 'customer_id long,purchase_date date,product_id integer,transaction_amount double'


transactions_df = spark.read \
.format("csv") \
.schema(cust_schema) \
.load("/public/trendytech/datasets/cust_transf.csv")


start_date = "2023-05-01"
end_date = "2023-06-30"
```

filtered_df = transactions_df.filter((transactions_df.purchase_date >= start_date) & (transactions_df.purchase_date <= end_date))

revenue_df = filtered_df.groupBy("product_id").sum("transaction_amount").withColumnRenamed("sum(transaction_amount)", "revenue")

top_products_no_cache = revenue_df.sort("revenue",ascending=False).limit(10).show()

```
cust_schema = 'customer_id long,purchase_date date,product_id integer,transaction_amount double'
```

```
transactions_df = spark.read \
.format("csv") \
.schema(cust_schema) \
.load("/public/trendytech/datasets/cust_transf.csv")
```

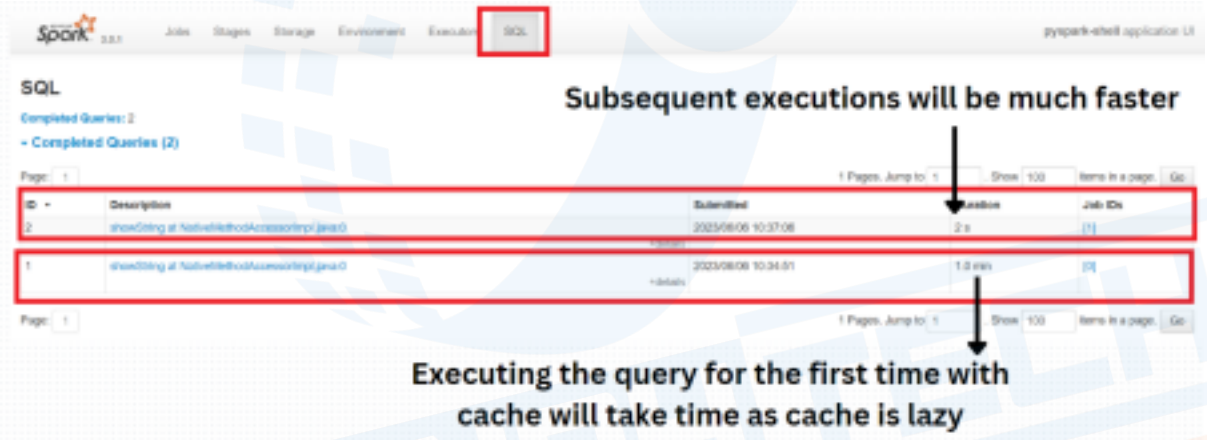
```
start_date = "2023-05-01"
end_date = "2023-06-30"
filtered_df = transactions_df.filter((transactions_df.purchase_date >= start_date) & (transactions_df.purchase_date <= end_date))
```

```
revenue_df = filtered_df.groupBy("product_id").sum("transaction_amount").withColumnRenamed("sum(transaction_amount)", "revenue")
top_products_no_cache = revenue_df.sort("revenue",ascending=False).limit(10).show()
```

```
+----------+--------------------+
|product_id|             revenue|
+----------+--------------------+
|      1001| 8.747870076028482E8|
|      1003|  6.997946075949888E8|
|      1002|5.248822075897857E8|
|      1005| 4.373060075933379E8|
|      1004| 3.498098075985674E8|
|      1015|  12537.909999999963|
|      1014|  11492.909999999963|
|      1013|  10447.909999999963|
|      1012|   9402.909999999965|
|      1011|   8357.909999999967|
+----------+--------------------+
```


**#with caching**

```
start_date = "2023-05-01"

end_date = "2023-06-30"

cached_filtered_df = transactions_df.filter((transactions_df.purchase_date >= start_date) & (transactions_df.purchase_date <= end_date)).cache()


revenue_df_with_cache = cached_filtered_df.groupBy("product_id").sum("transaction_amount").withColumnRenamed("sum(transaction_amount)", "revenue")


top_products_with_cache = revenue_df_with_cache.orderBy("revenue", ascending=False).limit(10).show()
```




**A.2**

```
customer_transactions = filtered_df.groupBy("customer_id").sum("transaction_amount").withColumnRenamed("sum(transaction_amount)", "cust_amount")


customer_transactions.show()


top_customers = customer_transactions.sort("cust_amount", ascending=False)


top_10_customers = top_customers.limit(10).show()
```

**A.3**

```
spark.sql("create database tt_cust_transaction")
```

**#before caching**

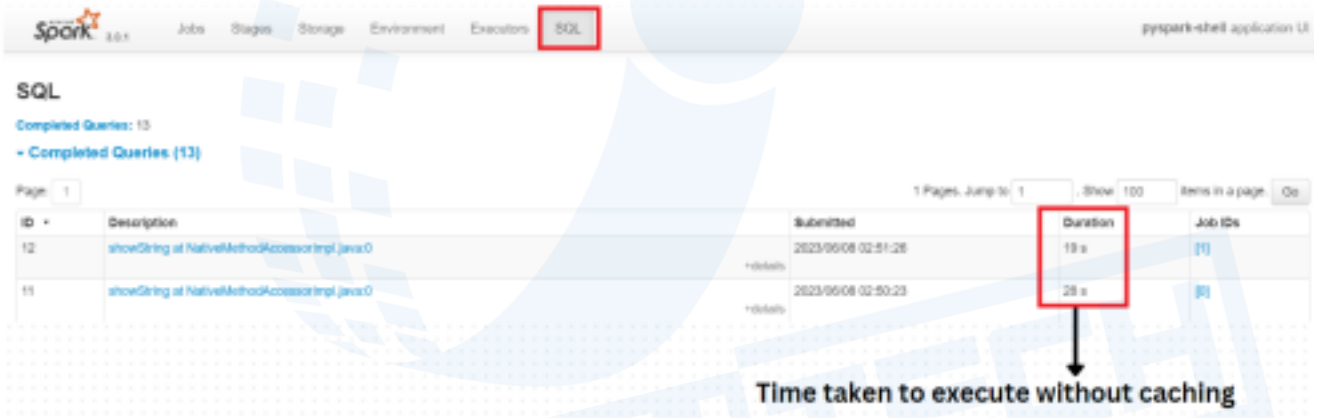
```
spark.sql("create table
tt_cust_transaction.customer_transactions_ext(customer_id
long,purchase_date date,product_id integer,transaction_amount double)
USING csv location '/public/trendytech/datasets/cust_transf.csv'")
```

```
spark.sql("SELECT product_id, SUM(transaction_amount) AS revenue FROM
tt_cust_transaction.customer_transactions_ext WHERE purchase_date >=
'2023-05-01' AND purchase_date <= '2023-06-30' GROUP BY product_id
ORDER BY revenue DESC LIMIT 10").show()
```

```
+----------+--------------------+
|product_id|             revenue|
+----------+--------------------+
|      1001| 8.7478700760284 83E8|
|      1003| 6.997946075949881E8|
|      1002|5.248022075897 8045E8|
|      1005| 4.3730600759333 79E8|
|      1004| 3.498098075985674E8|
|      1015|  12537.909999999963|
|      1014|  11492.909999999963|
|      1013|  10447.909999999963|
|      1012|   9402.909999999965|
|      1011|   8357.909999999967|
+----------+--------------------+
```

```
spark.sql("SELECT customer_id, SUM(transaction_amount) AS cust_amount
FROM tt_cust_transaction.customer_transactions_ext WHERE
purchase_date >= '2023-05-01' AND purchase_date <= '2023-06-30' GROUP
BY customer_id ORDER BY cust_amount DESC LIMIT 10").show()
```

```
+-----------+--------------------+
|customer_id|         cust_amount|
+-----------+--------------------+
|       1001| 3.1808845800053 36E8|
|       1004| 3.1013425800086 87E8|
|       1005|2.6240905800151232E8|
|       1003|2.1468385800145328E8|
|       1002|2.0672965800144082E8|
|       1011|1.9086143271084768E8|
|       1006|1.9085620771084768E8|
|       1015|1.6700301271081635E8|
|       1010|1.6699778771081635E8|
|       1014|   1.5109356771079E8|
+-----------+--------------------+
```

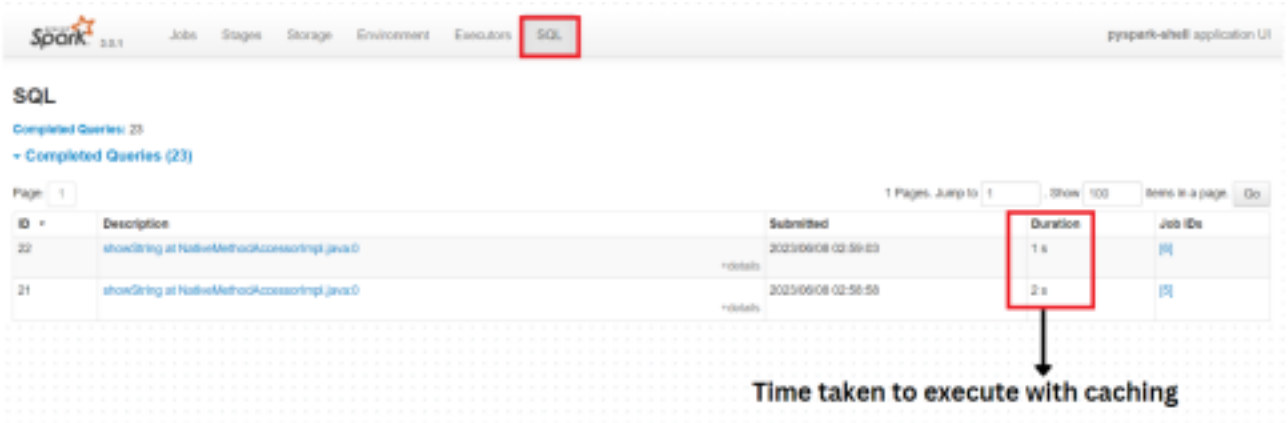



**#after caching**

```
spark.sql("cache table tt_cust_transaction.customer_transactions_ext")
```

```
spark.sql("SELECT product_id, SUM(transaction_amount) AS revenue FROM tt_cust_transaction.customer_transactions_ext WHERE purchase_date >= '2023-05-01' AND purchase_date <= '2023-06-30' GROUP BY product_id ORDER BY revenue DESC LIMIT 10").show()
```

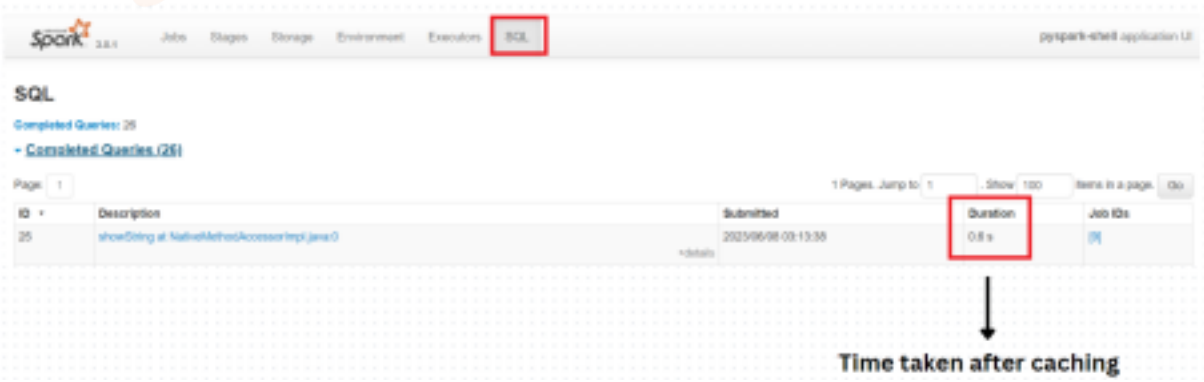
```
spark.sql("SELECT customer_id, SUM(transaction_amount) AS cust_amount FROM tt_cust_transaction.customer_transactions_ext WHERE purchase_date >= '2023-05-01' AND purchase_date <= '2023-06-30' GROUP BY customer_id ORDER BY cust_amount DESC LIMIT 10").show()
```




**A.4**

**#using cache**

```
from pyspark.sql.functions import year, month

new_df = transactions_df.withColumn("purchase_year",
year("purchase_date")).withColumn("purchase_month",
month("purchase_date"))

from pyspark.sql.functions import countDistinct


customer_month_counts = new_df.groupBy("customer_id", "purchase_year",
"purchase_month").agg(countDistinct("purchase_month").alias("distinct_mon
t hs")).cache()


regular_customers = customer_month_counts.filter("distinct_months = 1")
    \ .groupBy("customer_id").count() \
    .orderBy("count", ascending=False).limit(10).show()
```



**#using persist**

```
from pyspark.sql.functions import year, month

from pyspark.sql.functions import countDistinct

from pyspark.storagelevel import StorageLevel

new_df = transactions_df.withColumn("purchase_year",
year("purchase_date")).withColumn("purchase_month",
month("purchase_date"))
customer_month_counts = new_df.groupBy("customer_id", "purchase_year",
"purchase_month").agg(countDistinct("purchase_month").alias("distinct_mon
t hs")).persist(StorageLevel.MEMORY_AND_DISK_SER)


regular_customers = customer_month_counts.filter("distinct_months = 1")

    \ .groupBy("customer_id").count() \

    .orderBy("count", ascending=False).limit(10).show()
```

**A.5**

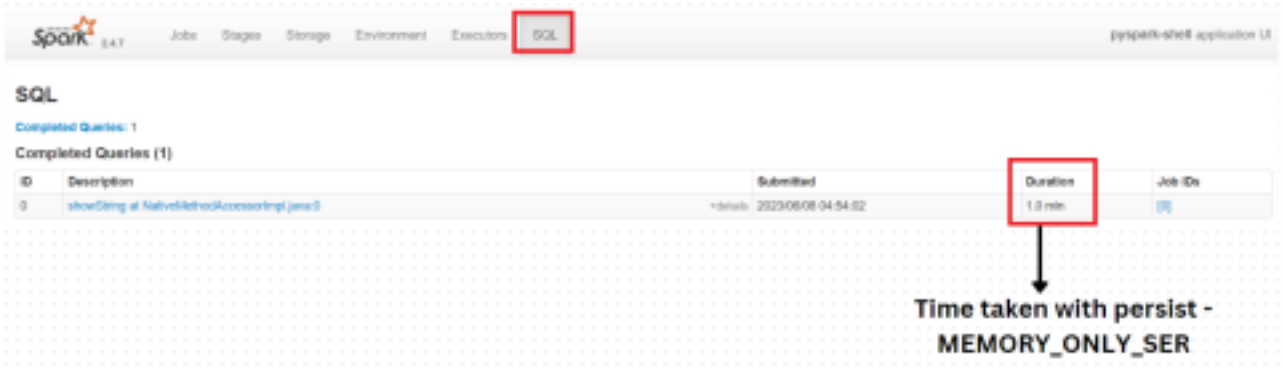
**#MEMORY ONLY**

```
from pyspark.sql.functions import year, month

from pyspark.sql.functions import countDistinct

from pyspark.storagelevel import StorageLevel


new_df = transactions_df.withColumn("purchase_year",
year("purchase_date")).withColumn("purchase_month",
month("purchase_date"))


customer_month_counts = new_df.groupBy("customer_id", "purchase_year",
"purchase_month").agg(countDistinct("purchase_month").alias("distinct_mon
t hs")).persist(StorageLevel.MEMORY_ONLY)
```

```
regular_customers = customer_month_counts.filter("distinct_months = 1")
    \ .groupBy("customer_id").count() \
    .orderBy("count", ascending=False).limit(10).show()
```

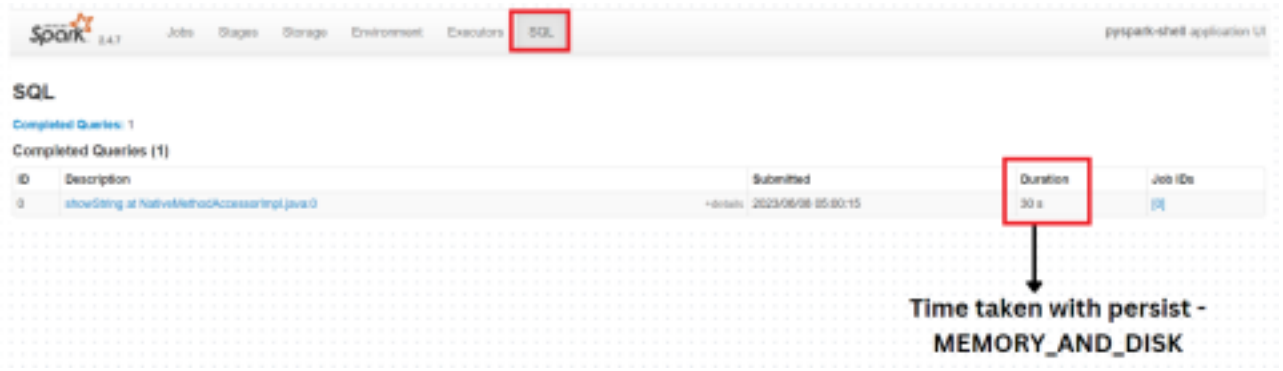

**# MEMORY_ONLY_SER**

```
from pyspark.sql.functions import year, month
from pyspark.sql.functions import countDistinct
from pyspark.storagelevel import StorageLevel

new_df = transactions_df.withColumn("purchase_year",
year("purchase_date")).withColumn("purchase_month",
month("purchase_date"))

customer_month_counts = new_df.groupBy("customer_id", "purchase_year",
"purchase_month").agg(countDistinct("purchase_month").alias("distinct_mon
t hs")).persist(StorageLevel.MEMORY_ONLY_SER)

regular_customers = customer_month_counts.filter("distinct_months = 1")
    \ .groupBy("customer_id").count() \
    .orderBy("count", ascending=False).limit(10).show()
```




**# MEMORY_AND_DISK**

```
from pyspark.sql.functions import year, month

from pyspark.sql.functions import countDistinct

from pyspark.storagelevel import StorageLevel


new_df = transactions_df.withColumn("purchase_year",
year("purchase_date")).withColumn("purchase_month",
month("purchase_date"))


customer_month_counts = new_df.groupBy("customer_id", "purchase_year",
"purchase_month").agg(countDistinct("purchase_month").alias("distinct_mon
t hs")).persist(StorageLevel.MEMORY_AND_DISK)


regular_customers = customer_month_counts.filter("distinct_months = 1")

    \ .groupBy("customer_id").count() \

    .orderBy("count", ascending=False).limit(10).show()
```




**# MEMORY_AND_DISK_SER**

```
from pyspark.sql.functions import year, month

from pyspark.sql.functions import countDistinct
from pyspark.storagelevel import StorageLevel


new_df = transactions_df.withColumn("purchase_year",
year("purchase_date")).withColumn("purchase_month",
month("purchase_date"))


customer_month_counts = new_df.groupBy("customer_id", "purchase_year",
"purchase_month").agg(countDistinct("purchase_month").alias("distinct_mon
t hs")).persist(StorageLevel.MEMORY_AND_DISK_SER)


regular_customers = customer_month_counts.filter("distinct_months = 1")

    \ .groupBy("customer_id").count() \

    .orderBy("count", ascending=False).limit(10).show()
```

**# DISK_ONLY**

```
from pyspark.sql.functions import year, month

from pyspark.sql.functions import countDistinct

from pyspark.storagelevel import StorageLevel
```

```
new_df = transactions_df.withColumn("purchase_year",
year("purchase_date")).withColumn("purchase_month",
month("purchase_date"))


customer_month_counts = new_df.groupBy("customer_id", "purchase_year",
"purchase_month").agg(countDistinct("purchase_month").alias("distinct_mon
t hs")).persist(StorageLevel.DISK_ONLY)


regular_customers = customer_month_counts.filter("distinct_months = 1")
    \ .groupBy("customer_id").count() \
    .orderBy("count", ascending=False).limit(10).show()
```

**B)**

**#user defined function**

```
def get_customer_history(customer_id):
    customer_history_df = transactions_df.filter(transactions_df.customer_id ==
customer_id).cache()
    return customer_history_df
```

**#pass the customer_id you want to get the history**

```
customer_id = 1001
customer_history_df = get_customer_history(customer_id)
customer_history_df.show()
```

**C)**

```
cached_filtered_df.unpersist()
spark.sql(“uncache table tt_cust_transaction.customer_transactions_ext”)
```

## Question 2

spark.sql("create database tt_assignments_hotel_usecase")

spark.sql("CREATE TABLE tt_assignments_hotel_usecase.hotel_bookings_external (booking_id INT, guest_name STRING, checkin_date DATE, checkout_date DATE, room_type STRING, total_price DOUBLE) USING csv location '/public/trendytech/datasets/hotel_data.csv' ")

spark.sql("select * from tt_assignments_hotel_usecase.hotel_bookings_external limit 5").show()

```
spark.sql("create database tt_assignments_hotel_usecase")
```

```
spark.sql("CREATE TABLE tt_assignments_hotel_usecase.hotel_bookings_external (booking_id INT,
```

```
spark.sql("select * from tt_assignments_hotel_usecase.hotel_bookings_external limit 5").show()
```

```
+----------+------------+------------+-------------+---------+-----------+
|booking_id|  guest_name|checkin_date|checkout_date|room_type|total_price|
+----------+------------+------------+-------------+---------+-----------+
|         1|    John Doe|  2023-05-01|   2023-05-05| Standard|      400.0|
|         2|  Jane Smith|  2023-05-02|   2023-05-06|   Deluxe|      600.0|
|         3|Mark Johnson|  2023-05-03|   2023-05-08| Standard|      450.0|
|         4|Sarah Wilson|  2023-05-04|   2023-05-07|Executive|      750.0|
|         5| Emily Brown|  2023-05-06|   2023-05-09|   Deluxe|      550.0|
+----------+------------+------------+-------------+---------+-----------+
```

**A)**

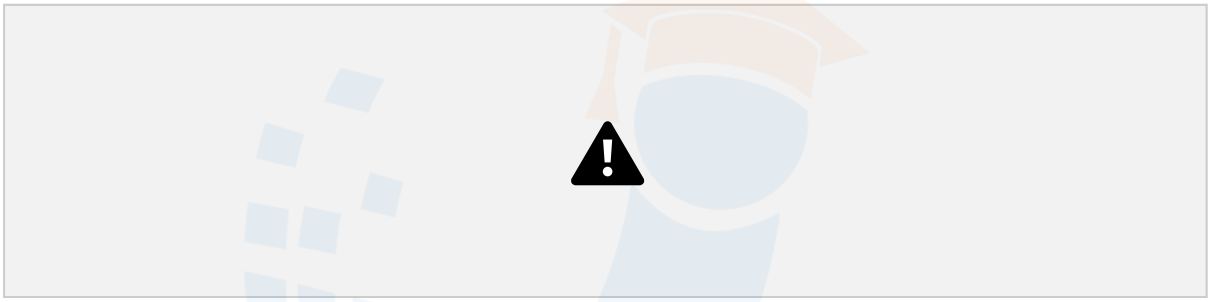
count_before_caching = spark.sql("SELECT COUNT(*) FROM tt_assignments_hotel_usecase.hotel_bookings_external").show()

```
count_before_caching = spark.sql("SELECT COUNT(*) FROM tt_assignments_hotel_usecase.hotel_bookings_external").show()
```

```
+--------+
|count(1)|
+--------+
|     107|
+--------+
```

**B)**

```
avg_price_without_caching = spark.sql("SELECT room_type, AVG(total_price) FROM tt_assignments_hotel_usecase.hotel_bookings_external GROUP BY room_type limit 100").show()
```



**#with caching**

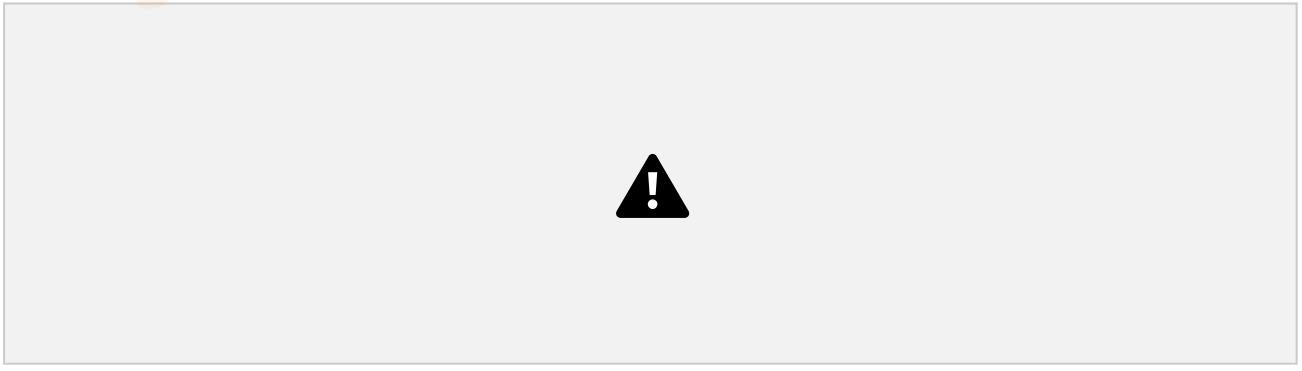
```
spark.sql("cache table tt_hotel.hotel_bookings_external")
```

**A)**

```
count_after_caching = spark.sql("SELECT COUNT(*) FROM tt_hotel.hotel_bookings_external").show()
```

**B)**

```
avg_price_with_caching = spark.sql("SELECT room_type, AVG(total_price) FROM tt_hotel.hotel_bookings_external GROUP BY room_type limit 100").show()
```



**Note**: You can see a large difference when dealing with really big data. Here since the data is small, the comparisons might be very less and might be varying.

**C)**

```
spark.sql("uncache table tt_hotel.hotel_bookings_external")
```