Group B3, task 9

1 PARTITIONS

1.1 QUERY 1

1.1.1 Partition by range

```
CREATE TABLE BodyMeasurementsMod

(

    MeasurementID NUMBER PRIMARY KEY,
    UserID NUMBER,
    MeasurementDate DATE,
    Height NUMBER(5, 2),
    Weight NUMBER(5, 2),
    BodyFatPercentage NUMBER(4, 2),
    FOREIGN KEY (UserID) REFERENCES MEMBERS(UserID)

)

PARTITION BY RANGE (MeasurementDate) (
    PARTITION p1 VALUES LESS THAN (TO_DATE('2016-01-01', 'YYYY-MM-DD')),
    PARTITION p2 VALUES LESS THAN (TO_DATE('2018-01-01', 'YYYY-MM-DD')),
    PARTITION p3 VALUES LESS THAN (MAXVALUE)

);
```

view modified query

	Original Query (seconds)	Query with partition (seconds)
Run 1	2.891690254211426	3.1677420139312744
Run 2	2.9416854667663574	3.084730625152588
Run 3	2.90867018699646	3.1087069511413574
Average	<mark>2.914</mark>	3.1 <mark>2</mark>

1.1.2 Query Plan

```
PLAN_TABLE_OUTPUT
|Plan hash value: 1201052493
                                                                                                                             | Rows | Bytes |TempSpc| Cost (%CPU)| Time
                                                                                                                                                                                                                               | Pstart| Pstop |
 | Id | Operation
                                                                               Name
                 SELECT STATEMENT
MERGE JOIN SEMI
MERGE JOIN
                                                                                                                                                                                               (27) | 00:00:01
(27) | 00:00:01
(30) | 00:00:01
(34) | 00:00:01
(41) | 00:00:01
(41) | 00:00:01
                                                                                                                                                                                 15974
13973
                                                                                                                                                  810M
2732M
                                                                                                                                  8096K
                        MERGE JOIN
                                                                                                                                      46M
                                                                                                                                                                                  12081
                         MERGE JOIN
VIEW
FILTER
HASH GROUP BY
HASH JOIN
VIEW
HASH GROUP BY
PARTITION RANGE ALL
TABLE ACCESS FULL
                                                                                                                                      46M
                                                                                                                                                                                    9889
                                                                                                                                                                                                          00:00:01
00:00:01
00:00:01
00:00:01
                                                                                                                                                   2908M
                                                                                                                                                                                               (41)
                                                                                                                                                                                                 (41) | 00:00:01

(7) | 00:00:01

(5) | 00:00:01

(5) | 00:00:01

(1) | 00:00:01

(1) | 00:00:01

(2) | 00:00:01

(2) | 00:00:01

(3) | 00:00:01

(1) | 00:00:01

(7) | 00:00:01

(8) | 00:00:01

(1) | 00:00:01

(1) | 00:00:01

(1) | 00:00:01
                                                                                                                                       46M
                                                                                                                                                   2908M
                                                                                                                                                                                    6250
                                                                                                                                     732K
732K
732K
732K
                                                                                                                                                                                   1422
1422
1377
   9
10
11
12
13
14
* 15
16
|* 17
                      PARTITION RANGE ALL
TABLE ACCESS FULL
PARTITION RANGE ALL
TABLE ACCESS FULL
SORT JOIN
TABLE ACCESS FULL
SORT JOIN
TABLE ACCESS FULL
                                                                                  BODYMEASUREMENTSMOD
                                                                                                                                     732K
                                                                                                                                                                                    1377
                                                                                                                                                                                   1379
1379
2192
                                                                                                                                     732K
                                                                                                                                     732K
154K
154K
                                                                                                                                                   24M
3469K
3469K
                                                                                  BODYMEASUREMENTSMOD
                                                                                  MEMBERS
                                                                                                                                                                                    1131
                                                                                                                                                                   2776K
                                                                                                                                27062
                                                                                                                                                   1136K
                                                                                                                                                                                   1892
                          TABLE ACCESS FULL
                                                                                  DIETLOG
                                                                                                                                27062
108K
                                                                                                                                                   1136K
                                                                                                                                                                                   1591
                      SORT UNIQUE
TABLE ACCESS FULL
 Predicate Information (identified by operation id):
      6 - filter((MAX/CASE "BM"."MEASUREMENTDATE" WHEN "SUBQ"."LASTMEASUREMENTDATE" THEN "BM"."WEIGHT" END )-MIN(CASE
"BM"."MEASUREMENTDATE" WHEN "SUBQ"."FIRSTMEASUREMENTDATE" THEN "BM"."WEIGHT" END ))/MIN(CASE "BM"."MEASUREMENTDATE"
```

```
| WHEN "SUBQ"."FIRSTMEASUREMENTDATE" THEN "BM"."WEIGHT" END )>0.06)
| 8 - access("BM"."USERID"="SUBQ"."USERID")
| 15 - access("U"."USERID"="SUBQCTE"."USERID")
| filter("U"."USERID"="SUBQCTE"."USERID")
| 17 - access("U"."USERID"="DZ"."USERID")
| filter("U"."USERID"="DZ"."USERID")
| 18 - filter("DBM_LOB"."INSTR'(INTERNAL_FUNCTION("DZ"."MEALDESCRIPTION"), 'the')>0)
| 19 - access("U"."USERID"="D"."USERID")
| filter("U"."USERID"="D"."USERID")
| cfilter("U"."USERID"="D"."USERID")
| cfilter("U"."USERID"="D"."USERID")
| cfilter("U"."USERID"="DESTIDENCE TO DATE(' 2018-01-01-00:00:00', 'syyyy-mm-dd hh24:mi:ss') AND "D"."MEALDATE"<TO_DATE(' 2019-01-01-00:00:00', 'syyyy-mm-dd hh24:mi:ss'))
```

view original (query plan)

1.2 QUERY 2

1.2.1 Partition by hash

```
CREATE TABLE HealthRecordsMod

(

RecordID NUMBER PRIMARY KEY,

UserID NUMBER,

RecordDate DATE,

BloodPressure VARCHAR2(10),

CholesterolLevel NUMBER,

HeartRate NUMBER,

Notes CLOB,

FOREIGN KEY (UserID) REFERENCES MEMBERS(UserID)

)

PARTITION BY HASH(UserID) PARTITIONS 4;
```

view modified query

	Original Query (seconds)	Query with hash partition
Run 1	3.6679887771606445	3.3190224170684814
Run 2	3.6720266342163086	3.210211753845215
Run 3	3.657158136367798	3.2407665252685547
Average	3.6 ₇	<mark>3.256</mark>

1.2.2 Query Plan

```
PLAN_TABLE_OUTPUT
|Plan hash value: 2665936367
| Id | Operation
                                                                       | Rows | Bytes |TempSpc| Cost (%CPU)| Time
                                                                                                                              | Pstart| Pstop |
         SELECT STATEMENT
                                                                            142K
                                                                                      14M
                                                                                                              (1) | 00:00:01
    0 |
                                                                                                     18453
          SORT ORDER BY
                                                                            142K
                                                                                      14M
                                                                                                     18453
                                                                                                               (1)
                                                                                                                    00:00:01
            HASH JOIN RIGHT SEMI
PART JOIN FILTER CREATE
                                                                                                              (1) | 00:00:01
(1) | 00:00:01
(1) | 00:00:01
                                                                            142K
                                                                                      14M
                                                                                                11M
                                                                                                     15023
                                                                            353K
                                                                                                      6315
                                                  :BF0000
                                                                                    7585K
                                                                            353K
                                                                                    7585K
                                                                                                      6315
                                                  VW_NSO_2
                                                                                                              (1)
(1)
(1)
               HASH GROUP BY PARTITION HASH ALL
     5
                                                                            353K
                                                                                    7585K
                                                                                                      6315
                                                                                                                    00:00:01
                                                                                                                    00:00:01
                                                                            353K
                                                                                    7585K
                                                                                                      6294
                                                                                                                                     1
                                                                                                                                              4
                  TABLE ACCESS FULL
                                                  HEALTHRECORDSMOD
                                                                            353K
                                                                                    7585K
                                                                                                      6294
                                                                                                                    00:00:01
                                                                                                                                     1
     8
             HASH JOIN
                                                                            142K
                                                                                     11M
                                                                                                      7486
                                                                                                              (1)
(3)
(3)
(3)
(4)
(4)
(4)
(4)
(0)
                                                                                                                    00:00:01
              PART JOIN FILTER CREATE
                                                  :BF0001
                                                                            193
                                                                                    6948
                                                                                                      1188
                                                                                                                    00:00:01
    10
               NESTED LOOPS
                                                                            193
                                                                                    6948
                                                                                                                    00:00:01
                NESTED LOOPS
    11
                                                                            267
                                                                                    6948
                                                                                                      1188
                                                                                                                    99.99.91
   12
                                                                                    1335
                 VIEW
                                                  VW NSO 1
                                                                                                                    00:00:01
                                                                            267
                                                                                                       918
  * 13
                  HASH GROUP BY
                                                                            267
                                                                                                                    00:00:01
 * 14
                    TABLE ACCESS FULL
                                                  EXERCISEACTIVITIES
                                                                           5403
                                                                                   70239
                                                                                                       917
                                                                                                                    99.99.91
 * 15
                  INDEX UNIQUE SCAN
                                                  SYS_C008324
                                                                                                                    00:00:01
                                                                              1
  * 16
                TABLE ACCESS BY INDEX ROWID
                                                                                                                    00:00:01
   17
              PARTITION HASH AND
                                                                            353K
                                                                                      16M
                                                                                                      6295
                                                                                                                    00:00:01 | KEY(AP) | KEY(AP)
                                                                                                              (1) | 00:00:01 | KEY(AP) | KEY(AP) |
   18
               TABLE ACCESS FULL
                                                 HEALTHRECORDSMOD
                                                                            353K
                                                                                      16M
                                                                                                      6295
Predicate Information (identified by operation id):
   2 - access("HR"."USERID"="USERID" AND "HR"."RECORDDATE"="MAX(RECORDDATE)")
8 - access("U"."USERID"="HR"."USERID")
```

- <u>view original</u> (query plan)

1.2.3 Partition by range for user id, for comparison with hash

```
CREATE TABLE HealthRecordsModNew

(

RecordID NUMBER PRIMARY KEY,
UserID NUMBER,
RecordDate DATE,
BloodPressure VARCHAR2(10),
CholesterolLevel NUMBER,
HeartRate NUMBER,
Notes CLOB,
FOREIGN KEY (UserID) REFERENCES MEMBERS(UserID)

)

PARTITION BY RANGE (UserID) (
PARTITION p1 VALUES LESS THAN (40000),
PARTITION p2 VALUES LESS THAN (80000),
PARTITION p3 VALUES LESS THAN (120000),
PARTITION p_max_value VALUES LESS THAN (MAXVALUE)

);
```

view modified query

	Original Query (seconds)	Query with range partition
Run 1	3.6679887771606445	0.5901393890380859
Run 2	3.6720266342163086	0.6251513957977295
Run 3	3.657158136367798	0.6021437644958496
Average	<mark>3.67</mark>	<mark>0.605</mark>

1.2.4 Query Plan

```
PLAN TABLE OUTPUT
Plan hash value: 2626611078
| Id | Operation
                                                                      | Rows | Bytes | TempSpc | Cost (%CPU) | Time
    0 |
         SELECT STATEMENT
                                                                          142K
                                                                                    14M
                                                                                                  18478
                                                                                                           (1)
                                                                                                                00:00:01
          SORT ORDER BY
                                                                          142K
                                                                                    14M
                                                                                                  18478
                                                                                                                00:00:01
           HASH JOIN RIGHT SEMI
                                                                          142K
                                                                                    14M
                                                                                             11M
                                                                                                  15041
                                                                                                           (1) |
(1) |
                                                                                                                00:00:01
            PART JOIN FILTER CREATE
                                                                                  7792K
                                                :BF0000
                                                                                                   6316
                                                                                                                00:00:01
                                                                          362K
                                                                                  7792K
                                                                                                           (1)
                                                                                                                 00:00:01
                                                VW_NSO_2
                                                                          362K
                                                                                                   6316
              HASH GROUP BY
PARTITION RANGE ALL
                                                                                                           (1)
(1)
     5
                                                                          362K
                                                                                  7792K
                                                                                                   6316
                                                                                                                00:00:01
                                                                          362K
                                                                                  7792K
                                                                                                                00:00:01
                                                                                                   6294
                                                                                                                                          4
                 TABLE ACCESS FULL
                                                HEALTHRECORDSMODNEW
                                                                          362K
                                                                                  7792K
                                                                                                    6294
                                                                                                           (1)
                                                                                                                00:00:01
                                                                                                                                          4
            HASH JOIN
     8
                                                                                                           (1)
                                                                          142K
                                                                                   11M
                                                                                                   7486
                                                                                                                00:00:01
              PART JOIN FILTER CREATE
                                                :BF0001
                                                                          193
                                                                                  6948
                                                                                                   1188
                                                                                                                00:00:01
                                                                                                           (3)
    10
               NESTED LOOPS
                                                                          193
                                                                                  6948
                                                                                                                 00:00:01
                NESTED LOOPS
                                                                                  6948
    11
                                                                          267
                                                                                                   1188
                                                                                                                00:00:01
    12
                                                                                                           (4)
                 VIEW
                                                VW_NSO_1
                                                                          267
                                                                                  1335
                                                                                                                00:00:01
                                                                                                    918
                  HASH GROUP BY
                                                                                                           (4)
(4)
  * 13
                                                                          267
                                                                                  3471
                                                                                                    918
                                                                                                                00:00:01
* 14
                   TABLE ACCESS FULL
                                                EXERCISEACTIVITIES
                                                                         5403
                                                                                 70239
                                                                                                    917
                                                                                                                00:00:01
||* 15
||* 16
                 INDEX UNIQUE SCAN
                                                SYS_C008324
                                                                                                           (0)
                                                                                                                00:00:01
                                                                           1
                                                                                                     1
                TABLE ACCESS BY INDEX ROWID
                                                                                    31
                                                                                                                00:00:01
                                                                                                                           KEY(AP) KEY(AP)
   17
              PARTITION RANGE AND
                                                                          362K
                                                                                    16M
                                                                                                   6296
                                                                                                           (1) | 00:00:01 | KEY(AP) | KEY(AP)
(1) | 00:00:01 | KEY(AP) | KEY(AP)
               TABLE ACCESS FULL
                                                HEALTHRECORDSMODNEW
                                                                          362K
                                                                                    16M
Predicate Information (identified by operation id):
   2 - access("HR"."USERID"="USERID" AND "HR"."RECORDDATE"="MAX(RECORDDATE)")
8 - access("U"."USERID"="HR"."USERID")
```

- <u>view original</u> (query plan)

2 QUERY PLANS

2.1 **QUERY 1**

```
PLAN TABLE OUTPUT
Plan hash value: 630115401
|| Id | Operation
                                        Name | Rows | Bytes | TempSpc | Cost (%CPU) | Time
     0 | SELECT STATEMENT
                                                                 749
                                                                        88382
                                                                        88382
          HASH JOIN SEMI
                                                                 749
                                                                                           9275
                                                                                                   (3)
           HASH JOIN
                                                                1371
                                                                                                         00:00:01
                                                                          473K
    3
            HASH JOIN
                                                                7827
                                                                                           6204
                                                                                                  (2) | 00:00:01
                                                                                          5072 (3) 00:00:01
              VIEW
     4
                                                                7827
                                                                          298K
     5
               FILTER
               HASH GROUP BY
                                                                          313K
     6
                                                                7827
                                                                                          5072
                                                                                                   (3) | 00:00:01
    7
                 HASH JOIN
                                                                 618K
                                                                         24M 5352K 5035
                                                                                                  (2) | 00:00:01
     8
                  VIEW
                                                                 156K
                                                                         3515K
                                                                                           2716
                                                                                                        00:00:01
    9
                  HASH GROUP BY
                                                                 156K
                                                                         1987K
                                                                                   14M 2716
                                                                                                   (2)
                                                                                                        00:00:01
                    TABLE ACCESS FULL BODYMEASUREMENTS
                                                                 618K
                                                                         7846K
                                                                                           1170
                                                                                                         00:00:01
    10
                                                                                                   (1)
                 TABLE ACCESS FULL | BODYMEASUREMENTS
   11
                                                                 618K
                                                                          10M
                                                                                          1172
                                                                                                   (2) | 00:00:01
              TABLE ACCESS FULL
   12
                                          MEMBERS
                                                                 154K
                                                                         3469K
                                                                                        1131
                                                                                                   (1) 00:00:01
  * 13 |
            TABLE ACCESS FULL
                                          DIETLOG
                                                              27062
                                                                         1136K
                                                                                          1591
                                                                                                   (8) | 00:00:01
* 14
                                                             108K 1378K
           TABLE ACCESS FULL
                                        DIETLOG
                                                                                        1479 (1) 00:00:01
Predicate Information (identified by operation id):
   1 - access("U"."USERID"="D"."USERID")
   2 - access("U"."USERID"="D2"."USERID")
3 - access("U"."USERID"="SUBQCTE"."USERID")
    5 - filter((MAX(CASE "BM"."MEASUREMENTDATE" WHEN "SUBQ"."LASTMEASUREMENTDATE" THEN
   "BM". "WEIGHT" END )-MIN(CASE "BM". "MEASUREMENTDATE" WHEN "SUBQ". "LASTMEASUREMENTDATE" THEN

"BM". "WEIGHT" END )-MIN(CASE "BM". "MEASUREMENTDATE" WHEN "SUBQ". "FIRSTMEASUREMENTDATE" THEN

"BM". "WEIGHT" END )>0.06)

7 - access("BM". "USERID"="SUBQ". "USERID")
   13 - filter("DBMS_LOB"."INSTR"(INTERNAL_FUNCTION("D2"."MEALDESCRIPTION"), 'the')>0)
  14 - filter("D"."MEALDATE">=TO_DATE(' 2018-01-01 00:00:00', 'syyyy-mm-dd hh24:mi:ss') AND "D"."MEALDATE"<TO_DATE(' 2019-01-01 00:00:00', 'syyyy-mm-dd hh24:mi:ss'))
```

2.2 **QUERY 2**

```
PLAN_TABLE_OUTPUT
|Plan hash value: 1760211671
|| Id | Operation
                                                              Rows | Bytes | TempSpc | Cost (%CPU) | Time
    a l
        SELECT STATEMENT
                                                                  193 | 15826
                                                                                        13354
                                                                                                     99.99.91
         SORT ORDER BY
                                                                                                     00:00:01
    1
                                                                  193
                                                                        15826
                                                                                        13354
                                                                                                (1)
          HASH JOIN SEMI
                                                                        15826
                                                                                        13353
                                                                                                     00:00:01
           HASH JOIN
NESTED LOOPS
                                                                                        6707
1188
                                                                                                (1) | 00:00:01
(3) | 00:00:01
    3
4
                                                                  490
                                                                        33320
                                                                        7913
                                                                 193
             NESTED LOOPS
              VIEW
                                         VW_NSO_1
                                                                267 1335
                                                                                      918
                                                                                                (4) 00:00:01
```

```
HASH GROUP BY
                                                                                                3471
                                                                                                                                        00:00:01
                                                                                                                         918
||* 8
||* 9
||* 10
                      TABLE ACCESS FULL
                                                         EXERCISEACTIVITIES
                                                                                       5403
                                                                                                70239
                                                                                                                         917
                                                                                                                                  (4)
(0)
(0)
                                                                                                                                        00:00:01
                   INDEX UNIQUE SCAN
                                                         SYS C008324
                                                                                                                                        00:00:01
                  TABLE ACCESS BY INDEX ROWID
                                                         HEALTHRECORDS
   11
                 TABLE ACCESS FULL
                                                                                         385K
                                                                                                      9M
                                                                                                                        5516
                                                                                                                                  (1)
                                                                                                                                        00:00:01
                                                                                                  2075K
    12
               VIEW
                                                                                                                                  (1)
                                                                                                                                        00:00:01
                                                         VW NSO 2
                                                                                         151K
                                                                                                                        6645
    13
                                                                                                  1927K
                                                                                         151K
   14
                  TABLE ACCESS FULL
                                                         HEALTHRECORDS
                                                                                         385K
                                                                                                  4898K
                                                                                                                        5514
                                                                                                                                  (1) 00:00:01
Predicate Information (identified by operation id):
    2 - access("HR"."USERID"="USERID" AND "HR"."RECORDDATE"="MAX(RECORDDATE)")
3 - access("U"."USERID"="HR"."USERID")
          filter(COUNT(*)>0)
   8 - filter(EXTRACT(YEAR FROM INTERNAL_FUNCTION("ACTIVITYDATE"))=2017)
9 - access("U"."USERID"="USERID")
10 - filter("U"."GENDER"='M' AND TRUNC(MONTHS_BETWEEN(TO_DATE(' 2023-01-01 00:00:00',
                  hh24:mi:ss'),INTERNAL_FUNCTION("BIRTHDATE"))/12)>=25 AND TRUNC(MONTHS_BETMEEM(TO_DATE(' 2023-01-01 00:00:00', 'syyyy-mm-dd hh24:mi:ss'),INTERNAL_FUNCTION("BIRTHDATE"))/12)<=35)
```

3 QUERIES

3.1 Q1 ORIGINAL

```
WITH SubgCTE AS (
   SELECT
        BM.UserID.
        MAX(CASE WHEN BM.MeasurementDate = Subq.LastMeasurementDate THEN BM.Weight END) AS
        MIN(CASE WHEN BM.MeasurementDate = Subq.FirstMeasurementDate THEN BM.Weight END) AS
FirstWeight
    FROM
        BodyMeasurements BM
    JOIN (
        SELECT
            BM. UserID,
            MAX(BM.MeasurementDate) AS LastMeasurementDate,
            MIN(BM.MeasurementDate) AS FirstMeasurementDate
        FROM
            BodyMeasurements BM
        GROUP BY
            BM. UserID
    ) Subq
    ON BM.UserID = Subq.UserID
        BM. UserID, Subq. LastMeasurementDate, Subq. FirstMeasurementDate
SELECT
   U.UserID,
    U.FirstName,
    U.LastName,
    (SubqCTE.LastWeight - SubqCTE.FirstWeight) / SubqCTE.FirstWeight AS WeightChangeRatio,
    U.Gender,
   D2.MEALDESCRIPTION
FROM
   Members U
JOIN SubqCTE ON U.UserID = SubqCTE.UserID
JOIN DIETLOG D2 ON U.USERID = D2.USERID
WHERE
    (SubqCTE.LastWeight - SubqCTE.FirstWeight) / SubqCTE.FirstWeight > 0.06
    AND EXISTS (
```

```
SELECT 1
FROM DietLog D
WHERE U.UserID = D.UserID
AND D.MealDate >= TO_DATE('2018-01-01', 'YYYY-MM-DD')
AND D.MealDate < TO_DATE('2019-01-01', 'YYYY-MM-DD')
)
AND DBMS_LOB.INSTR(D2.MEALDESCRIPTION, 'the') > 0;
```

3.2 Q2 ORIGINAL

```
WITH RecentHealthRecords AS (
   SELECT
        hr.UserID,
        hr.HeartRate,
        hr.CholesterolLevel
        HealthRecords hr
    WHERE
        (hr.UserID, hr.RecordDate) IN (
            SELECT UserID, MAX(RecordDate)
            FROM HealthRecords
            GROUP BY UserID
SELECT
   u.UserID,
   u.FirstName,
   u.LastName,
   rhr.HeartRate,
   rhr.CholesterolLevel
FROM
   Members u
JOIN
   RecentHealthRecords rhr ON u.UserID = rhr.UserID
   u.Gender = 'M'
   AND TRUNC(MONTHS_BETWEEN(TO_DATE('2023-01-01', 'YYYY-MM-DD'), u.BirthDate) / 12) BETWEEN
25 AND 35
   AND u.UserID IN (
        SELECT UserID
        FROM ExerciseActivities
        WHERE EXTRACT(YEAR FROM ActivityDate) = 2017
        GROUP BY UserID
        HAVING COUNT(*) > 0
ORDER BY u.UserID;
```

4 MODIFIED QUERIES

```
JOIN (
        SELECT
            BM.UserID,
            MAX(BM.MeasurementDate) AS LastMeasurementDate,
            MIN(BM.MeasurementDate) AS FirstMeasurementDate
            BodyMeasurementsMod BM
        GROUP BY
            BM.UserID
   ) Subq
    ON BM.UserID = Subq.UserID
    GROUP BY
        BM. UserID, Subq. LastMeasurementDate, Subq. FirstMeasurementDate
)
SELECT
   U.UserID,
   U.FirstName,
   U.LastName,
    (SubqCTE.LastWeight - SubqCTE.FirstWeight) / SubqCTE.FirstWeight AS WeightChangeRatio,
   U.Gender,
   D2.MEALDESCRIPTION
FROM
   Members U
JOIN SubgCTE ON U.UserID = SubgCTE.UserID
JOIN DIETLOG D2 ON U.USERID = D2.USERID
    (SubqCTE.LastWeight - SubqCTE.FirstWeight) / SubqCTE.FirstWeight > 0.06
   AND EXISTS (
        SELECT 1
        FROM DietLog D
        WHERE U.UserID = D.UserID
        AND D.MealDate >= TO_DATE('2018-01-01', 'YYYY-MM-DD')
        AND D.MealDate < TO_DATE('2019-01-01', 'YYYY-MM-DD')
   AND DBMS_LOB.INSTR(D2.MEALDESCRIPTION, 'the') > 0"""
sql_query_pt2 = """WITH RecentHealthRecordsMod AS (
   SELECT
        hr.UserID,
        hr.HeartRate,
        hr.CholesterolLevel
    FROM
        HealthRecordsMod hr
   WHERE
        (hr.UserID, hr.RecordDate) IN (
            SELECT UserID, MAX(RecordDate)
            FROM HealthRecordsMod
            GROUP BY UserID
        )
SELECT
   u.UserID,
   u.FirstName,
   u.LastName,
   rhr.HeartRate,
    rhr.CholesterolLevel
FROM
   Members u
   RecentHealthRecordsMod rhr ON u.UserID = rhr.UserID
WHERE
  u.Gender = 'M'
```

```
AND TRUNC(MONTHS_BETWEEN(SYSDATE, u.BirthDate) / 12) BETWEEN 25 AND 35
   AND u.UserID IN (
        SELECT UserID
        FROM ExerciseActivities
        WHERE EXTRACT(YEAR FROM ActivityDate) = 2017
        GROUP BY UserID
        HAVING COUNT(*) > 0
ORDER BY u.UserID"""
sql_query_pt3 = """WITH RecentHealthRecordsModNew AS (
   SELECT
        hr.UserID,
        hr.HeartRate,
        hr.CholesterolLevel
        HealthRecordsModNew hr
   WHERE
        (hr.UserID, hr.RecordDate) IN (
            SELECT UserID, MAX(RecordDate)
            FROM HealthRecordsModNew
            GROUP BY UserID
SELECT
   u.UserID,
   u.FirstName,
   u.LastName,
   rhr.HeartRate,
   rhr.CholesterolLevel
FROM
   Members u
JOIN
   RecentHealthRecordsModNew rhr ON u.UserID = rhr.UserID
WHERE
   u.Gender = 'M'
   AND TRUNC(MONTHS_BETWEEN(SYSDATE, u.BirthDate) / 12) BETWEEN 25 AND 35
   AND u.UserID IN (
        SELECT UserID
        FROM ExerciseActivities
        WHERE EXTRACT(YEAR FROM ActivityDate) = 2017
        GROUP BY UserID
        HAVING COUNT(*) > 0
   )
ORDER BY u.UserID"""
```