1. Combien y-a-t-il :

- D'aéroports en tout, de départ et de destination :

```
aeroport=# SELECT
aeroport-#     (SELECT COUNT(*) FROM airports) AS total_airports,
aeroport-#     (SELECT COUNT(DISTINCT origin) FROM flights) AS departure_airports,
aeroport-#     (SELECT COUNT(DISTINCT dest) FROM flights) AS destination_airports;
 total_airports | departure_airports | destination_airports
----------------+--------------------+----------------------
           1462 |                  3 |                  103
(1 row)
```

- Combien y-a-t-il d'aéroports aux Etats-Unis où on ne passe pas à l'heure d'été (*indice : colonne dst : 23*) ? de fuseaux horaires (*10 voir colone tzone dont une « /N »*)

```
aeroport=# SELECT
aeroport-#     COUNT(*) AS airports_without_dst
aeroport-# FROM airports
aeroport-# WHERE dst = 'N';
 airports_without_dst
----------------------
                   23
(1 row)


aeroport=#
aeroport=# SELECT
aeroport-#     COUNT(DISTINCT tz) AS time_zones
aeroport-# FROM airports;
 time_zones
------------
          8
(1 row)
```

- De compagnies, d'avions, de vols annulés ?

```
aeroport=# SELECT
aeroport-#     (SELECT COUNT(*) FROM airlines) AS total_airlines,
aeroport-#     (SELECT COUNT(*) FROM planes) AS total_planes,
aeroport-#     (SELECT COUNT(*) FROM flights WHERE arr_delay IS NULL) AS cancelled_flights;
 total_airlines | total_planes | cancelled_flights
----------------+--------------+-------------------
             16 |         4039 |                 0
(1 row)
```

2. Quel est l'aéroport de départ le plus emprunté ?
   Quelles sont les 10 destinations les plus (moins) prisées (*en indiquant le nom complet des destinations et non juste le code correspondant et le % corresp pour chaque destination*) ?
   Quelle sont les 10 avions qui ont le plus (moins) décollé ?

```
aeroport=# -- Aéroport de départ le plus emprunté
aeroport=# SELECT origin, COUNT(*) AS flight_count
aeroport-# FROM flights
aeroport-# GROUP BY origin
aeroport-# ORDER BY flight_count DESC
aeroport-# LIMIT 1;
 origin | flight_count
--------+-------------
 EWR    |        91241
(1 row)
```

```
aeroport=# SELECT a.name, f.dest, COUNT(*) AS flight_count
aeroport-#     FROM flights f
aeroport-#     JOIN airports a ON f.dest = a.faa
aeroport-#     GROUP BY a.name, f.dest
aeroport-#     ORDER BY flight_count DESC
aeroport-#     LIMIT 10;
                  name                    | dest | flight_count
------------------------------------------+------+-------------
 Hartsfield Jackson Atlanta Intl          | ATL  |        12946
 Chicago Ohare Intl                       | ORD  |        12654
 Los Angeles Intl                         | LAX  |        11895
 General Edward Lawrence Logan Intl       | BOS  |        11560
 Orlando Intl                             | MCO  |        10637
 Charlotte Douglas Intl                   | CLT  |        10448
 San Francisco Intl                       | SFO  |         9729
 Fort Lauderdale Hollywood Intl           | FLL  |         9443
 Miami Intl                               | MIA  |         8938
 Ronald Reagan Washington Natl            | DCA  |         7386
(10 rows)
```

```
aeroport=# SELECT a.name, f.dest, COUNT(*) AS flight_count
aeroport-#     FROM flights f
aeroport-#     JOIN airports a ON f.dest = a.faa
aeroport-#     GROUP BY a.name, f.dest
aeroport-#     ORDER BY flight_count ASC
aeroport-#     LIMIT 10;
              name              | dest | flight_count
--------------------------------+------+-------------
 Blue Grass                     | LEX  |            1
 South Bend Rgnl                | SBN  |            4
 Montrose Regional Airport      | MTJ  |           15
 Yampa Valley                   | HDN  |           15
 Cherry Capital Airport         | TVC  |           16
 Key West Intl                  | EYW  |           17
 Palm Springs Intl              | PSP  |           19
 Gallatin Field                 | BZN  |           20
 Jackson Hole Airport           | JAC  |           25
 Charlottesville-Albemarle      | CHO  |           31
(10 rows)
```

```
aeroport=# SELECT tailnum, COUNT(*) AS flight_count
aeroport-# FROM flights
aeroport-# WHERE tailnum IS NOT NULL
aeroport-# GROUP BY tailnum
aeroport-# ORDER BY flight_count DESC
aeroport-# LIMIT 10;
 tailnum | flight_count
---------+--------------
 0       |         1973
 N725MQ  |          443
 N723MQ  |          394
 N713MQ  |          385
 N722MQ  |          378
 N711MQ  |          376
 N258JB  |          332
 N353JB  |          316
 N542MQ  |          310
 N351JB  |          310
(10 rows)


aeroport=# SELECT tailnum, COUNT(*) AS flight_count
aeroport-# FROM flights
aeroport-# WHERE tailnum IS NOT NULL
aeroport-# GROUP BY tailnum
aeroport-# ORDER BY flight_count ASC
aeroport-# LIMIT 10;
 tailnum | flight_count
---------+--------------
 N287AT  |            1
 N502SW  |            1
 N746SK  |            1
 N955DN  |            1
 N136DL  |            1
 N978SW  |            1
 N757AT  |            1
 N829MH  |            1
 N7AYAA  |            1
 N838MH  |            1
(10 rows)
```

3. Combien chaque compagnie a desservi de destination ;

```
aeroport=# SELECT carrier, COUNT(DISTINCT dest) AS destination_count
aeroport-# FROM flights
aeroport-# GROUP BY carrier;
 carrier | destination_count
---------+-------------------
 9E      |                47
 AA      |                19
 AS      |                 1
 B6      |                42
 DL      |                40
 EV      |                61
 F9      |                 1
 FL      |                 3
 HA      |                 1
 MQ      |                20
 OO      |                 4
 UA      |                45
 US      |                 5
 VX      |                 5
 WN      |                11
 YV      |                 3
(16 rows)
```

combien chaque compagnie a desservie de destination par aéroport d'origine.

```
aeroport=# SELECT carrier, origin, COUNT(DISTINCT
dest) AS destination_count
aeroport-# FROM flights
aeroport-# GROUP BY carrier, origin
aeroport-# ORDER BY carrier, origin;
 carrier | origin | destination_count
---------+--------+-------------------
 9E      | EWR    |                 4
 9E      | JFK    |                34
 9E      | LGA    |                36
 AA      | EWR    |                 3
 AA      | JFK    |                17
 AA      | LGA    |                 5
 AS      | EWR    |                 1
 B6      | EWR    |                 7
 B6      | JFK    |                42
 B6      | LGA    |                 6
 DL      | EWR    |                 4
 DL      | JFK    |                29
 DL      | LGA    |                22
 EV      | EWR    |                53
 EV      | JFK    |                 3
 EV      | LGA    |                45
 F9      | LGA    |                 1
 FL      | LGA    |                 3
 HA      | JFK    |                 1
 MQ      | EWR    |                 1
 MQ      | JFK    |                11
 MQ      | LGA    |                12
 OO      | EWR    |                 2
 OO      | LGA    |                 2
 UA      | EWR    |                45
 UA      | JFK    |                 2
 UA      | LGA    |                 4
 US      | EWR    |                 2
 US      | JFK    |                 3
 US      | LGA    |                 4
 VX      | EWR    |                 2
 VX      | JFK    |                 5
 WN      | EWR    |                 9
 WN      | LGA    |                 8
 YV      | LGA    |                 3
(35 rows)
```

Réaliser les graphiques adéquats qui synthétisent ces informations ?

4. Trouver tous les vols ayant atterri à Houston (IAH ou HOU) ?

```
aeroport=#
aeroport=# SELECT *
aeroport-# FROM flights
aeroport-# WHERE dest IN ('IAH', 'HOU');
 flight_id | year | month | day | dep_time | sched_dep_time | dep_delay | arr_time | sched_arr_time | arr_delay | carrier | flight | tailnum | origin | dest | ai
r_time | distance | hour | minute |      time_hour
-----------+------+-------+-----+----------+----------------+-----------+----------+----------------+-----------+---------+--------+---------+--------+------+---
-------+----------+------+--------+---------------------
   1783544 | 2021 |     1 |   1 |      517 |            515 |         2 |      830 |            819 |        11 | UA      |   1545 | N14228  | EWR    | IAH  |
227.00 |     1400 |    5 |     15 | 2021-01-01 05:00:00
   1783545 | 2021 |     1 |   1 |      533 |            529 |         4 |      850 |            830 |        20 | UA      |   1714 | N24211  | LGA    | IAH  |
227.00 |     1416 |    5 |     29 | 2021-01-01 05:00:00
   1783576 | 2021 |     1 |   1 |      623 |            627 |        -4 |      933 |            932 |         1 | UA      |    496 | N459UA  | LGA    | IAH  |
229.00 |     1416 |    6 |     27 | 2021-01-01 06:00:00
   1783625 | 2021 |     1 |   1 |      728 |            732 |        -4 |     1041 |           1038 |         3 | UA      |    473 | N488UA  | LGA    | IAH  |
238.00 |     1416 |    7 |     32 | 2021-01-01 07:00:00
   1783633 | 2021 |     1 |   1 |      739 |            739 |         0 |     1104 |           1038 |        26 | UA      |   1479 | N37408  | EWR    | IAH  |
249.00 |     1400 |    7 |     39 | 2021-01-01 07:00:00
   1783721 | 2021 |     1 |   1 |      908 |            908 |         0 |     1228 |           1219 |         9 | UA      |   1220 | N12216  | EWR    | IAH  |
233.00 |     1400 |    9 |      8 | 2021-01-01 09:00:00
   1783780 | 2021 |     1 |   1 |     1028 |           1026 |         2 |     1350 |           1339 |        11 | UA      |   1004 | N76508  | LGA    | IAH  |
237.00 |     1416 |   10 |     26 | 2021-01-01 10:00:00
   1783791 | 2021 |     1 |   1 |     1044 |           1045 |        -1 |     1352 |           1351 |         1 | UA      |    455 | N667UA  | EWR    | IAH  |
229.00 |     1400 |   10 |     45 | 2021-01-01 10:00:00
   1783812 | 2021 |     1 |   1 |     1114 |            900 |       134 |     1447 |           1222 |       145 | UA      |   1086 | N76502  | LGA    | IAH  |
248.00 |     1416 |    9 |      0 | 2021-01-01 09:00:00
   1783855 | 2021 |     1 |   1 |     1205 |           1200 |         5 |     1503 |           1505 |        -2 | UA      |   1461 | N39418  | EWR    | IAH  |
221.00 |     1400 |   12 |      0 | 2021-01-01 12:00:00
   1783857 | 2021 |     1 |   1 |     1208 |           1158 |        10 |     1540 |           1502 |        38 | B6      |    625 | N239JB  | JFK    | HOU  |
253.00 |     1428 |   11 |     58 | 2021-01-01 11:00:00
   1783879 | 2021 |     1 |   1 |     1248 |           1250 |        -2 |     1607 |           1607 |         0 | UA      |   1280 | N26210  | LGA    | IAH  |
238.00 |     1416 |   12 |     50 | 2021-01-01 12:00:00
   1783901 | 2021 |     1 |   1 |     1306 |           1300 |         6 |     1622 |           1610 |        12 | WN      |   2596 | N7738A  | EWR    | HOU  |
239.00 |     1411 |   13 |      0 | 2021-01-01 13:00:00
   1783937 | 2021 |     1 |   1 |     1356 |           1350 |         6 |     1659 |           1640 |        19 | UA      |   1258 | N26906  | EWR    | IAH  |
218.00 |     1400 |   13 |     50 | 2021-01-01 13:00:00
   1783957 | 2021 |     1 |   1 |     1430 |           1430 |         0 |     1735 |           1744 |        -9 | UA      |    997 | N452UA  | LGA    | IAH  |
227.00 |     1416 |   14 |     30 | 2021-01-01 14:00:00
   1784020 | 2021 |     1 |   1 |     1527 |           1515 |        12 |     1854 |           1810 |        44 | UA      |   1695 | N69059  | EWR    | IAH  |
210.00 |     1400 |   15 |     15 | 2021-01-01 15:00:00
   1784080 | 2021 |     1 |   1 |     1620 |           1620 |         0 |     1945 |           1922 |        23 | UA      |   1178 | N18119  | EWR    | IAH  |
242.00 |     1400 |   16 |     20 | 2021-01-01 16:00:00
   1784123 | 2021 |     1 |   1 |     1702 |           1700 |         2 |     2044 |           2028 |        16 | UA      |   1259 | N16632  | LGA    | IAH  |
234.00 |     1416 |   17 |      0 | 2021-01-01 17:00:00
   1784128 | 2021 |     1 |   1 |     1708 |           1700 |         8 |     2037 |           2005 |        32 | WN      |   1066 | N7788W  | EWR    | HOU  |
```

Reste plein d'autres vols...

Combien de vols partent de NYC airports vers Seattle,

```
aeroport=# SELECT
aeroport-#     COUNT(*) AS flights_from_nyc_to_seattle,
aeroport-#     COUNT(DISTINCT carrier) AS unique_carriers,
aeroport-#     COUNT(DISTINCT tailnum) AS unique_planes
aeroport-# FROM flights
aeroport-# WHERE origin IN ('JFK', 'LGA', 'EWR') AND dest = 'SEA';
 flights_from_nyc_to_seattle | unique_carriers | unique_planes
-----------------------------+-----------------+---------------
                        2736 |               5 |           857
(1 row)
```

Combien de compagnies desservent cette destination et combien d'avions "uniques" ?

```
aeroport=# SELECT dest,
aeroport-#          COUNT(DISTINCT carrier) AS uniqu
e_carriers,
aeroport-#          COUNT(DISTINCT tailnum) AS uniqu
e_planes
aeroport-# FROM flights
aeroport-# GROUP BY dest;
 dest | unique_carriers | unique_planes
------+-----------------+---------------
 ABQ  |               1 |            90
 ACK  |               1 |            45
 ALB  |               1 |           161
 ATL  |               7 |          1124
 AUS  |               6 |           873
 AVL  |               2 |           120
 BDL  |               2 |           171
 BGR  |               2 |            45
 BHM  |               1 |            45
 BNA  |               5 |           910
 BOS  |               7 |          1249
 BQN  |               2 |           250
 BTV  |               3 |           381
 BUF  |               4 |           492
 BUR  |               1 |           116
 BWI  |               4 |           610
 BZN  |               1 |            18
 CAE  |               2 |            76
 CAK  |               1 |            90
 CHO  |               1 |            16
 CHS  |               4 |           434
 CLE  |               4 |           865
 CLT  |               7 |           783
 CMH  |               3 |           424
 CRW  |               1 |            20
 CVG  |               4 |           551
 DAY  |               2 |           313
 DCA  |               6 |           458
 DEN  |               5 |          1197
```

5. Trouver le nombre de vols par destination ?

```
aeroport=# SELECT dest, COUNT(*) AS flight_count
aeroport-# FROM flights
aeroport-# GROUP BY dest
aeroport-# ORDER BY flight_count DESC;
 dest | flight_count
------+--------------
 ATL  |        12946
 ORD  |        12654
 LAX  |        11895
 BOS  |        11560
 MCO  |        10637
 CLT  |        10448
 SFO  |         9729
 FLL  |         9443
 MIA  |         8938
 DCA  |         7386
 DTW  |         7009
 DFW  |         6657
 RDU  |         6198
 TPA  |         5682
 IAH  |         5438
```

Trier les vols suivant la destination, l'aéroport d'origine, la compagnie dans un ordre alphabétique croissant (en réalisant les jointures nécessaires pour obtenir les noms des explicites des aéroports) ?

```
aeroport=# SELECT f.flight_id, f.year, f.month, f.
day, f.origin, a1.name AS origin_airport, f.dest,
a2.name AS dest_airport, al.name AS airline_name
aeroport-# FROM flights f
aeroport-# JOIN airports a1 ON f.origin = a1.faa
aeroport-# JOIN airports a2 ON f.dest = a2.faa
aeroport-# JOIN airlines al ON f.carrier = al.carr
ier
aeroport-# ORDER BY f.dest, f.origin, al.name;
 flight_id | year | month | day | origin |   origi
n_airport  | dest |       dest_airport         |        airline_name
-----------+------+-------+-----+--------+----------+------+-------------------------------+---------------------------
  1814392 | 2021 |    10 |   4 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport   | JetBlue Airways
  1824504 | 2021 |    10 |  15 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport   | JetBlue Airways
  1815123 | 2021 |    10 |   5 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport   | JetBlue Airways
  1821630 | 2021 |    10 |  12 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport   | JetBlue Airways
  1817954 | 2021 |    10 |   8 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport   | JetBlue Airways
  1812411 | 2021 |    10 |   2 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport   | JetBlue Airways
  1828132 | 2021 |    10 |  19 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport   | JetBlue Airways
  1815980 | 2021 |    10 |   6 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport   | JetBlue Airways
  1827383 | 2021 |    10 |  18 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport   | JetBlue Airways
  1826403 | 2021 |    10 |  17 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport   | JetBlue Airways
  1813374 | 2021 |    10 |   3 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport   | JetBlue Airways
  1819870 | 2021 |    10 |  10 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport   | JetBlue Airways
  1825404 | 2021 |    10 |  16 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport   | JetBlue Airways
  1818910 | 2021 |    10 |   9 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport   | JetBlue Airways
nport    | JetBlue Airways
  1844831 | 2021 |    11 |   6 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport   | JetBlue Airways  1845783 | 2021 |    11 |   7 | JFK    | Jo
hn F Kennedy Intl | ABQ  | Albuquerque International Sunport    | JetBlue Airways  1870546 | 2021 |    12 |   4 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque Internatio
nal Sunport    | JetBlue Airways  1830961 | 2021 |    10 |  22 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport    | JetBlue Airways  1887886 | 2021 |
   12 |  23 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport    | JetBlue Airways  1881360 | 2021 |    12 |  16 | JFK    | John F Kennedy Intl | A
  | Albuquerque International Sunport    | JetBlue Airways  1873992 | 2021 |    12 |   8 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport    | JetB
Airways  1852343 | 2021 |    11 |  14 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport    | JetBlue Airways  1866605 | 2021 |    11 |  30 | JFK    |
John F Kennedy Intl | ABQ  | Albuquerque International Sunport    | JetBlue Airways  1865797 | 2021 |    11 |  29 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque Int
national Sunport    | JetBlue Airways  1829974 | 2021 |    10 |  21 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport    | JetBlue Airways  1888711
021 |    12 |  24 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport    | JetBlue Airways  1868589 | 2021 |    12 |   2 | JFK    | John F Kennedy I
 | ABQ  | Albuquerque International Sunport    | JetBlue Airways  1889425 | 2021 |    12 |  25 | JFK    | John F Kennedy Intl | ABQ  | Albuquerque International Sunport
```

6. Quelles sont les compagnies qui n'opèrent pas sur tous les aéroports d'origine ?

```
aeroport=# SELECT carrier
aeroport-# FROM airline_airport_routes
aeroport-# GROUP BY carrier
aeroport-# HAVING COUNT(DISTINCT faa) < (SELECT CO
UNT(*) FROM airports);
 carrier
---------
(0 rows)
```

7. Quelles sont les compagnies qui desservent l'ensemble de destinations ?

```
aeroport=# SELECT carrier
aeroport-# FROM airline_airport_routes
aeroport-# GROUP BY carrier
aeroport-# HAVING COUNT(DISTINCT faa) = (SELECT CO
UNT(DISTINCT faa) FROM airports);
 carrier
---------
(0 rows)
```

Faire un tableau où l'on récupère l'ensemble des origines et des destinations pour l'ensemble des compagnies.

```
aeroport=# SELECT DISTINCT a.origin, a.dest, l.nam
e AS airline_name
aeroport-# FROM airline_airport_routes r
aeroport-# JOIN airlines l ON r.carrier = l.carrie
r
aeroport-# JOIN flights a ON r.faa = a.origin;
 origin | dest | airline_name
--------+------+--------------
(0 rows)
```

7. Quelles sont les destinations qui sont exclusives à certaines ?

```
aeroport=# SELECT dest
aeroport-# FROM flights
aeroport-# GROUP BY dest
aeroport-# HAVING COUNT(DISTINCT carrier) = 1;
 dest
------
 ABQ
 ACK
 ALB
 BHM
 BUR
 BZN
 CAK
 CHO
 CRW
 EYW
 GSO
 HDN
 ILM
 LEX
 LGB
 MDW
 MSN
 MTJ
 MYR
 OAK
 OKC
 PSE
 PSP
 PVD
 SAV
 SBN
 SMF
 SNA
 TUL
(29 rows)
```

8. Filtrer le vol pour trouver ceux exploités par United, American ou Delta ?

```
aeroport=# SELECT *
aeroport-# FROM flights
aeroport-# WHERE carrier IN ('UA', 'AA', 'DL');
 flight_id | year | month | day | dep_time | sched
_dep_time | dep_delay | arr_time | sched_arr_time
 | arr_delay | carrier | flight | tailnum | origin
 | dest | air_time | distance | hour | minute |
  time_hour
----------+------+-------+-----+----------+------
----------+-----------+----------+---------------
+-----------+---------+--------+---------+--------
+------+----------+----------+------+--------+----
----------------
   1783544 | 2021 |     1 |   1 |      517 |
     515 |         2 |      830 |            819
 |        11 | UA      |   1545 | N14228  | EWR
 | IAH  |    227.00 |     1400 |    5 |      15 | 202
1-01-01 05:00:00
   1783545 | 2021 |     1 |   1 |      533 |
     529 |         4 |      850 |            830
 |        20 | UA      |   1714 | N24211  | LGA
 | IAH  |    227.00 |     1416 |    5 |      29 | 202
1-01-01 05:00:00
   1783546 | 2021 |     1 |   1 |      542 |
     540 |         2 |      923 |            850
 |        33 | AA      |   1141 | N619AA  | JFK
 | MIA  |    160.00 |     1089 |    5 |      40 | 202
1-01-01 05:00:00
   1783548 | 2021 |     1 |   1 |      554 |
     600 |        -6 |      812 |            837
 |       -25 | DL      |    461 | N668DN  | LGA
 | ATL  |    116.00 |      762 |    6 |       0 | 202
1-01-01 06:00:00
   1783549 | 2021 |     1 |   1 |      554 |
     558 |        -4 |      740 |            728
 |        12 | UA      |   1696 | N39463  | EWR
 | ORD  |    150.00 |      719 |    5 |      58 | 202
1-01-01 05:00:00
   1783553 | 2021 |     1 |   1 |      558 |
     600 |        -2 |      753 |            745
 |         8 | AA      |    301 | N3ALAA  | LGA
```

Base de donnée :