Queries executed via Mongo Compass:
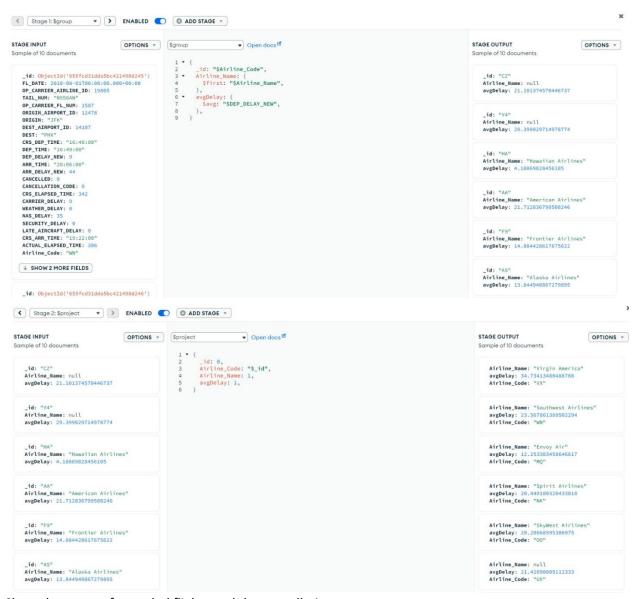
1) Find the total number of flights for each airline, showing the airline code, name, and the count of flights.

```
-db.flights.aggregate([
  { $group: { _id: { Airline_Code: "$Airline_Code", Airline_Name: "$Airline_Name" }, totalFlights: {
$sum: 1 } } },
  { $project: { _id: 0, Airline_Code: "$_id.Airline_Code", Airline_Name: "$_id.Airline_Name",
Total_Flights: "$totalFlights" } }
]);
```

| < | Stage 1: $group ▼ | > | ENABLED ⬤ | ⊕ ADD STAGE ▼ |

STAGE INPUT   OPTIONS ▼ $group ▼   Open docs ⬀
Sample of 10 documents

```
_id: ObjectId('655fcd31dda5bc421498d245')
FL_DATE: 2018-08-01T00:00:00.000+00:00
OP_CARRIER_AIRLINE_ID: 19805
TAIL_NUM: "N956AN"
OP_CARRIER_FL_NUM: 1587
ORIGIN_AIRPORT_ID: 12478
ORIGIN: "JFK"
DEST_AIRPORT_ID: 14107
DEST: "PHX"
```

```
1 ▼ {
2 ▼   _id: {
3       airlineCode: "$Airline_Code",
4       airlineName: "$Airline_Name",
5     },
6 ▼   count: {
7       $sum: 1,
8     },
9   }
```

| < | Stage 2: $project ▼ | > | ENABLED ⬤ | ⊕ ADD STAGE ▼ |

STAGE INPUT   OPTIONS ▼ $project ▼   Open docs ⬀
Sample of 10 documents

```
▶ _id: Object
  count: 15401
```

```
▶ _id: Object
  count: 4057
```

```
▶ _id: Object
  count: 2328
```

```
▶ _id: Object
  count: 991
```

```
1 ▼ {
2     _id: 0,
3     airlineCode: "$_id.airlineCode",
4     airlineName: "$_id.airlineName",
5     count: 1,
6   }
```

STAGE OUTPUT

OPTIONS ▾

Sample of 10 documents

```
count: 8526
airlineCode: "B6"
airlineName: "JetBlue Airways"
```

```
count: 3805
airlineCode: "AS"
airlineName: "Alaska Airlines"
```

```
count: 9761
airlineCode: "AA"
airlineName: "American Airlines"
```

```
count: 5074
airlineCode: "VX"
airlineName: "Virgin America"
```

```
count: 3089
airlineCode: "F9"
airlineName: "Frontier Airlines"
```

2) Calculate the average departure delay for each airline, showing the airline code, name, and the average delay.

```
db.flights.aggregate([
  { $group: { _id: { Airline_Code: "$Airline_Code", Airline_Name: "$Airline_Name" }, avgDelay: {
$avg: "$DEP_DELAY_NEW" } } },
  { $project: { _id: 0, Airline_Code: "$_id.Airline_Code", Airline_Name: "$_id.Airline_Name",
Average_Departure_Delay: "$avgDelay" } }
]);
```

STAGE INPUT | OPTIONS ▼
Sample of 10 documents

```
_id: ObjectId('655fcd31dda5bc421498d245')
FL_DATE: 2018-08-01T00:00:00.000+00:00
OP_CARRIER_AIRLINE_ID: 19805
TAIL_NUM: "N956AN"
OP_CARRIER_FL_NUM: 1587
ORIGIN_AIRPORT_ID: 12478
ORIGIN: "JFK"
DEST_AIRPORT_ID: 14107
DEST: "PHX"
CRS_DEP_TIME: "16:40:00"
DEP_TIME: "16:49:00"
DEP_DELAY_NEW: 9
ARR_TIME: "20:06:00"
ARR_DELAY_NEW: 44
CANCELLED: 0
CANCELLATION_CODE: 0
CRS_ELAPSED_TIME: 342
CARRIER_DELAY: 9
WEATHER_DELAY: 0
NAS_DELAY: 35
SECURITY_DELAY: 0
LATE_AIRCRAFT_DELAY: 0
CRS_ARR_TIME: "19:22:00"
ACTUAL_ELAPSED_TIME: 386
Airline_Code: "WN"
```

↓ SHOW 2 MORE FIELDS

```
_id: ObjectId('655fcd31dda5bc421498d246')
```

$group ▼ | Open docs

```
1 ▾ {
2      _id: "$Airline_Code",
3 ▾    Airline_Name: {
4          $first: "$Airline_Name",
5      },
6 ▾    avgDelay: {
7          $avg: "$DEP_DELAY_NEW",
8      },
9  }
```

STAGE OUTPUT | OPTIONS ▼
Sample of 10 documents

```
_id: "CZ"
Airline_Name: null
avgDelay: 21.101374570446737
```

```
_id: "Y4"
Airline_Name: null
avgDelay: 29.399029714978774
```

```
_id: "HA"
Airline_Name: "Hawaiian Airlines"
avgDelay: 4.18869828456105
```

```
_id: "AA"
Airline_Name: "American Airlines"
avgDelay: 21.712836799508246
```

```
_id: "F9"
Airline_Name: "Frontier Airlines"
avgDelay: 14.884428617675622
```

```
_id: "AS"
Airline_Name: "Alaska Airlines"
avgDelay: 13.844940867279895
```

STAGE INPUT | OPTIONS ▼
Sample of 10 documents

```
_id: "CZ"
Airline_Name: null
avgDelay: 21.101374570446737
```

```
_id: "Y4"
Airline_Name: null
avgDelay: 29.399029714978774
```

```
_id: "HA"
Airline_Name: "Hawaiian Airlines"
avgDelay: 4.18869828456105
```

```
_id: "AA"
Airline_Name: "American Airlines"
avgDelay: 21.712836799508246
```

```
_id: "F9"
Airline_Name: "Frontier Airlines"
avgDelay: 14.884428617675622
```

```
_id: "AS"
Airline_Name: "Alaska Airlines"
avgDelay: 13.844940867279895
```

$project ▼ | Open docs

```
1 ▾ {
2      _id: 0,
3      Airline_Code: "$_id",
4      Airline_Name: 1,
5      avgDelay: 1,
6  }
```

STAGE OUTPUT | OPTIONS ▼
Sample of 10 documents

```
Airline_Name: "Virgin America"
avgDelay: 34.73413480488766
Airline_Code: "VX"
```

```
Airline_Name: "Southwest Airlines"
avgDelay: 23.567861389502294
Airline_Code: "WN"
```

```
Airline_Name: "Envoy Air"
avgDelay: 12.253383458646617
Airline_Code: "MQ"
```

```
Airline_Name: "Spirit Airlines"
avgDelay: 20.449100320433818
Airline_Code: "NK"
```

```
Airline_Name: "SkyWest Airlines"
avgDelay: 20.2066859530 6975
Airline_Code: "OO"
```

```
Airline_Name: null
avgDelay: 21.42890809112333
Airline_Code: "UX"
```
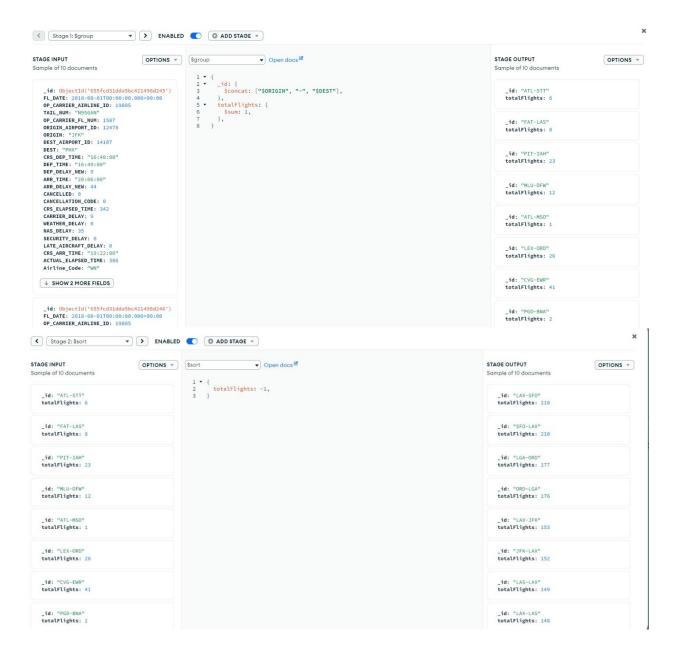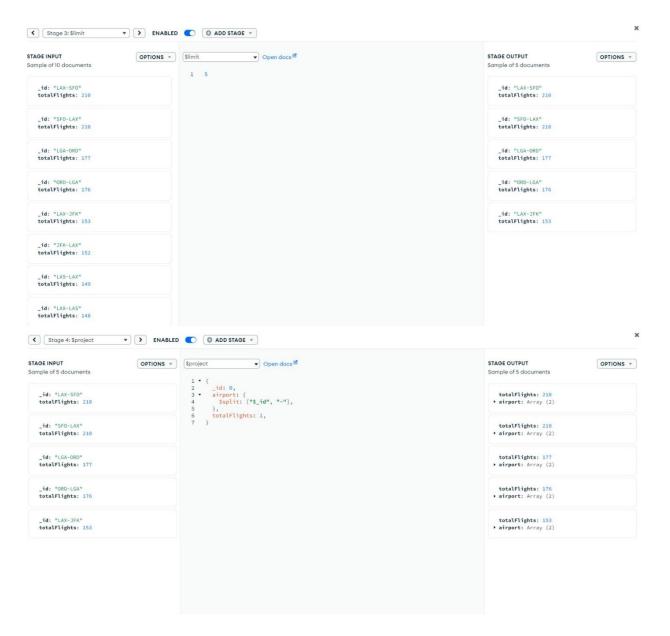
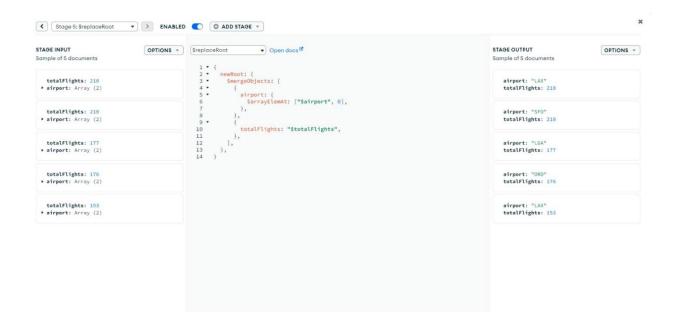3) Show the count of canceled flights and the cancellation reasons.

```
db.flights.aggregate([
  { $match: { CANCELLED: 1 } },
  { $group: { _id: "$CANCELLATION_CODE", count: { $sum: 1 } } },
  { $project: { _id: 0, Cancellation_Code: "$_id", Count: "$count" } }
]);
```

STAGE INPUT | OPTIONS ▼
Sample of 10 documents

```
_id: ObjectId('655fcd31dda5bc421498d245')
FL_DATE: 2018-08-01T00:00:00.000+00:00
OP_CARRIER_AIRLINE_ID: 19805
TAIL_NUM: "N956AN"
OP_CARRIER_FL_NUM: 1587
ORIGIN_AIRPORT_ID: 12478
ORIGIN: "JFK"
DEST_AIRPORT_ID: 14107
DEST: "PHX"
CRS_DEP_TIME: "16:40:00"
DEP_TIME: "16:49:00"
DEP_DELAY_NEW: 9
ARR_TIME: "20:06:00"
ARR_DELAY_NEW: 44
CANCELLED: 0
CANCELLATION_CODE: 0
CRS_ELAPSED_TIME: 342
CARRIER_DELAY: 9
WEATHER_DELAY: 0
NAS_DELAY: 35
SECURITY_DELAY: 0
LATE_AIRCRAFT_DELAY: 0
CRS_ARR_TIME: "19:22:00"
ACTUAL_ELAPSED_TIME: 386
Airline_Code: "WN"
```
↓ SHOW 2 MORE FIELDS

$match ▼ | Open docs⧉

```
1 ▼ {
2       CANCELLED: 1,
3   }
```

STAGE OUTPUT | OPTIONS ▼
Sample of 10 documents

```
_id: ObjectId('655fcd31dda5bc421498d269')
FL_DATE: 2018-08-01T00:00:00.000+00:00
OP_CARRIER_AIRLINE_ID: 19805
TAIL_NUM: "N970AN"
OP_CARRIER_FL_NUM: 1619
ORIGIN_AIRPORT_ID: 11057
ORIGIN: "CLT"
DEST_AIRPORT_ID: 11298
DEST: "DFW"
CRS_DEP_TIME: "11:45:00"
DEP_TIME: "12:59:00"
DEP_DELAY_NEW: 74
ARR_TIME: "0:00:00"
ARR_DELAY_NEW: 0
CANCELLED: 1
CANCELLATION_CODE: "A"
CRS_ELAPSED_TIME: 169
CARRIER_DELAY: 74
WEATHER_DELAY: 0
NAS_DELAY: 0
SECURITY_DELAY: 0
LATE_AIRCRAFT_DELAY: 0
CRS_ARR_TIME: "0:00:00"
ACTUAL_ELAPSED_TIME: 169
Airline_Code: "WN"
```
↓ SHOW 2 MORE FIELDS

STAGE INPUT | OPTIONS ▼
Sample of 10 documents

```
_id: ObjectId('655fcd31dda5bc421498d269')
FL_DATE: 2018-08-01T00:00:00.000+00:00
OP_CARRIER_AIRLINE_ID: 19805
TAIL_NUM: "N970AN"
OP_CARRIER_FL_NUM: 1619
ORIGIN_AIRPORT_ID: 11057
ORIGIN: "CLT"
DEST_AIRPORT_ID: 11298
DEST: "DFW"
CRS_DEP_TIME: "11:45:00"
DEP_TIME: "12:59:00"
DEP_DELAY_NEW: 74
ARR_TIME: "0:00:00"
ARR_DELAY_NEW: 0
CANCELLED: 1
CANCELLATION_CODE: "A"
CRS_ELAPSED_TIME: 169
CARRIER_DELAY: 74
WEATHER_DELAY: 0
NAS_DELAY: 0
SECURITY_DELAY: 0
LATE_AIRCRAFT_DELAY: 0
CRS_ARR_TIME: "0:00:00"
ACTUAL_ELAPSED_TIME: 169
Airline_Code: "WN"
```
↓ SHOW 2 MORE FIELDS

```
_id: ObjectId('655fcd31dda5bc421498d288')
FL_DATE: 2018-08-01T00:00:00.000+00:00
OP_CARRIER_AIRLINE_ID: 19805
TAIL_NUM: "N752US"
```

$group ▼ | Open docs⧉

```
1 ▼ {
2       _id: "$CANCELLATION_CODE",
3 ▼     count: {
4           $sum: 1,
5       },
6   }
```

STAGE OUTPUT | OPTIONS ▼
Sample of 3 documents

```
_id: "B"
count: 3762
```

```
_id: "A"
count: 3452
```

```
_id: "C"
count: 7056
```

4) List the top 5 busiest airports based on the total number of departures and arrivals.

```
db.flights.aggregate([
  { $group: { _id: "$ORIGIN_AIRPORT_ID", totalFlights: { $sum: 1 } } },
  { $sort: { totalFlights: -1 } },
  { $limit: 5 },
  { $lookup: { from: "airports", localField: "_id", foreignField: "AIRPORT_ID", as: "AirportInfo" } },
  { $project: { _id: 0, Airport_ID: "$_id", Airport_Name: "$AirportInfo.ORIGIN", Total_Flights:
"$totalFlights" } }
]);
```

Stage 1: $group

ENABLED · ADD STAGE

STAGE INPUT
OPTIONS
Sample of 10 documents

```
_id: ObjectId('655fcd31dda5bc421498d245')
FL_DATE: 2018-08-01T00:00:00.000+00:00
OP_CARRIER_AIRLINE_ID: 19805
TAIL_NUM: "N956AN"
OP_CARRIER_FL_NUM: 1587
ORIGIN_AIRPORT_ID: 12478
ORIGIN: "JFK"
DEST_AIRPORT_ID: 14107
DEST: "PHX"
CRS_DEP_TIME: "16:40:00"
DEP_TIME: "16:49:00"
DEP_DELAY_NEW: 9
ARR_TIME: "20:06:00"
ARR_DELAY_NEW: 44
CANCELLED: 0
CANCELLATION_CODE: 0
CRS_ELAPSED_TIME: 342
CARRIER_DELAY: 9
WEATHER_DELAY: 0
NAS_DELAY: 35
SECURITY_DELAY: 0
LATE_AIRCRAFT_DELAY: 0
CRS_ARR_TIME: "19:22:00"
ACTUAL_ELAPSED_TIME: 386
Airline_Code: "WN"
```

⬇ SHOW 2 MORE FIELDS

```
_id: ObjectId('655fcd31dda5bc421498d246')
FL_DATE: 2018-08-01T00:00:00.000+00:00
OP_CARRIER_AIRLINE_ID: 19805
```

$group · Open docs

```
1 ▾ {
2 ▾   _id: {
3       $concat: ["$ORIGIN", "-", "$DEST"],
4     },
5 ▾   totalFlights: {
6       $sum: 1,
7     },
8   }
```

STAGE OUTPUT
OPTIONS
Sample of 10 documents

```
_id: "ATL-STT"
totalFlights: 6
```

```
_id: "FAT-LAS"
totalFlights: 8
```

```
_id: "PIT-IAH"
totalFlights: 23
```

```
_id: "MLU-DFW"
totalFlights: 12
```

```
_id: "ATL-MSO"
totalFlights: 1
```

```
_id: "LEX-ORD"
totalFlights: 26
```

```
_id: "CVG-EWR"
totalFlights: 41
```

```
_id: "PGD-BNA"
totalFlights: 2
```

Stage 2: $sort

ENABLED · ADD STAGE

STAGE INPUT
OPTIONS
Sample of 10 documents

```
_id: "ATL-STT"
totalFlights: 6
```

```
_id: "FAT-LAS"
totalFlights: 8
```

```
_id: "PIT-IAH"
totalFlights: 23
```

```
_id: "MLU-DFW"
totalFlights: 12
```

```
_id: "ATL-MSO"
totalFlights: 1
```

```
_id: "LEX-ORD"
totalFlights: 26
```

```
_id: "CVG-EWR"
totalFlights: 41
```

```
_id: "PGD-BNA"
totalFlights: 2
```

$sort · Open docs

```
1 ▾ {
2     totalFlights: -1,
3   }
```

STAGE OUTPUT
OPTIONS
Sample of 10 documents

```
_id: "LAX-SFO"
totalFlights: 210
```

```
_id: "SFO-LAX"
totalFlights: 210
```

```
_id: "LGA-ORD"
totalFlights: 177
```

```
_id: "ORD-LGA"
totalFlights: 176
```

```
_id: "LAX-JFK"
totalFlights: 153
```

```
_id: "JFK-LAX"
totalFlights: 152
```

```
_id: "LAS-LAX"
totalFlights: 149
```

```
_id: "LAX-LAS"
totalFlights: 148
```

STAGE INPUT   OPTIONS ▾
Sample of 10 documents

$limit ▾   Open docs ⬈

```
1   5
```

STAGE OUTPUT   OPTIONS ▾
Sample of 5 documents

_id: "LAX-SFO"
totalFlights: 210

_id: "SFO-LAX"
totalFlights: 210

_id: "LGA-ORD"
totalFlights: 177

_id: "ORD-LGA"
totalFlights: 176

_id: "LAX-JFK"
totalFlights: 153

_id: "JFK-LAX"
totalFlights: 152

_id: "LAS-LAX"
totalFlights: 149

_id: "LAX-LAS"
totalFlights: 148

STAGE OUTPUT:

_id: "LAX-SFO"
totalFlights: 210

_id: "SFO-LAX"
totalFlights: 210

_id: "LGA-ORD"
totalFlights: 177

_id: "ORD-LGA"
totalFlights: 176

_id: "LAX-JFK"
totalFlights: 153

STAGE INPUT   OPTIONS ▾
Sample of 5 documents

$project ▾   Open docs ⬈

```
1 ▾ {
2      _id: 0,
3 ▾    airport: {
4        $split: ["$_id", "-"],
5      },
6      totalFlights: 1,
7   }
```

STAGE OUTPUT   OPTIONS ▾
Sample of 5 documents

_id: "LAX-SFO"
totalFlights: 210

_id: "SFO-LAX"
totalFlights: 210

_id: "LGA-ORD"
totalFlights: 177

_id: "ORD-LGA"
totalFlights: 176

_id: "LAX-JFK"
totalFlights: 153

STAGE OUTPUT:

totalFlights: 210
▸ airport: Array (2)

totalFlights: 210
▸ airport: Array (2)

totalFlights: 177
▸ airport: Array (2)

totalFlights: 176
▸ airport: Array (2)

totalFlights: 153
▸ airport: Array (2)

STAGE INPUT   OPTIONS ▾
Sample of 5 documents

```
totalFlights: 210
▸ airport: Array (2)
```

```
totalFlights: 210
▸ airport: Array (2)
```

```
totalFlights: 177
▸ airport: Array (2)
```

```
totalFlights: 176
▸ airport: Array (2)
```

```
totalFlights: 153
▸ airport: Array (2)
```

$replaceRoot ▾   Open docs

```
1  ▾ {
2  ▾   newRoot: {
3  ▾     $mergeObjects: [
4  ▾       {
5  ▾         airport: {
6             $arrayElemAt: ["$airport", 0],
7           },
8         },
9  ▾       {
10            totalFlights: "$totalFlights",
11          },
12        ],
13      },
14    }
```

STAGE OUTPUT   OPTIONS ▾
Sample of 5 documents

```
airport: "LAX"
totalFlights: 210
```

```
airport: "SFO"
totalFlights: 210
```

```
airport: "LGA"
totalFlights: 177
```

```
airport: "ORD"
totalFlights: 176
```

```
airport: "LAX"
totalFlights: 153
```

5) Show the distribution of departure delays with categories (e.g., early, on time, minor delay, moderate delay, severe delay).

```
db.flights.aggregate([
 {
   $project: {
    _id: 0,
     Flight_ID: 1,
     Dep_Delay_Category: {
      $cond: [
        { $eq: ["$DEP_DELAY_NEW", 0] }, "On Time",
        { $lt: ["$DEP_DELAY_NEW", 15] }, "Minor Delay",
        { $lt: ["$DEP_DELAY_NEW", 60] }, "Moderate Delay",
        "Severe Delay"
      ]
    }
  }
 },
```

```
{ $group: { _id: "$Dep_Delay_Category", count: { $sum: 1 } } }
]);
```


6) Calculate the average departure delay for each day of the week.

```
db.flights.aggregate([
 { $group: { _id: "$DAY_OF_WEEK", avgDelay: { $avg: "$DEP_DELAY_NEW" } } },
 { $project: { _id: 0, Day_Of_Week: "$_id", Average_Departure_Delay: "$avgDelay" } }
]);
```

7) Find the airline with the maximum weather delay, showing the airline code and name.

```
db.flights.aggregate([

 { $match: { WEATHER_DELAY: { $gt: 0 } } },

 { $sort: { WEATHER_DELAY: -1 } },

 { $limit: 1 },

 { $project: { _id: 0, Airline_Code: "$Airline_Code", Airline_Name: "$Airline_Name",
Max_Weather_Delay: "$WEATHER_DELAY" } }

]);
```

STAGE INPUT   OPTIONS ▼
Sample of 10 documents

```
_id: ObjectId('655fcd31dda5bc421498d245')
FL_DATE: 2018-08-01T00:00:00.000+00:00
OP_CARRIER_AIRLINE_ID: 19805
TAIL_NUM: "N956AN"
OP_CARRIER_FL_NUM: 1587
ORIGIN_AIRPORT_ID: 12478
ORIGIN: "JFK"
DEST_AIRPORT_ID: 14107
DEST: "PHX"
CRS_DEP_TIME: "16:40:00"
DEP_TIME: "16:49:00"
DEP_DELAY_NEW: 9
ARR_TIME: "20:06:00"
ARR_DELAY_NEW: 44
CANCELLED: 0
CANCELLATION_CODE: 0
CRS_ELAPSED_TIME: 342
CARRIER_DELAY: 9
WEATHER_DELAY: 0
NAS_DELAY: 35
SECURITY_DELAY: 0
LATE_AIRCRAFT_DELAY: 0
CRS_ARR_TIME: "19:22:00"
ACTUAL_ELAPSED_TIME: 386
Airline_Code: "WN"
```

⌄ SHOW 2 MORE FIELDS

```
_id: ObjectId('655fcd31dda5bc421498d246')
FL_DATE: 2018-08-01T00:00:00.000+00:00
OP_CARRIER_AIRLINE_ID: 19805
```

$match ▼   Open docs ⧉

```
1 ▾ {
2 ▾   WEATHER_DELAY: {
3       $exists: true,
4     },
5   }
```

STAGE OUTPUT   OPTIONS ▼
Sample of 10 documents

```
_id: ObjectId('655fcd31dda5bc421498d245')
FL_DATE: 2018-08-01T00:00:00.000+00:00
OP_CARRIER_AIRLINE_ID: 19805
TAIL_NUM: "N956AN"
OP_CARRIER_FL_NUM: 1587
ORIGIN_AIRPORT_ID: 12478
ORIGIN: "JFK"
DEST_AIRPORT_ID: 14107
DEST: "PHX"
CRS_DEP_TIME: "16:40:00"
DEP_TIME: "16:49:00"
DEP_DELAY_NEW: 9
ARR_TIME: "20:06:00"
ARR_DELAY_NEW: 44
CANCELLED: 0
CANCELLATION_CODE: 0
CRS_ELAPSED_TIME: 342
CARRIER_DELAY: 9
WEATHER_DELAY: 0
NAS_DELAY: 35
SECURITY_DELAY: 0
LATE_AIRCRAFT_DELAY: 0
CRS_ARR_TIME: "19:22:00"
ACTUAL_ELAPSED_TIME: 386
Airline_Code: "WN"
```

⌄ SHOW 2 MORE FIELDS

```
_id: ObjectId('655fcd31dda5bc421498d246')
FL_DATE: 2018-08-01T00:00:00.000+00:00
OP_CARRIER_AIRLINE_ID: 19805
```

STAGE INPUT   OPTIONS ▼
Sample of 10 documents

```
_id: ObjectId('655fcd31dda5bc421498d245')
FL_DATE: 2018-08-01T00:00:00.000+00:00
OP_CARRIER_AIRLINE_ID: 19805
TAIL_NUM: "N956AN"
OP_CARRIER_FL_NUM: 1587
ORIGIN_AIRPORT_ID: 12478
ORIGIN: "JFK"
DEST_AIRPORT_ID: 14107
DEST: "PHX"
CRS_DEP_TIME: "16:40:00"
DEP_TIME: "16:49:00"
DEP_DELAY_NEW: 9
ARR_TIME: "20:06:00"
ARR_DELAY_NEW: 44
CANCELLED: 0
CANCELLATION_CODE: 0
CRS_ELAPSED_TIME: 342
CARRIER_DELAY: 9
WEATHER_DELAY: 0
NAS_DELAY: 35
SECURITY_DELAY: 0
LATE_AIRCRAFT_DELAY: 0
CRS_ARR_TIME: "19:22:00"
ACTUAL_ELAPSED_TIME: 386
Airline_Code: "WN"
```

⌄ SHOW 2 MORE FIELDS

```
_id: ObjectId('655fcd31dda5bc421498d246')
FL_DATE: 2018-08-01T00:00:00.000+00:00
OP_CARRIER_AIRLINE_ID: 19805
```

$group ▼   Open docs ⧉

```
1 ▾ {
2 ▾   _id: {
3       Airline_Code: "$Airline_Code",
4       Airline_Name: "$Airline_Name",
5     },
6 ▾   MAX_WEATHER_DELAY: {
7       $max: "$WEATHER_DELAY",
8     },
9   }
```

STAGE OUTPUT   OPTIONS ▼
Sample of 10 documents

```
▸ _id: Object
  MAX_WEATHER_DELAY: 226
```

```
▸ _id: Object
  MAX_WEATHER_DELAY: 226
```

```
▸ _id: Object
  MAX_WEATHER_DELAY: 468
```

```
▸ _id: Object
  MAX_WEATHER_DELAY: 0
```

```
▸ _id: Object
  MAX_WEATHER_DELAY: 84
```

```
▸ _id: Object
  MAX_WEATHER_DELAY: 0
```

```
▸ _id: Object
  MAX_WEATHER_DELAY: 73
```

```
▸ _id: Object
  MAX_WEATHER_DELAY: 0
```

‹ | Stage 3: $sort ▾ | › | ENABLED 🔵 | ⊕ ADD STAGE ▾

STAGE INPUT | OPTIONS ▾
Sample of 10 documents

| $sort ▾ | Open docs ⧉

```
1 ▾ {
2       MAX_WEATHER_DELAY: -1,
3   }
```

STAGE OUTPUT | OPTIONS ▾
Sample of 10 documents

▸ _id: Object
  MAX_WEATHER_DELAY: 226

▸ _id: Object
  MAX_WEATHER_DELAY: 226

▸ _id: Object
  MAX_WEATHER_DELAY: 468

▸ _id: Object
  MAX_WEATHER_DELAY: 0

▸ _id: Object
  MAX_WEATHER_DELAY: 84

▸ _id: Object
  MAX_WEATHER_DELAY: 0

▸ _id: Object
  MAX_WEATHER_DELAY: 73

▸ _id: Object
  MAX_WEATHER_DELAY: 0

STAGE OUTPUT:

▸ _id: Object
  MAX_WEATHER_DELAY: "`43"

▸ _id: Object
  MAX_WEATHER_DELAY: "`43"

▸ _id: Object
  MAX_WEATHER_DELAY: 468

▸ _id: Object
  MAX_WEATHER_DELAY: 367

▸ _id: Object
  MAX_WEATHER_DELAY: 226

▸ _id: Object
  MAX_WEATHER_DELAY: 226

▸ _id: Object
  MAX_WEATHER_DELAY: 223

▸ _id: Object
  MAX_WEATHER_DELAY: 161

‹ | Stage 4: $limit ▾ | › | ENABLED 🔵 | ⊕ ADD STAGE ▾

STAGE INPUT | OPTIONS ▾
Sample of 10 documents

| $limit ▾ | Open docs ⧉

```
1   1
```

STAGE OUTPUT | OPTIONS ▾
Sample of 1 document

▸ _id: Object
  MAX_WEATHER_DELAY: "`43"

STAGE INPUT:

▸ _id: Object
  MAX_WEATHER_DELAY: "`43"

▸ _id: Object
  MAX_WEATHER_DELAY: "`43"

▸ _id: Object
  MAX_WEATHER_DELAY: 468

▸ _id: Object
  MAX_WEATHER_DELAY: 367

▸ _id: Object
  MAX_WEATHER_DELAY: 226

▸ _id: Object
  MAX_WEATHER_DELAY: 226

▸ _id: Object
  MAX_WEATHER_DELAY: 223

▸ _id: Object
  MAX_WEATHER_DELAY: 161

8) Show the total number of flights for each month.

db.flights.aggregate([

    { $group: { _id: { $month: "$FL_DATE" }, totalFlights: { $sum: 1 } } },
    { $project: { _id: 0, Month: "$_id", Total_Flights: "$totalFlights" } }

]);

STAGE INPUT   OPTIONS ▾ $sort   ▾   Open docs ⬈   STAGE OUTPUT   OPTIONS ▾
Sample of 1 document   Sample of 1 document

```
1 ▾ {
2      _id: 1,
3 }
```

_id: 8   _id: 8
totalFlights: 100000   totalFlights: 100000

9) Determine the busiest day of the week based on the total number of flights.

db.flights.aggregate([

 { $group: { _id: "$DAY_OF_WEEK", totalFlights: { $sum: 1 } } },

 { $sort: { totalFlights: -1 } },

 { $limit: 1 },

 { $project: { _id: 0, Busiest_Day: "$_id", Total_Flights: "$totalFlights" } }

]);

STAGE INPUT   OPTIONS ▾ $group   ▾   Open docs ⬈   STAGE OUTPUT   OPTIONS ▾
Sample of 10 documents   Sample of 5 documents

```
1 ▾ {
2      _id: "$DAY_OF_WEEK",
3 ▾    totalFlights: {
4          $sum: 1,
5      },
6 }
```

_id: ObjectId('655fcd31dda5bc421498d245')   _id: "Friday"
FL_DATE: 2018-08-01T00:00:00.000+00:00   totalFlights: 23897
OP_CARRIER_AIRLINE_ID: 19805
TAIL_NUM: "N956AN"
OP_CARRIER_FL_NUM: 1587   _id: "Wednesday"
ORIGIN_AIRPORT_ID: 12478   totalFlights: 23566
ORIGIN: "JFK"
DEST_AIRPORT_ID: 14107
DEST: "PHX"   _id: "Saturday"
CRS_DEP_TIME: "16:40:00"   totalFlights: 20207
DEP_TIME: "16:49:00"
DEP_DELAY_NEW: 9
ARR_TIME: "20:06:00"   _id: "Sunday"
ARR_DELAY_NEW: 44   totalFlights: 8495
CANCELLED: 0
CANCELLATION_CODE: 0
CRS_ELAPSED_TIME: 342   _id: "Thursday"
CARRIER_DELAY: 9   totalFlights: 23835
WEATHER_DELAY: 0
NAS_DELAY: 35
SECURITY_DELAY: 0
LATE_AIRCRAFT_DELAY: 0
CRS_ARR_TIME: "19:22:00"
ACTUAL_ELAPSED_TIME: 386
Airline_Code: "WN"

↓ SHOW 2 MORE FIELDS

_id: ObjectId('655fcd31dda5bc421498d246')
FL_DATE: 2018-08-01T00:00:00.000+00:00
OP_CARRIER_AIRLINE_ID: 19805

STAGE INPUT   OPTIONS ▼
Sample of 5 documents

```
_id: "Friday"
totalFlights: 23897
```

```
_id: "Wednesday"
totalFlights: 23566
```

```
_id: "Saturday"
totalFlights: 20207
```

```
_id: "Sunday"
totalFlights: 8495
```

```
_id: "Thursday"
totalFlights: 23835
```

$sort ▼   Open docs ⧉

```
1 ▾ {
2      totalFlights: -1,
3    }
```

STAGE OUTPUT   OPTIONS ▼
Sample of 5 documents

```
_id: "Friday"
totalFlights: 23897
```

```
_id: "Thursday"
totalFlights: 23835
```

```
_id: "Wednesday"
totalFlights: 23566
```

```
_id: "Saturday"
totalFlights: 20207
```

```
_id: "Sunday"
totalFlights: 8495
```

STAGE INPUT   OPTIONS ▼
Sample of 5 documents

```
_id: "Friday"
totalFlights: 23897
```

```
_id: "Thursday"
totalFlights: 23835
```

```
_id: "Wednesday"
totalFlights: 23566
```

```
_id: "Saturday"
totalFlights: 20207
```

```
_id: "Sunday"
totalFlights: 8495
```

$limit ▼   Open docs ⧉

```
1    1
```

STAGE OUTPUT   OPTIONS ▼
Sample of 1 document

```
_id: "Friday"
totalFlights: 23897
```

Show the count of on-time, delayed, and canceled flights for each route (origin-destination pair).

```
db.flights.aggregate([
  {
    $project: {
      _id: 0,
      Route: { $concat: ["$ORIGIN", "-", "$DEST"] },
      Flight_Status: {
```

```
      $switch: {

        branches: [

          { case: { $eq: ["$CANCELLED", 1] }, then: "Canceled" },

          { case: { $gte: ["$DEP_DELAY_NEW", 15] }, then: "Delayed" },

          { case: { $and: [ { $eq: ["$CANCELLED", 0] }, { $eq: ["$DEP_DELAY_NEW", 0] } ] }, then: "On
Time" }

        ],

        default: "Unknown"

      }

    }

  }

},

{ $group: { _id: { Route: "$Route", Flight_Status: "$Flight_Status" }, count: { $sum: 1 } } }

]);
```

```
< [ Stage 1: $group ▼ ] > ]   ENABLED ⬤   ⊕ ADD STAGE ▼                                                                    ✕

STAGE INPUT                          OPTIONS ▼      $group              ▼  Open docs ⧉        STAGE OUTPUT                    OPTIONS ▼
Sample of 10 documents                                                                      Sample of 10 documents

                                                     1 ▾ {
                                                     2 ▾   _id: {
  _id: ObjectId('655fcd31dda5bc421498d245')          3       origin: "$ORIGIN",            ▸ _id: Object
  FL_DATE: 2018-08-01T00:00:00.000+00:00             4       destination: "$DEST",           on_time: 2
  OP_CARRIER_AIRLINE_ID: 19805                       5     },                                delayed: 2
  TAIL_NUM: "N956AN"                                 6 ▾   on_time: {                        canceled: 0
  OP_CARRIER_FL_NUM: 1587                            7 ▾     $sum: {
  ORIGIN_AIRPORT_ID: 12478                           8 ▾       $cond: [
  ORIGIN: "JFK"                                      9 ▾         {                         ▸ _id: Object
  DEST_AIRPORT_ID: 14107                            10            $eq: ["$ARR_DELAY_NEW", 0],   on_time: 2
  DEST: "PHX"                                       11          },                            delayed: 3
  CRS_DEP_TIME: "16:40:00"                          12          1,                            canceled: 0
  DEP_TIME: "16:49:00"                              13          0,
  DEP_DELAY_NEW: 9                                  14        ],
  ARR_TIME: "20:06:00"                              15      },
  ARR_DELAY_NEW: 44                                 16    },                               ▸ _id: Object
  CANCELLED: 0                                      17 ▾   delayed: {                        on_time: 8
  CANCELLATION_CODE: 0                              18 ▾     $sum: {                         delayed: 4
  CRS_ELAPSED_TIME: 342                             19 ▾       $cond: [                      canceled: 1
  CARRIER_DELAY: 9                                  20 ▾         {
  WEATHER_DELAY: 0                                  21            $gt: ["$ARR_DELAY_NEW", 0],
  NAS_DELAY: 35                                     22          },
  SECURITY_DELAY: 0                                 23          1,                         ▸ _id: Object
  LATE_AIRCRAFT_DELAY: 0                            24          0,                           on_time: 15
  CRS_ARR_TIME: "19:22:00"                          25        ],                             delayed: 6
  ACTUAL_ELAPSED_TIME: 386                          26      },                               canceled: 0
  Airline_Code: "WN"                                27    },
                                                    28 ▾   canceled: {
  [ ↓ SHOW 2 MORE FIELDS ]                          29 ▾     $sum: {                       ▸ _id: Object
                                                    30 ▾       $cond: [                      on_time: 5
                                                    31 ▾         {                           delayed: 3
  _id: ObjectId('655fcd31dda5bc421498d246')         32            $eq: ["$CANCELLED", 1],     canceled: 0
  FL_DATE: 2018-08-01T00:00:00.000+00:00            33          },
  OP_CARRIER_AIRLINE_ID: 19805                      34          1,
  TAIL_NUM: "N973AN"                                35          0,                         ▸ _id: Object
                                                    36        ],                             on_time: 4
```

Queries executed via Mongo Shell:

Calculate the average departure delay for each airport (origin and destination combined).

```
flights> db.delay.aggregate([
...    { $group: { _id: { Airport: { $concat: ["$ORIGIN", "-", "$DEST"] } }, avgDelay: { $avg: "$DEP_DELAY_NEW" } } },
...    { $project: { _id: 0, Airport: "$_id.Airport", Average_Departure_Delay: "$avgDelay" } }
... ]);
[
   { Airport: 'LGA-CLE', Average_Departure_Delay: 16.518763796909493 },
   { Airport: 'SFO-RNO', Average_Departure_Delay: 32.53030303030303 },
   { Airport: 'ORD-RNO', Average_Departure_Delay: 24.673076923076923 },
   { Airport: 'SFO-ANC', Average_Departure_Delay: 12.903225806451612 },
   { Airport: 'AUS-IAH', Average_Departure_Delay: 9.384328358208956 },
   { Airport: 'SWF-MCO', Average_Departure_Delay: 41.25806451612903 },
   { Airport: 'LEX-LGA', Average_Departure_Delay: 17 },
   { Airport: 'SAT-EWR', Average_Departure_Delay: 1.2903225806451613 },
   { Airport: 'AUS-JAX', Average_Departure_Delay: 9.333333333333334 },
   { Airport: 'IAH-MCI', Average_Departure_Delay: 9.980519480519481 },
   { Airport: 'LWB-IAD', Average_Departure_Delay: 25.785714285714285 },
   { Airport: 'SLC-OAK', Average_Departure_Delay: 12.23728813559322 },
   { Airport: 'UIN-CGI', Average_Departure_Delay: 51.03703703703704 },
   { Airport: 'ABQ-ORD', Average_Departure_Delay: 15.932692307692308 },
   { Airport: 'RIC-ATL', Average_Departure_Delay: 6.592783505154639 },
   { Airport: 'MSY-PHL', Average_Departure_Delay: 20.51851851851852 },
   { Airport: 'ATL-ANC', Average_Departure_Delay: 21.129032258064516 },
   { Airport: 'GJT-DFW', Average_Departure_Delay: 9.326086956521738 },
   { Airport: 'BUF-DTW', Average_Departure_Delay: 14.744827586206897 },
   { Airport: 'SPI-DFW', Average_Departure_Delay: 11.131147540983607 }
]
Type "it" for more
flights> it
[
   { Airport: 'EYW-MIA', Average_Departure_Delay: 5.588709677419355 },
   { Airport: 'ABQ-OAK', Average_Departure_Delay: 8.4 },
   { Airport: 'BIL-AZA', Average_Departure_Delay: 58.8 },
   { Airport: 'SEA-JAC', Average_Departure_Delay: 0 },
   { Airport: 'FAI-MSP', Average_Departure_Delay: 14.064516129032258 },
   { Airport: 'SFO-ONT', Average_Departure_Delay: 23.215469613259668 },
   { Airport: 'TUL-DFW', Average_Departure_Delay: 12.605263157894736 },
   { Airport: 'HOU-OKC', Average_Departure_Delay: 8.530973451327434 },
   { Airport: 'ORD-DAY', Average_Departure_Delay: 22.66355140186916 },
   { Airport: 'DFW-DTW', Average_Departure_Delay: 16.517808219178082 },
   { Airport: 'CRW-DCA', Average_Departure_Delay: 19.74137931034483 },
```

Determine the busiest day of the week based on the total number of flights.

```
flights> db.delay.aggregate([ { $group: { _id: "$DAY_OF_WEEK", totalFlights: { $sum: 1 } } }, { $sort: { totalFlights: -1 } }, { $limit: 1 },{ $project: { _id: 0, Busiest_Day: "$_id", Total_Flights: "$totalFlights" } }
... ]);
[ { Busiest_Day: 'Friday', Total_Flights: 234588 } ]
```

Identify the peak departure times during the day.

```
flights> db.delay.aggregate([ { $group: { _id: "$DAY_OF_WEEK", totalFlights: { $sum: 1 } } }, { $sort: { totalFlights: -1 } }, { $limit: 1 },{ $project: { _id: 0, Busiest_Day: "$_id", Total_Flights: "$totalFlights" } }
... ]);
[ { Busiest_Day: 'Friday', Total_Flights: 234588 } ]
flights> db.delay.aggregate([{
            { case: { $lt: ["$CRS_DEP_TIME", "21:00"] }, then: "Evening" },
...      $project: {
...          _id: 0,
...          Peak_Departure_Time: {
...              $switch: {
...                  branches: [
...                      { case: { $lt: ["$CRS_DEP_TIME", "12:00"] }, then: "Morning" },
...                      { case: { $lt: ["$CRS_DEP_TIME", "17:00"] }, then: "Afternoon" },
...                      { case: { $gte: ["$CRS_DEP_TIME", "21:00"] }, then: "Night" }
...                  ],
...                  default: "Unknown"
...              }
...          }
...      }
...   },
...   { $group: { _id: "$Peak_Departure_Time", totalFlights: { $sum: 1 } } }
... ]);
[
   { _id: 'Night', totalFlights: 496450 },
   { _id: 'Morning', totalFlights: 176374 },
   { _id: 'Afternoon', totalFlights: 412846 },
   { _id: 'Unknown', totalFlights: 317034 }
]
```