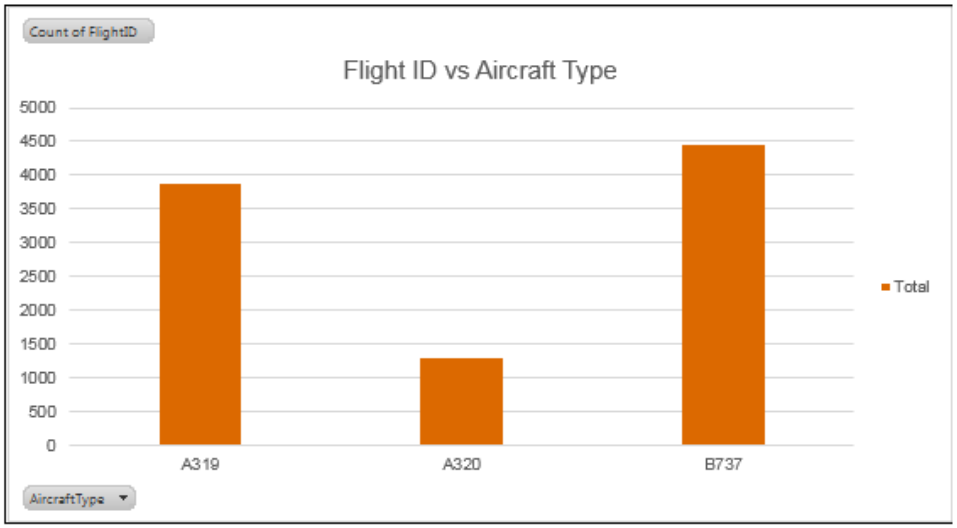
Aircraft analysis

Create a Pivot Table on the corresponding pivot tabs that uses data from the Flights and Aircraft tables to answer the following questions
Create a Pivot Chart below to show the number of each type of aircraft across all flights (include the name of the aircraft!)



2a) How many flights use the A319 aircraft?

Answer 3879

2b) What is the most common type of aircraft across all flights?

Answer B737

2c) What is the maximum average ticket price for flights on the A320 aircraft?

Answer $5,500

Fuel cost and revenue analysis

Use PowerPivot to create calculated fields that i) show the fuel cost per mile in Dollars (Aircraft table) and ii) the total revenue per flight, assuming a 10% tax on all fares (Flights table)
Create PivotTables and a Pivot Chart to answer the following questions:

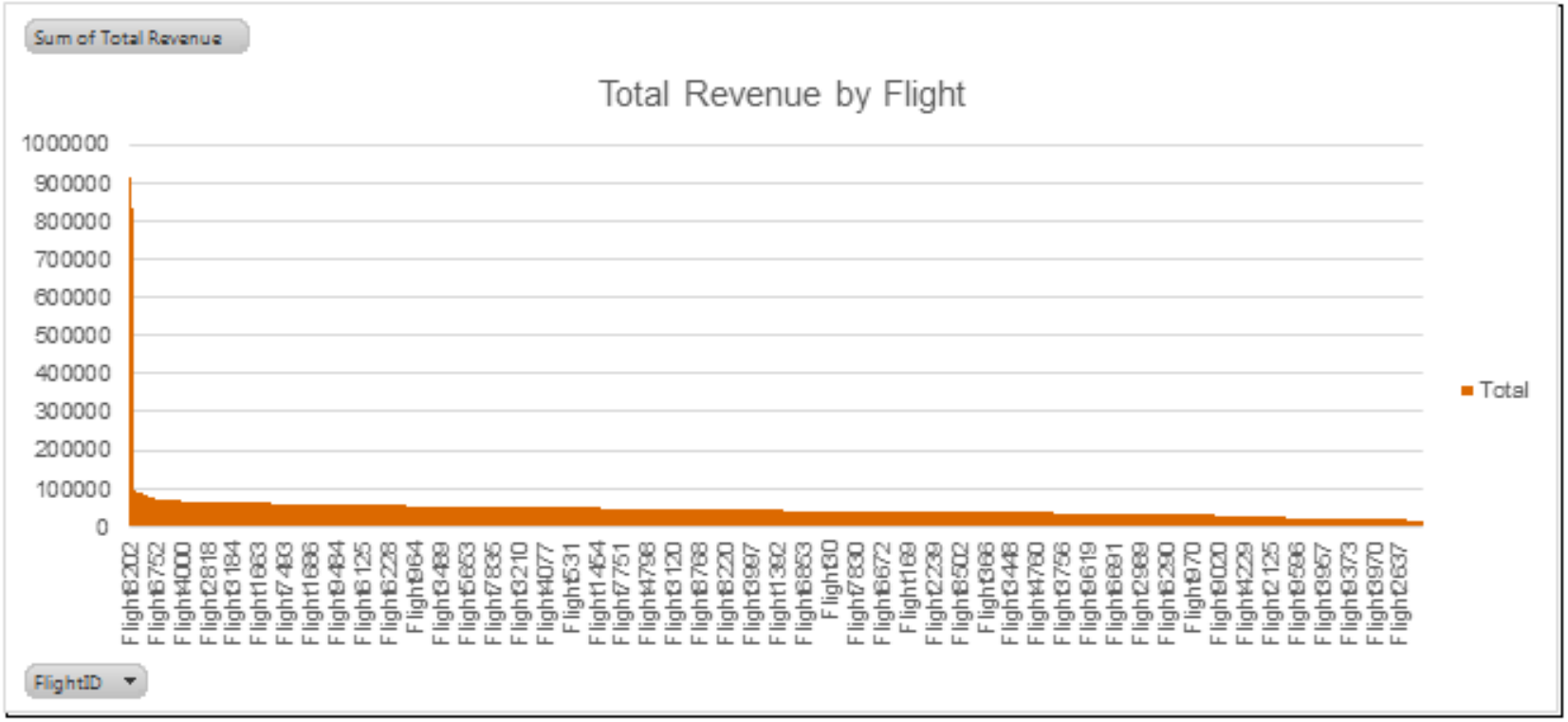
3a) Which aircraft has the highest fuel cost per mile?

Answer	B737

3b) Which flight(s) have the highest total revenue?

Answer	Flight8202 Flight8279 Flight6243 Flight1819

3c) What is the lowest total revenue gained from a flight?



Cost per mile and revenue analysis

Use PowerPivot to create calculated fields that i) show the fuel cost per mile in Dollars (Aircraft table) and ii) the total revenue per flight, assuming a 10% tax on all fares (Flights table)
Create PivotTables and a Pivot Chart to answer the following questions:

4a) How many flights are flown from O'Hare (ORD) to Los Angeles International Airport (LAX)?

Answer 699

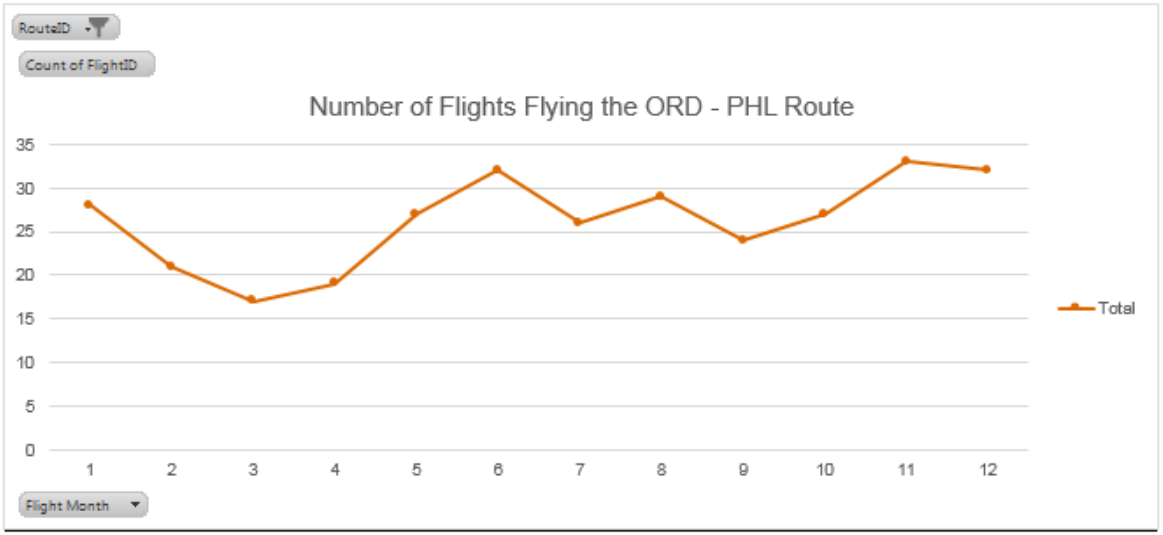
4b) Which route accounts for the lowest percentage of total revenue?

Answer ORD-SLC

4c) What was the most popular month to fly to Fort Lauderdale (FLL)?

Answer June

4d) Create a visual representation to show the number of flights per month on the ORD-PHL route



Exercise 1 - Goal Seek

Our employer, a Chicago based Airline, is considering adding Atlanta to the existing set of destinations. This will require an initial investment of $250k over the first year to develop infrastrucutre at the Atlanta airport plus 100k a year for landing rights. Next, we estimate that the additional route will generate $100k in incremental profit in year one, and $50k in incremental profit for years two through five. We've outlined the outlay projections in the table below in the "Outlays" column.

We have two techniques to evaluate if this project should be carried out based on our projections and initial investment over the five-year horizon. Net Present Value (NPV) and Internal Rate of Return (IRR). NPV accounts for the time-value of money and calculates the value of a dollar, to be received in a future time period, in today's terms for a given interest rate and also factors any costs associated with the investment (hence the "Net" part). IRR looks at the same problem from a different angle. IRR seeks to find what interest rate we'd need to arrive at a NPV of zero. In other words, NPV can be viewed as the profitability of a project in absolute terms ($$$), where IRR is the profitability of a project in relative terms (%).

1a) Calculate the NPV of the Outlay below using the NPV Excel Formula
1b) Calculate the IRR of the Outlay below using Goal Seek
1c) Check the results found with goal seek using the IRR formula

Outlays	Cash Flow	Net Cash Flow	Year
(350)	100	(250)	1
(100)	150	50	2
(100)	200	100	3
(100)	250	150	4
(100)	300	200	5

Calculate NPV using formula	$115,817
Discount Rate/IRR using Goal Seek	10%
Check work using IRR formula	27%

Exercise 2 - Scenario Manager

Our employer wants to explore the potential profitability and growth potential of this new route to Atlanta, under different market environments for demand growth. Marketing and Finance has come up with the following scenarios:

1. Normal: No Change
2. High Growth with Margin Impact: Sales start at 8%, which drives higher margins of 45% but includes slightly higher SG&A at 30%
3. Low Growth with Margin Impact: Sales dropped to 3% growth which drove lower margins of 32% with no effect on SG&A

2a) Using Scenario Manager, simulate the operation income for the new Atlanta route using the scenarios listed above

	Historical Year Ending Dec. 31,			Projected Year Ending Dec. 31,					2015 - 2020
	2014	2015	2016	2017	2018	2019	2020	2021	CAGR (%)
Ticket Revenue	$3,950,500	$4,225,000	$4,575,800	$4,804,590	$5,140,911	$5,603,593	$6,219,989	$7,028,587	*9.0%*
Fee Revenue	$975,000	$1,150,000	$1,280,000	$1,344,000	$1,438,080	$1,567,507	$1,739,933	$1,966,124	*9.0%*
Cost of Sales	$2,350,000	$2,514,000	$2,745,500	$3,689,154	$3,947,395	$4,302,660	$4,775,953	$5,396,827	*14.5%*
Gross Profit	$2,575,500	$2,861,000	$3,110,300	$2,459,436	$2,631,597	$2,868,440	$3,183,969	$3,597,885	*3.0%*
SG&A Expense	$1,042,800	$1,119,700	$1,254,600	$1,321,262	$1,413,751	$1,540,988	$1,710,497	$1,932,861	*9.0%*
Operating Income	**$1,532,700**	**$1,741,300**	**$1,855,700**	**$1,138,174**	**$1,217,846**	**$1,327,452**	**$1,473,472**	**$1,665,023**	*(2.1%)*

Ratios & Assumptions	Historical Year Ending Dec. 31,			Projected Year Ending Dec. 31,					2015 - 2020
	2014	2015	2016	2017	2018	2019	2020	2021	Increase
Revenue Growth Rate	N/A	9.1%	8.9%	5.0%	7.0%	9.0%	11.0%	13.0%	*2.0%*
Gross Margin	52.3%	53.2%	53.1%	40.0%	40.0%	40.0%	40.0%	40.0%	*0.0%*
SG&A Expense as % of Ticket Revenue	N/A	N/A	N/A	27.5%	27.5%	27.5%	27.5%	27.5%	*0.0%*

Exercise 3 - One-way Data Table

Our employer wants to analyze the impact of flight-related costs, such as fuel and labor, on profit per flight for the proposed Chicago-to-Atlanta route. The operations team has determined the minimum cost per mile is $30 and the maximum cost per mile is $50. The operations team has also provided estimates for the number of passengers per flight and revenue per passenger, 170 and $150, respectively. We've summarized this information in cells B113:C120. Using the information provided by the operations team we've determined an estimated profit per flight in cell C120. However, recall that we'd like to analyze how profit is impacted by cost per flight. This table only calculates profit for one value of cost per mile at a time. This is where the Data Table tool comes in.

We're going to use a one-way Data Table to analyze the impact of cost per mile on profit and summarize our findings in cells F113:G124

3a) Create a one-way data table using the Cost per Mile in cell C117

Input Parameters – ORD to ATL		
Passengers		170
Miles		510
Revenue per Passenger		$150
Cost per Mile		$40
Total Revenue		$25,500
Total Costs		$20,400
Profit per Flight		**$5,100**

Cost per Mile	$5,100
$30	$10,200
$32	$9,180
$34	$8,160
$36	$7,140
$38	$6,120
$40	$5,100
$42	$4,080
$44	$3,060
$46	$2,040
$48	$1,020
$50	$0

Exercise 4 - Two-way Data Table

Building upon the example of the one-way data table, let's add an additional variable, the number of passengers per flight. The operations team has analyzed historical demand and determined that the minimum demand is 150 passengers and the maximum demand is 200 passengers. Now, we'll analyze how profit changes when we have two variable inputs demand (Passengers) and costs (Cost per Mile).

The Two-way data table requires a slightly different setup, so now the objective (Profit per Flight), must be placed directly above the column input variable (Fuel Costs).

4a) Determine the range of profit per flight given the range of Cost per Mile and Passengers using a Two-Way data table

Input Parameters – ORD to ATL		
Passengers		170
Miles		510
Revenue per Passenger		$150
Cost per Mile		$40
Total Revenue		$25,500
Total Costs		$20,400
Profit per Flight		**$5,100**

		Passengers					
Costs per Mile	$5,100	150	160	170	180	190	200
	$30	$7,200	$8,700	$10,200	$11,700	$13,200	$14,700
	$32	$6,180	$7,680	$9,180	$10,680	$12,180	$13,680
	$34	$5,160	$6,660	$8,160	$9,660	$11,160	$12,660
	$36	$4,140	$5,640	$7,140	$8,640	$10,140	$11,640
	$38	$3,120	$4,620	$6,120	$7,620	$9,120	$10,620
	$40	$2,100	$3,600	$5,100	$6,600	$8,100	$9,600
	$42	$1,080	$2,580	$4,080	$5,580	$7,080	$8,580
	$44	$60	$1,560	$3,060	$4,560	$6,060	$7,560
	$46	($960)	$540	$2,040	$3,540	$5,040	$6,540
	$48	($1,980)	($480)	$1,020	$2,520	$4,020	$5,520
	$50	($3,000)	($1,500)	$0	$1,500	$3,000	$4,500

Exercise 5 - Simulation

The Airline Operations Team has prepared a brief summary of their outlook on demand over the coming year. They estimate that the Airline will have as few as 135 passengers 10% of the time, 150 passengers 40% of the time, 175 passengers 30% of the time, and 185 passengers 20% of the time. In addition to random demand, we'll now have random costs per mile depending on fuel price, season, and weather conditions to name a few factors. The operations team estimates that the cost per mile will be between $30 and $50, with each value in the range equally likely.

We've added a few more important inputs, such as the number of scheduled flights, miles per flight, and revenue per passenger, in cells B173:H174 below.

Route		Miles per Flight	Annual Flights Proposed	Total Miles	Min Cost per Mile	Max Cost per Mile	Revenue Per Passenger
ORD-ATL		510	385	196,350	$30	$50	$150

5a) Create 90 simulations of the Cost per Mile using the RAND function
5b) Create 90 simulations of the Passenger Revenue using VLOOKUP, the Likelihood Bins and the RAND function
5c) Create 90 simulations of the average annual profit using the Cost per Mile and Passenger Revenues
5d) Determine the probability of making a profit on the new Chicago - Atlanta Route
5d) Determine the probability of making a profit on the new Chicago - Atlanta Route

Likelihood bins		Passengers per Flight	Annual Passenger Revenue
0%		150	$8,662,500.00
41%		175	$10,106,250.00
71%		185	$10,683,750.00
91%		135	$7,796,250.00

Summary Information		
Average annual profit		($8,037,450)
Probability of profit		0%
Establish the route?		

Runs	Cost / Mile
1	$45
2	$48
3	$46
4	$48
5	$48
6	$34
7	$44
8	$43
9	$38
10	$43
11	$44
12	$36
13	$48

Runs	Cost / Mile	Annual Revenue	Profit
1	$45	$185	($8,880,484.97)
2	$48	$185	($9,392,692.88)
3	$46	$135	($9,035,354.67)
4	$48	$150	($9,397,483.30)
5	$48	$175	($9,433,236.36)
6	$34	$150	($6,591,677.24)
7	$44	$150	($8,731,350.20)
8	$43	$185	($8,386,961.58)
9	$38	$150	($7,378,941.84)
10	$43	$150	($8,464,883.69)
11	$44	$175	($8,686,048.55)
12	$36	$175	($7,011,684.78)
13	$48	$175	($9,336,461.17)
14	$34	$150	($6,680,820.59)
15	$49	$150	($9,658,714.58)
16	$30	$175	($5,959,995.38)
17	$47	$150	($9,282,418.53)
18	$32	$150	($6,343,220.15)
19	$41	$150	($8,026,182.78)
20	$43	$135	($8,510,600.16)
21	$47	$150	($9,216,258.97)
22	$31	$150	($6,184,350.09)
23	$40	$175	($7,866,836.20)
24	$46	$175	($9,092,057.08)
25	$44	$175	($8,724,955.06)
26	$36	$150	($6,972,702.98)
27	$36	$150	($7,047,748.93)
28	$43	$185	($8,462,746.79)
29	$40	$175	($7,858,049.43)
30	$41	$135	($8,054,842.97)
31	$48	$150	($9,502,320.65)
32	$48	$175	($9,414,307.45)
33	$37	$150	($7,268,677.87)
34	$37	$175	($7,296,210.77)
35	$48	$185	($9,418,558.86)
36	$42	$175	($8,227,145.00)
37	$48	$135	($9,520,019.59)
38	$40	$175	($7,850,270.39)
39	$35	$175	($6,791,119.34)
40	$44	$150	($8,638,209.22)
41	$48	$150	($9,458,651.84)
42	$38	$185	($7,432,578.45)
43	$38	$175	($7,397,216.64)
44	$47	$150	($9,296,682.74)
45	$36	$135	($7,155,726.79)
46	$45	$175	($8,886,408.81)
47	$43	$150	($8,435,247.91)
48	$42	$150	($8,234,463.88)
49	$49	$175	($9,641,185.89)
50	$34	$135	($6,670,428.25)

Exercise 6 - Solver

Often times we're in a situation where we'd like to optimize a particular measure. For example, we might want to know what decisions to make in order to maximize profit, while still meeting constraints. Or the situation might warrant a minimization problem, where we'd like to know the scheduling of resources that minimizes cost while still meeting customer demand.

In the scenario below, we've been presented with five business initiatives which come with an estimated total cost and a net benefit. We'd like to know which initiatives to execute against, subject to a $25m budget. In other words, our decision variables are binary (Yes/No) and we want to determine which initiatives to say "Yes" to. To accomplish this task we're going to use Excel Solver, a free add-in. Solver requires a few inputs, such as the objective function, the type of optimization problem, and any constraints.
In our scenario, we want to maximize Net Benefit, while keeping Total Cost at or below $25m.

6a) Calculate the total Net Benefit from the initiatives based on the Decision Variables in row 292
6b) Calculate the Total Cost of the initiatives based on the Decision Variables in row 292
6c) Determine the optimal mix of initiatives to execute against in order to maximize the Net Benefits whole maintaining a budget of $25M using Excel Solver

Initiatives		New Route (ORD-ATL)	More Flights for existing routes	Technology Investment	More Sales Reps	Process Improvement Plan
Decision Variables		0	0	1	1	1
Net Benefit		$275,630	$2,943,234	$824,594	$2,840,045	$1,224,404

Objective
$4,889,042

Constraints		New Route (ORD-ATL)	More Flights for existing routes	Technology Investment	More Sales Reps	Process Improvement Plan
Total Cost		$10,990,650	$21,826,243	$7,075,000	$13,398,817	$2,925,000

Total Cost		Budget
$23,398,817	<=	$25,000,000