Intro to Contemporary Math

Dijkstra's Algorithm

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Agenda

- Dijkstra's Algorithm
  - Interpreting Output

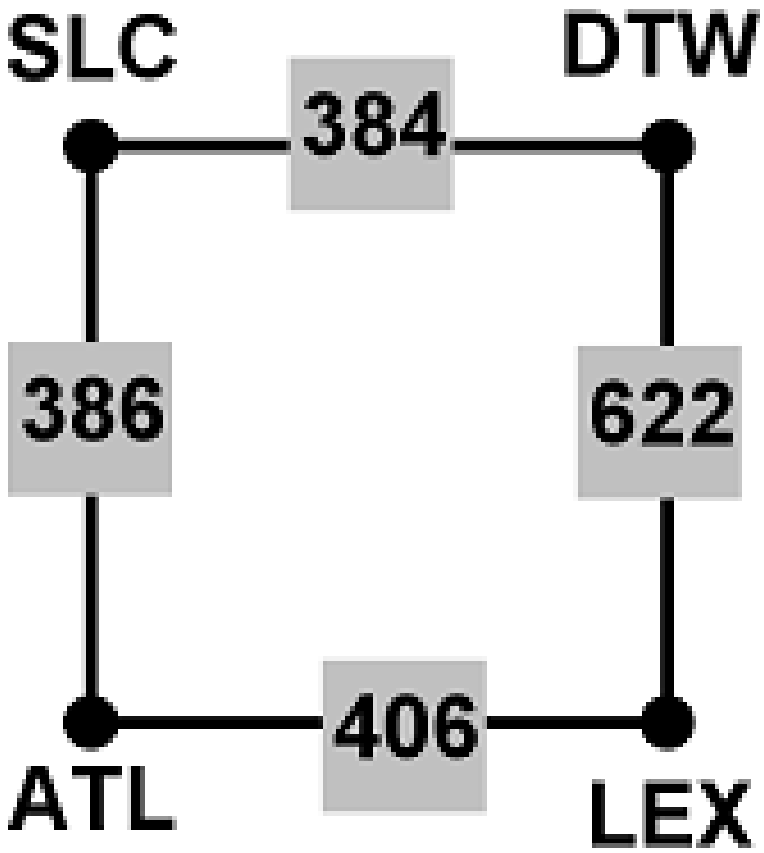
Dijkstra's Algorithm Records

At each vertex, there is a record (label from Step 2):

[NUMBER] (ANOTHER VERTEX LABEL)

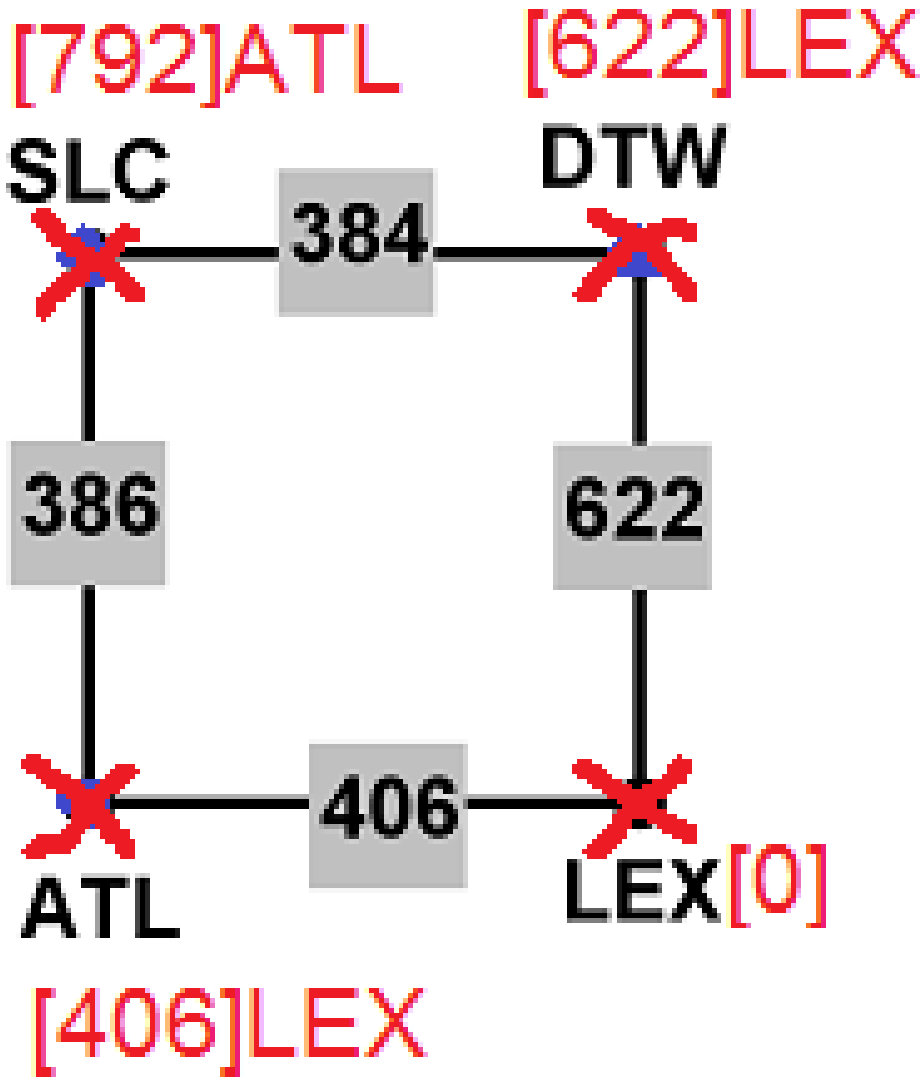
- The number is the **total weight** of the shortest path starting at this vertex
- The other vertex label shows where to go next to get to the destination on the shortest path

Example 1: Flight Costs



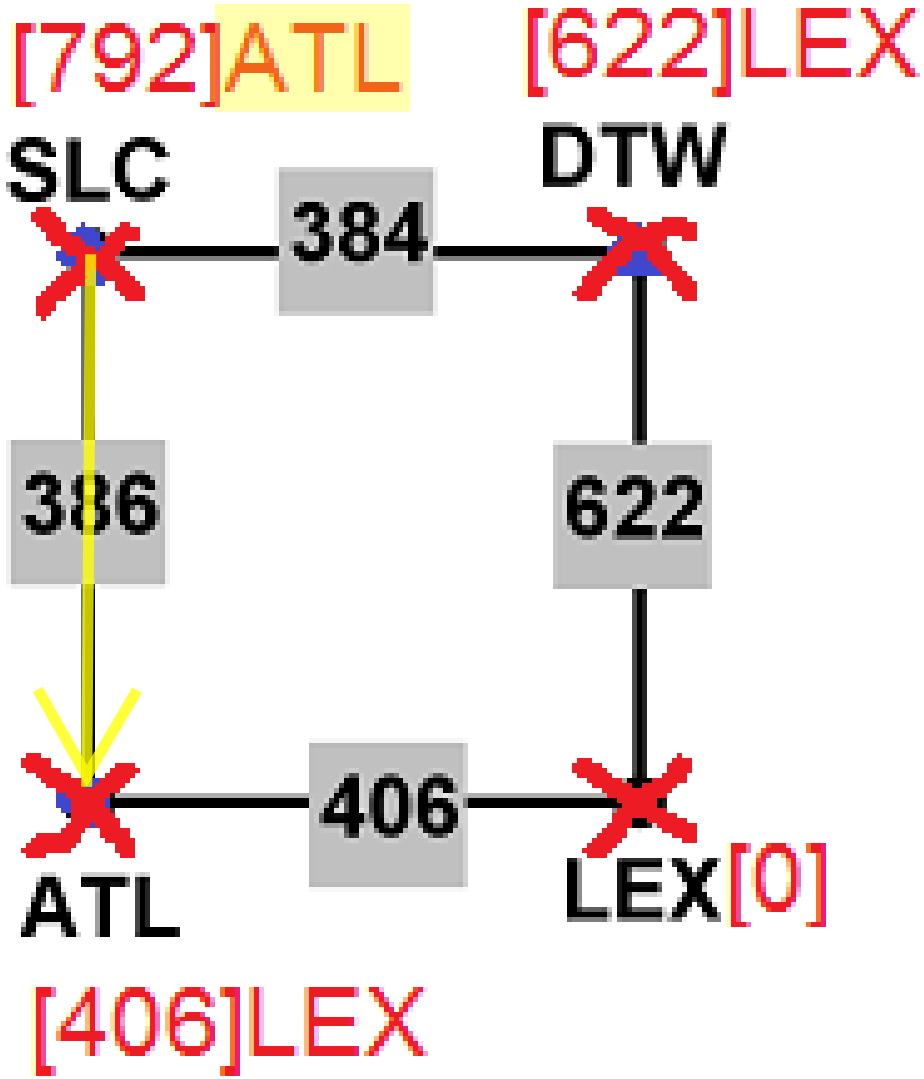
Example 1: Results of Algorithm

Dijkstra's algorithm gives a route and cost from SLC to LEX.



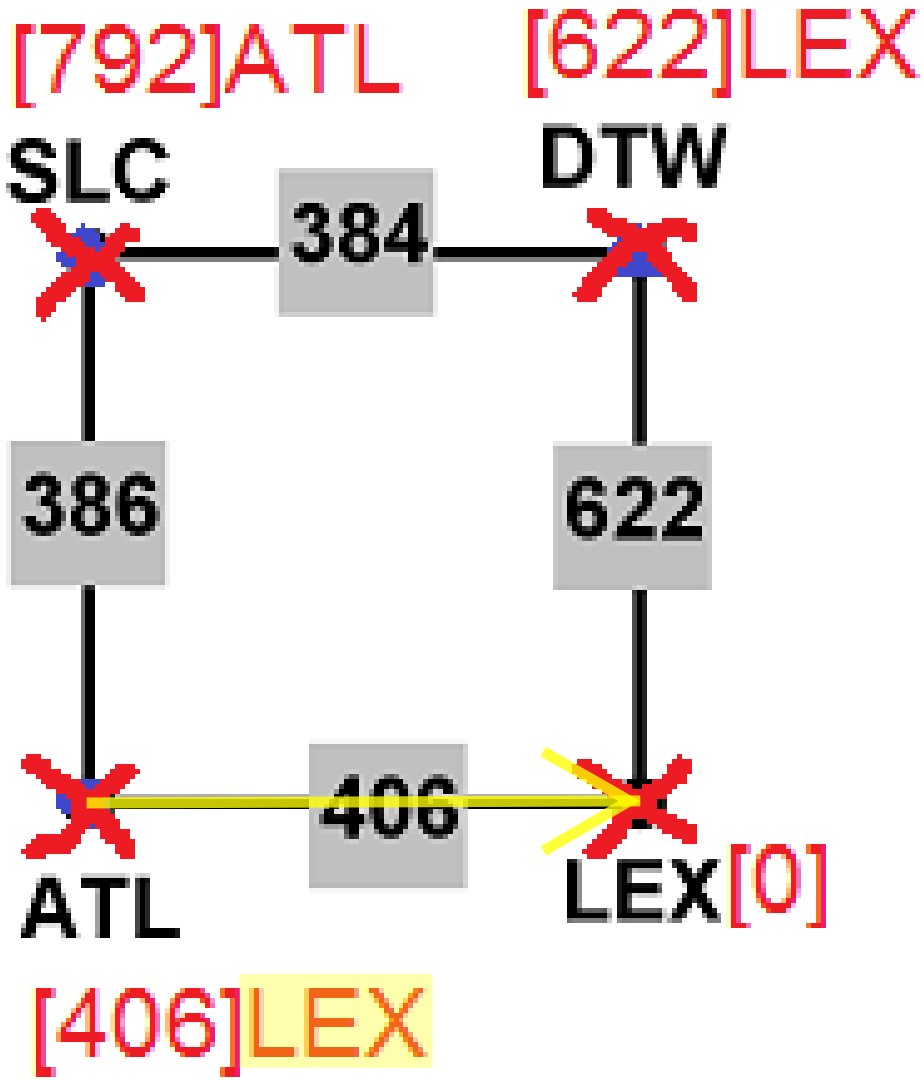
Example 1: Results of Algorithm

At SLC, we see the record "ATL," so we go to ATL next:



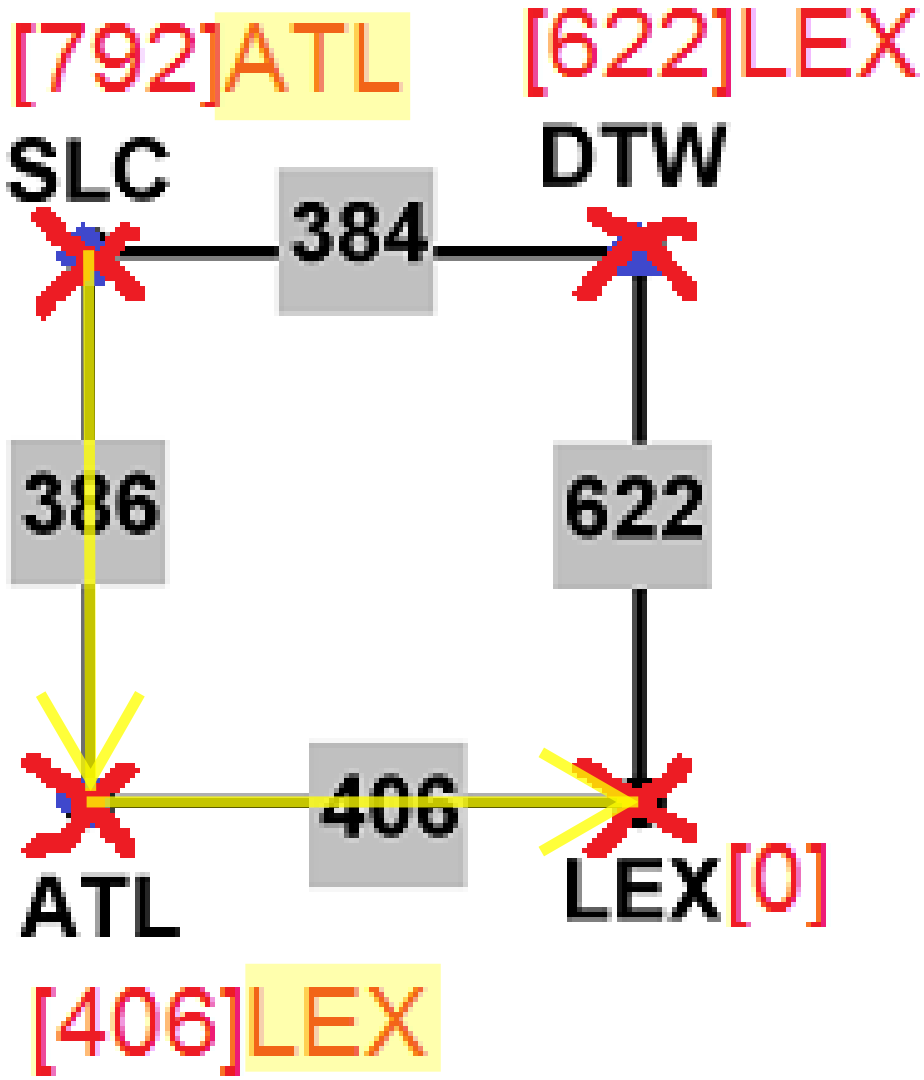
Example 1: Results of Algorithm

At ATL, we see the record "LEX," so we go to LEX:



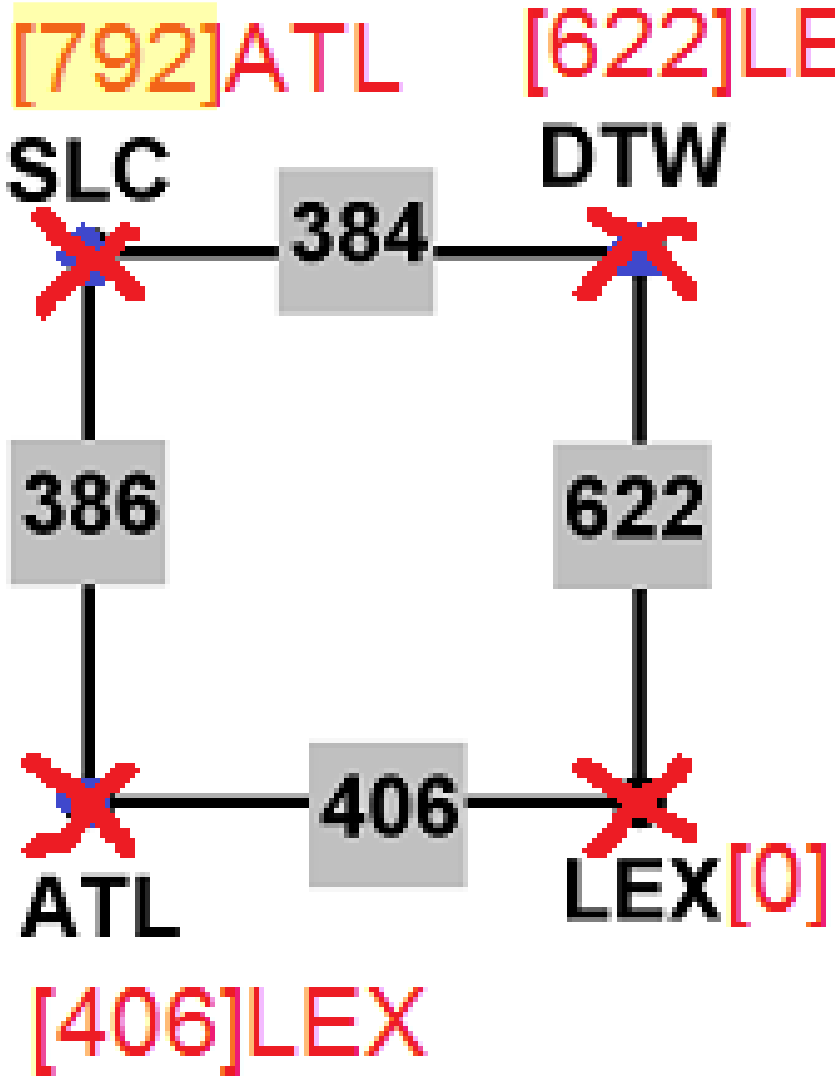
Example 1: Results of Algorithm

The path is SLC, ATL, LEX.



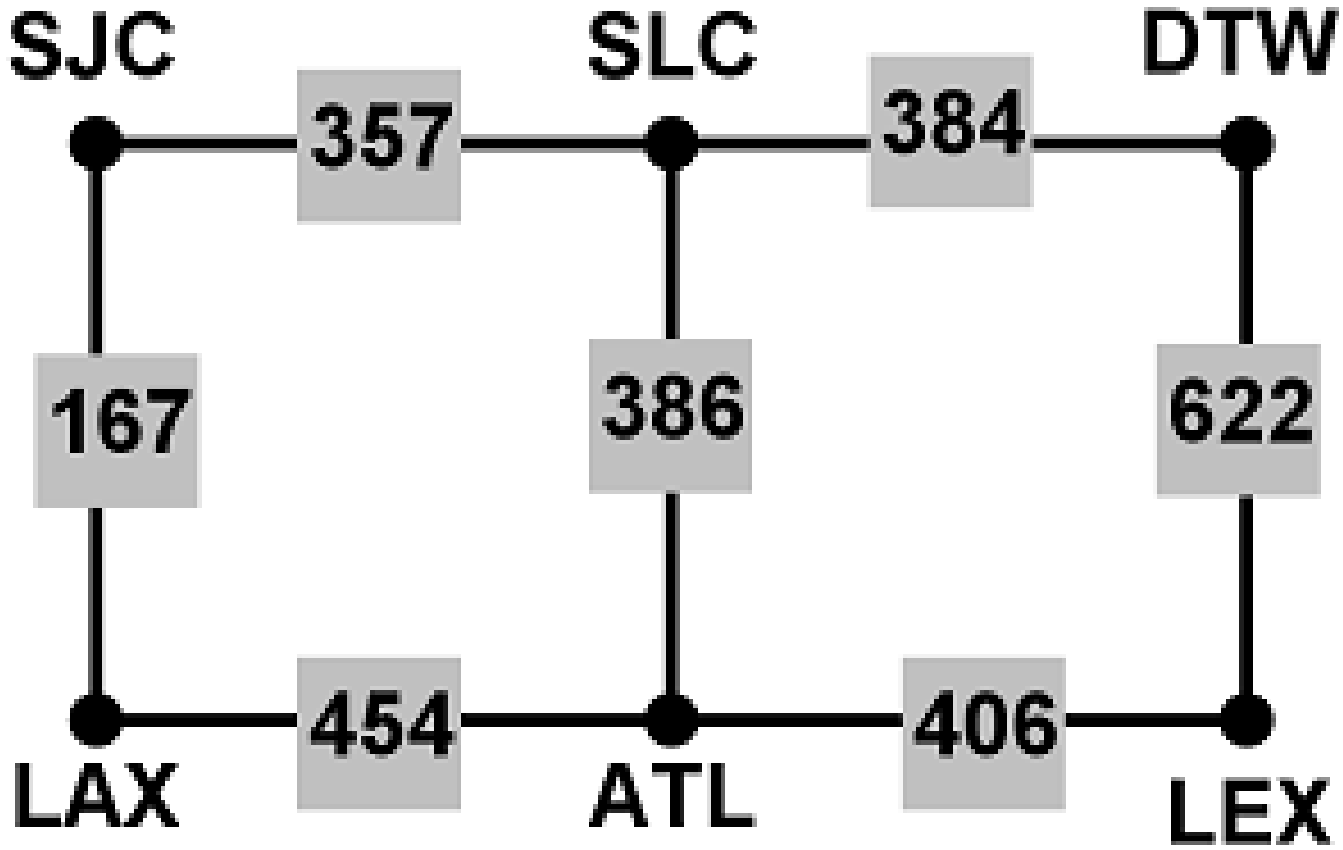
Example 1: Results of Algorithm

How much is the trip? At SLC, the record says "792." That is the total weight (cost) of the shortest path from SLC to LEX.



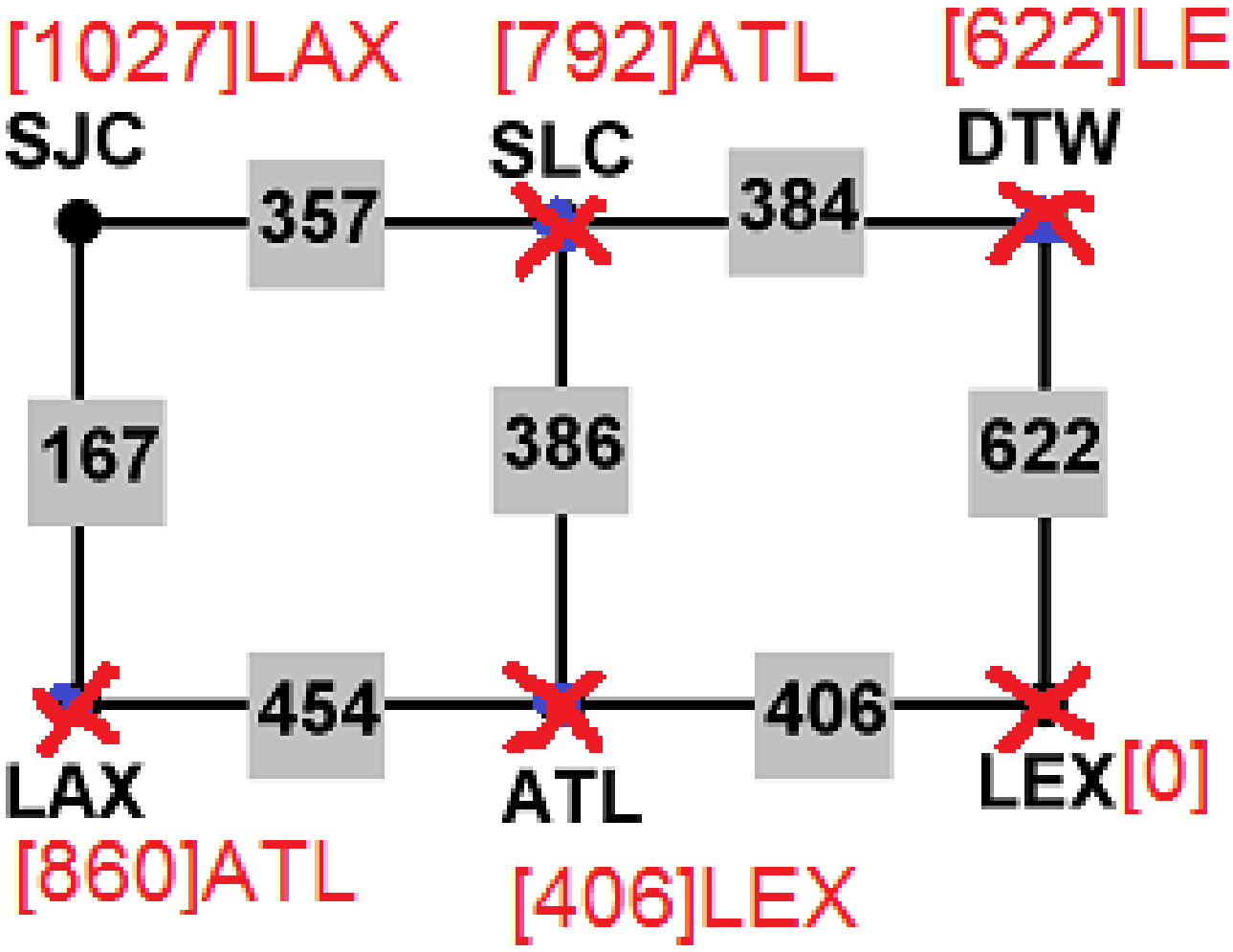
Notice that 792 = 386 + 406, the sum of the weights on our path.

Example 2: Flight Costs



?(6.1) Example 2: Results of Algorithm

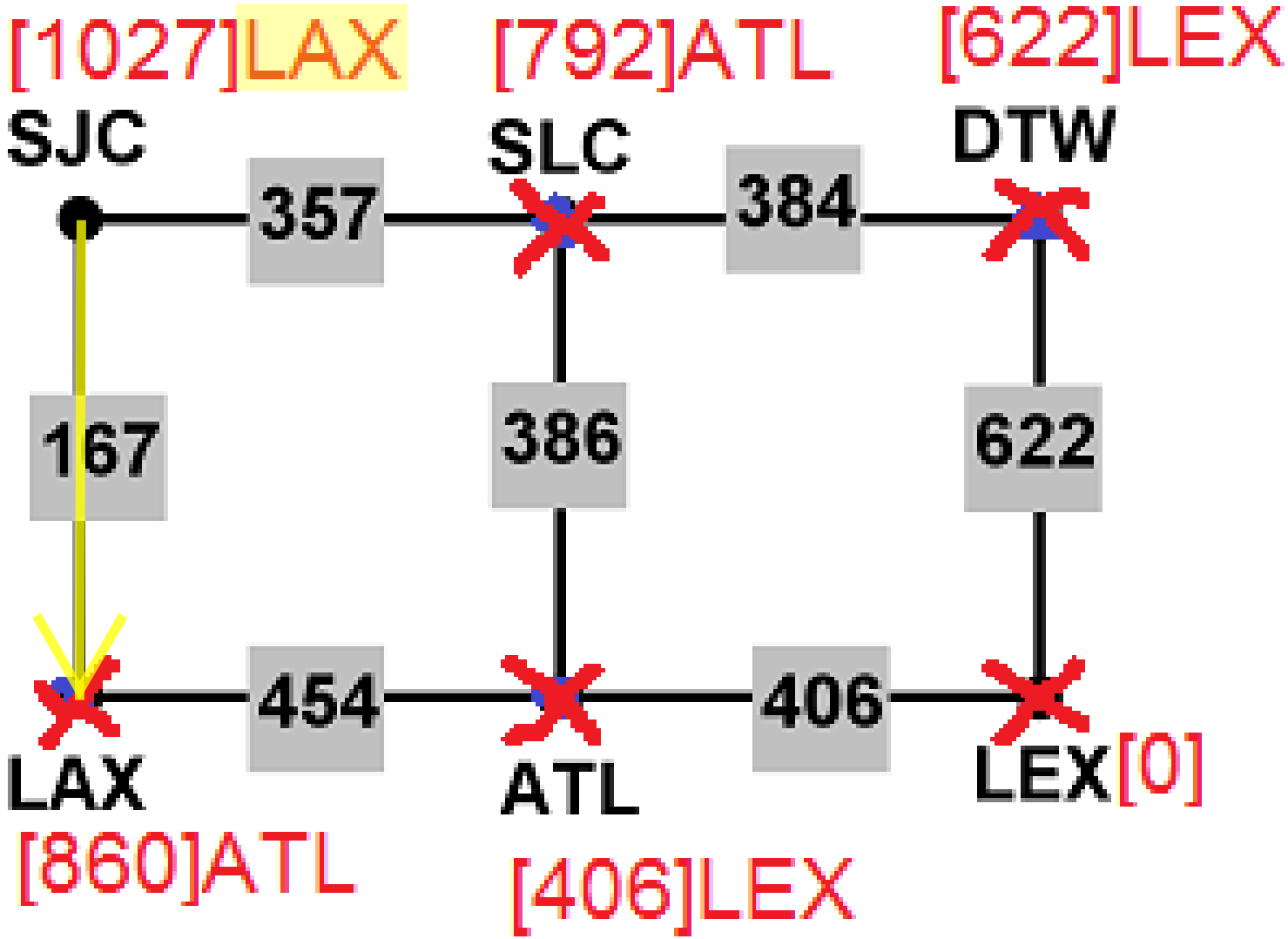
Find the cheapest route from SJC to LEX. At SJC, where do we go?



Type the 3-letter code:
SLC
DTW
LAX
ATL
LEX

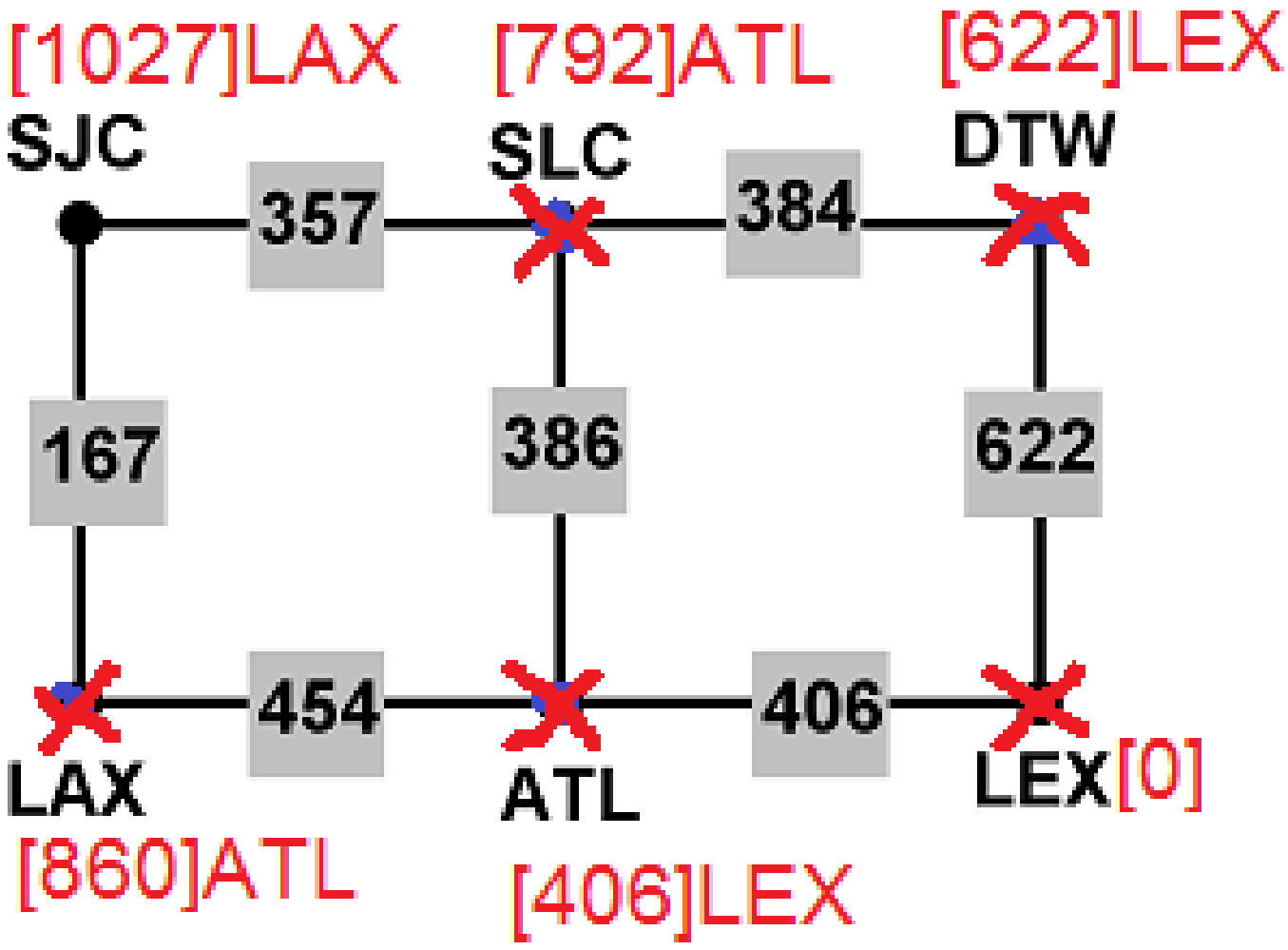
Example 2: Results of Algorithm

At SJC, we go to LAX



?(6.2) Example 2: Results of Algorithm

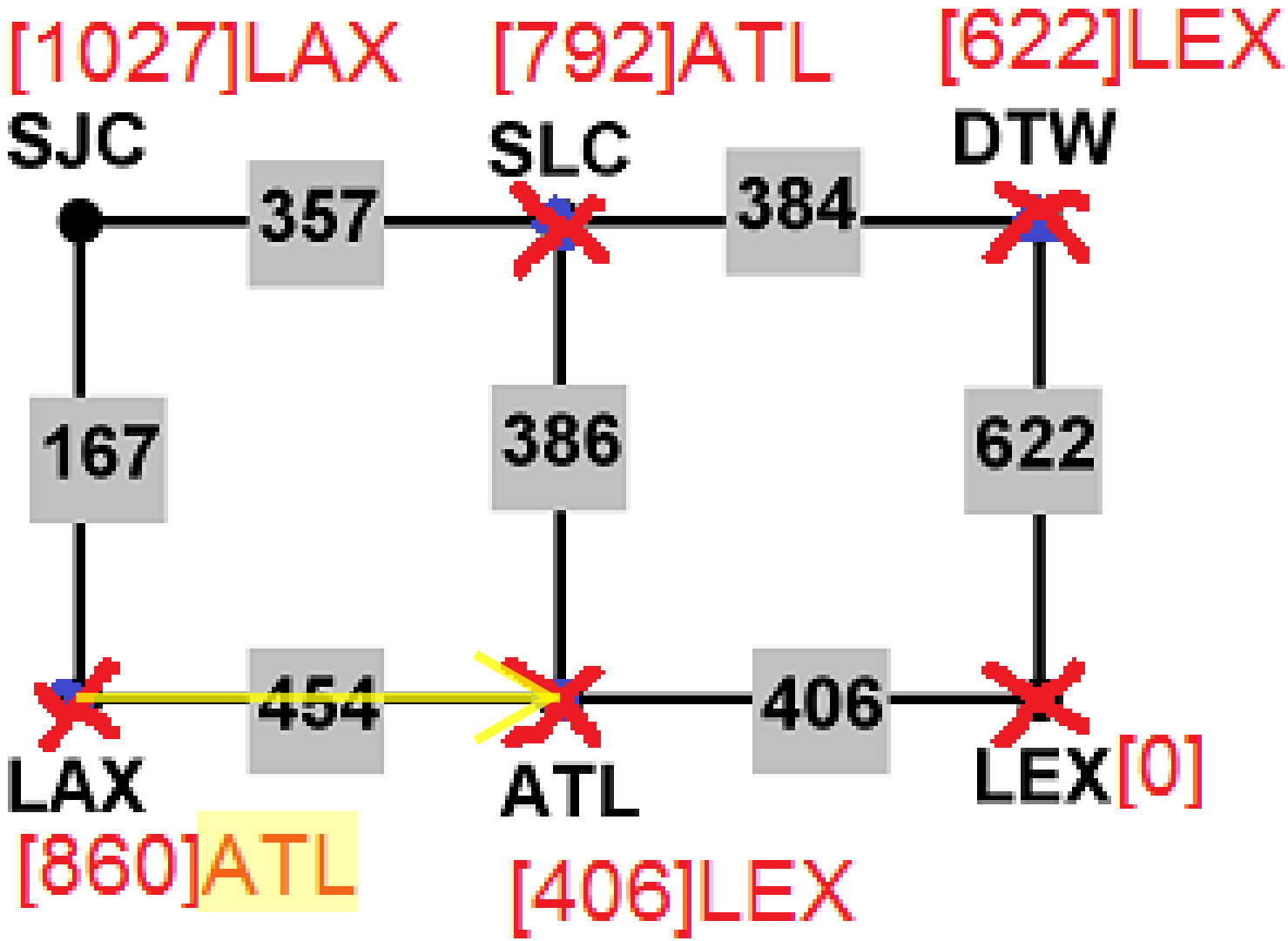
At LAX, where do we go?



Type the 3-letter code:
SLC
DTW
ATL
LEX

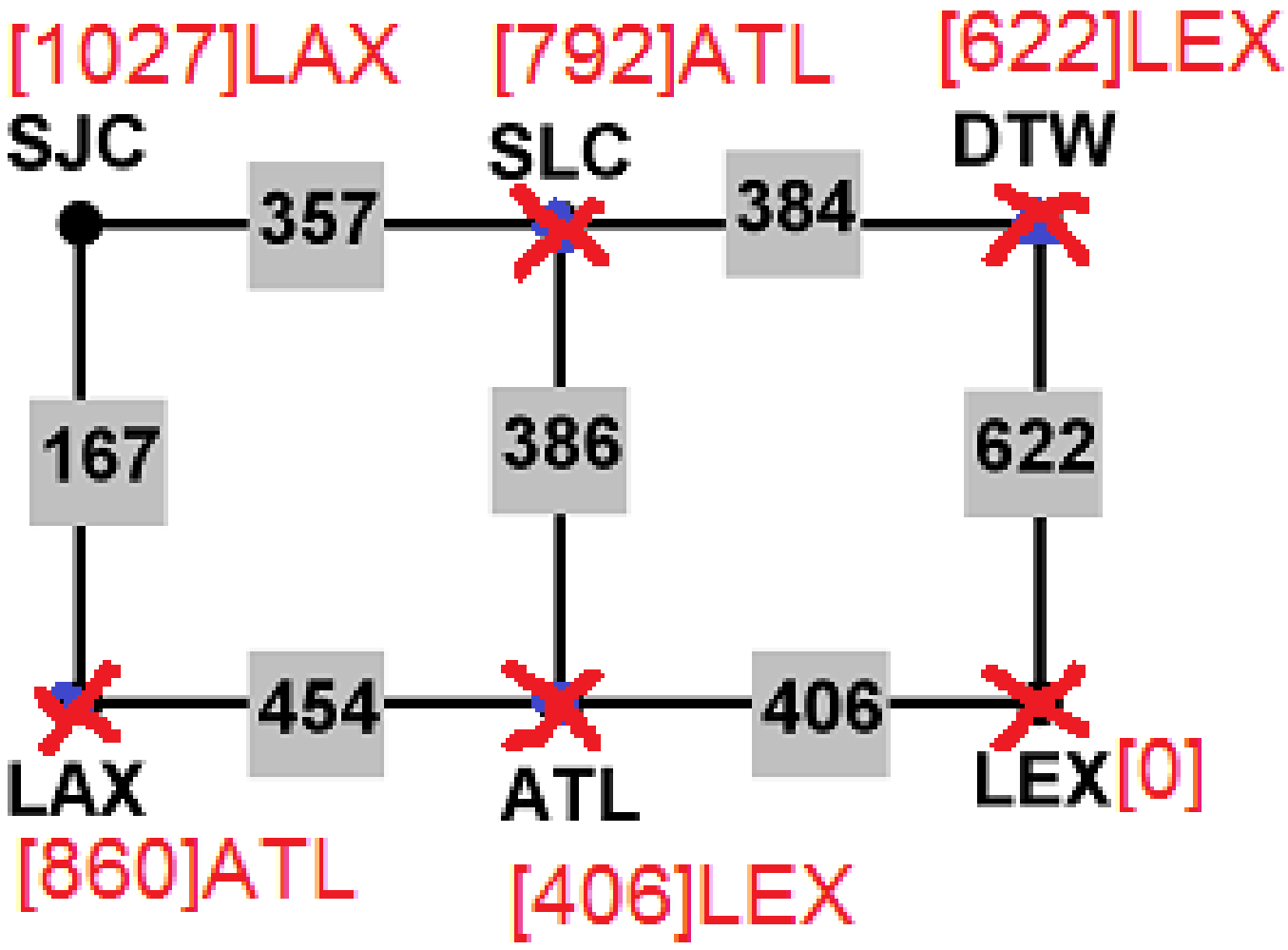
Example 2: Results of Algorithm

At LAX, we go to ATL.



?(6.3) Example 2: Results of Algorithm

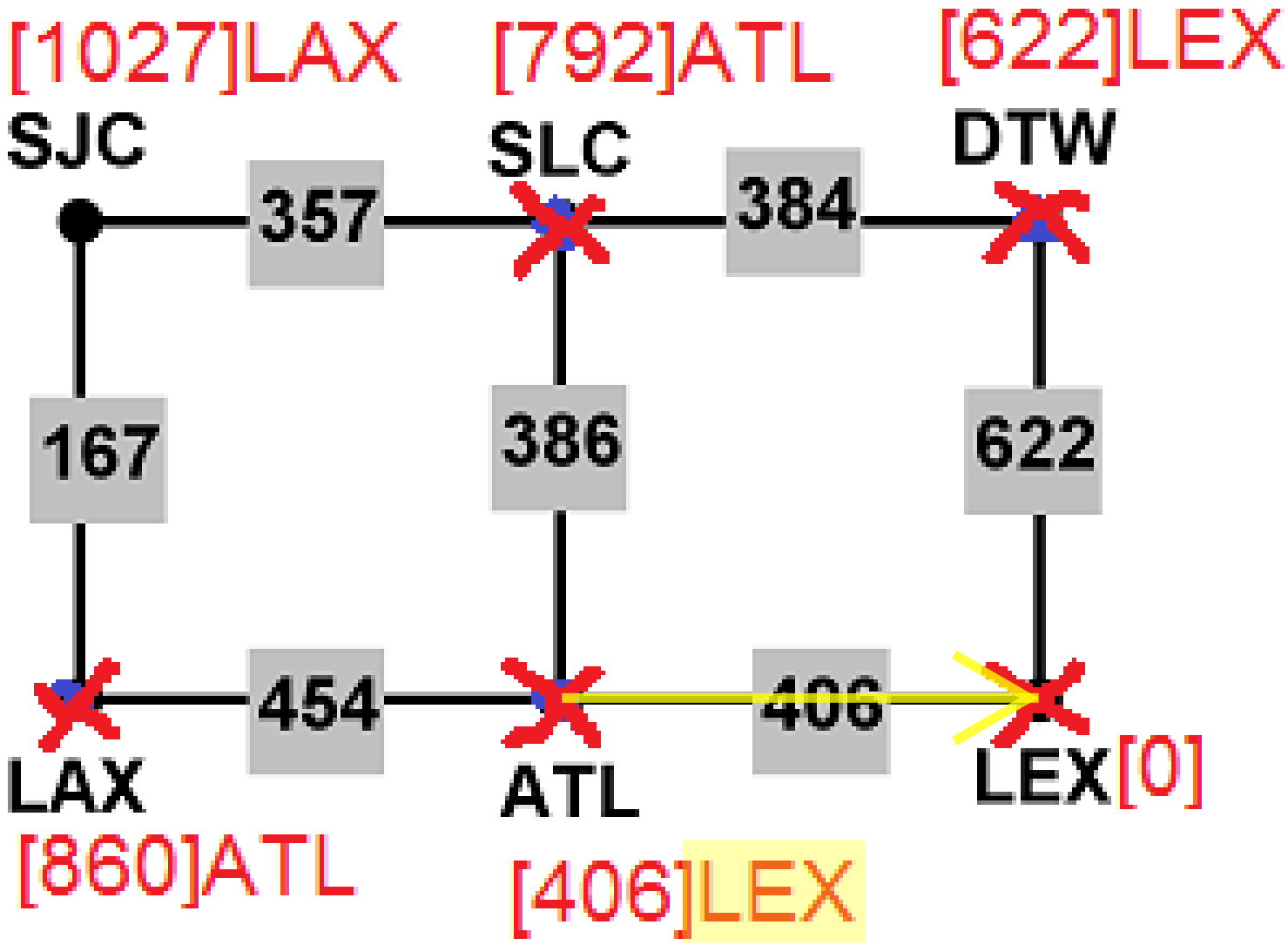
At ATL, where do we go?



Type the 3-letter code:
SLC
DTW
LEX

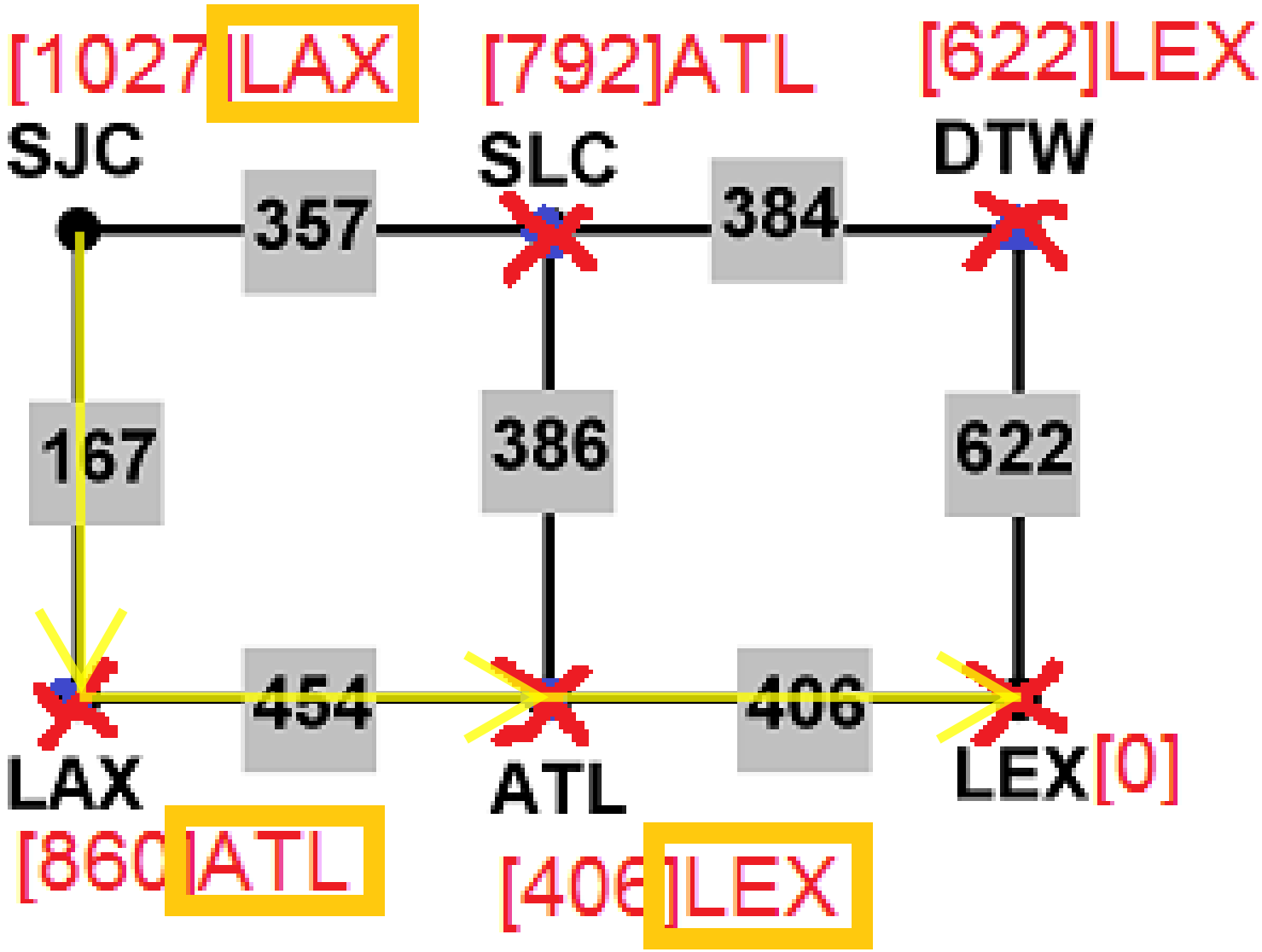
Example 2: Results of Algorithm

At ATL, we go to LEX.



Example 2: Shortest Path

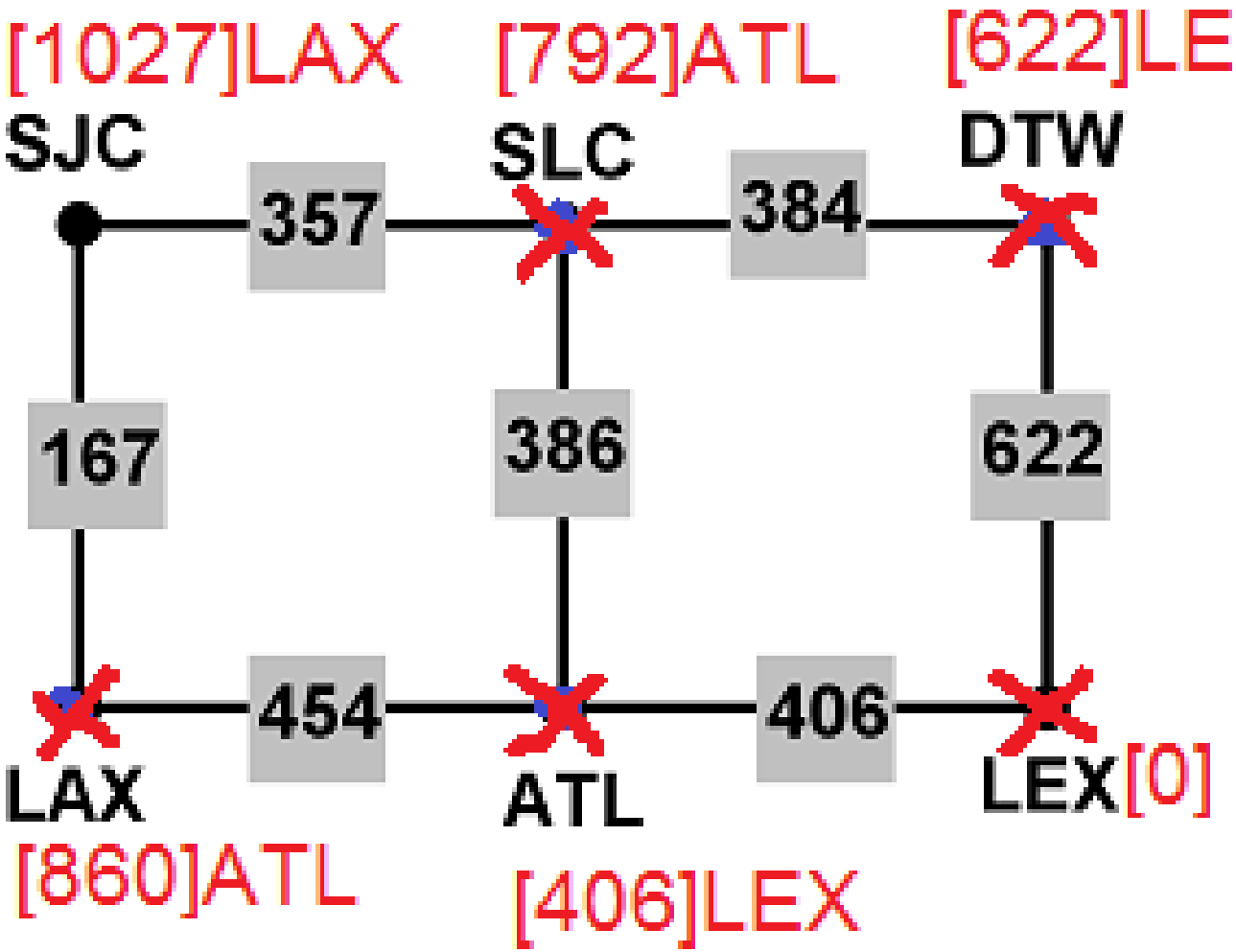
Follow records: SJC, LAX, ATL, LEX



?(6.4) Example 2: Total Weight

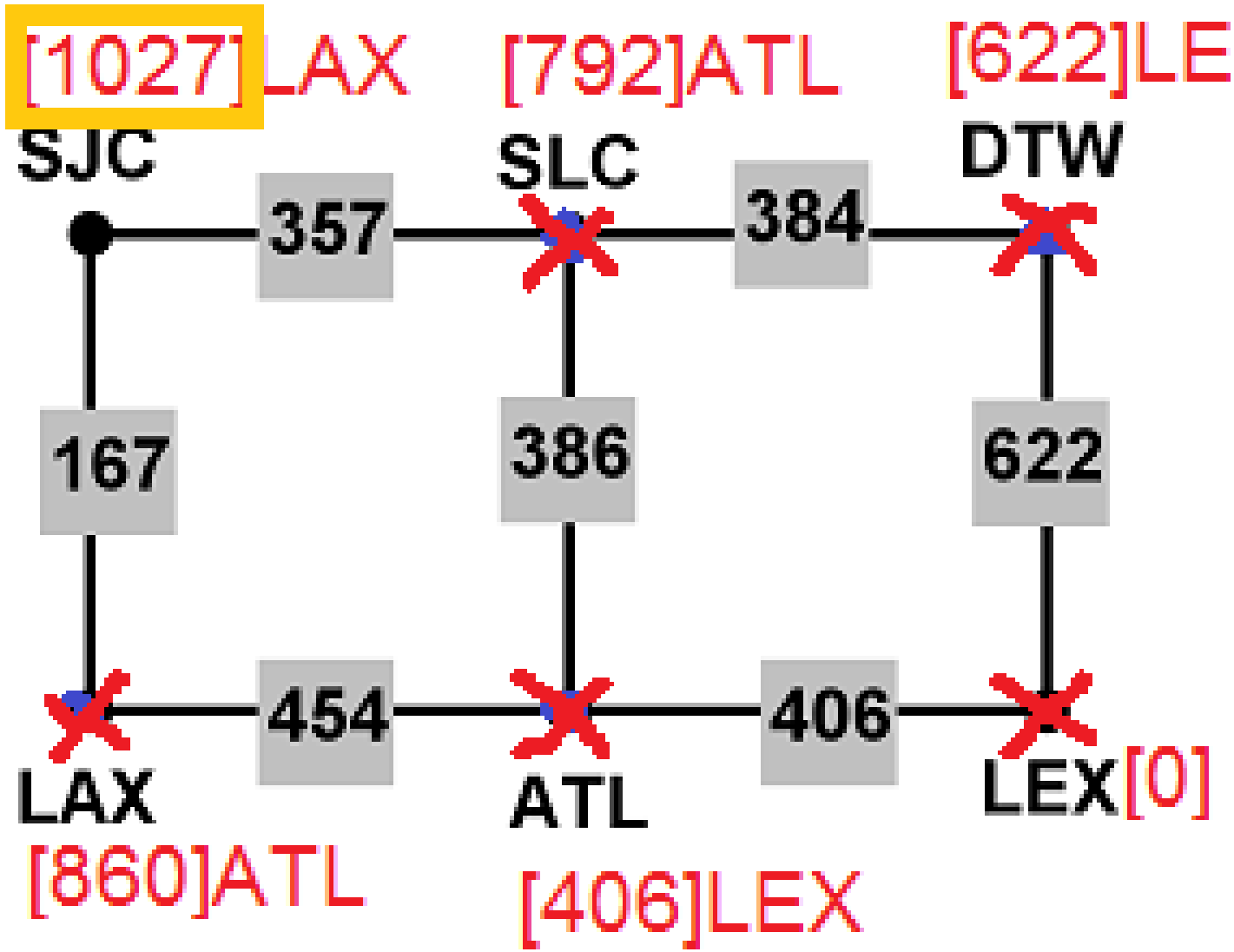
What is the total weight/cost?

Type a number



Example 2: Total Weight (Total Cost)

Total weight (total cost) is 1027 (number record at SJC)



1027 equals 167 +454 +406, the sum of the weights on our path.

Next Time

- Hamiltonian Circuits (Traveling Salesman Problem)
- Nearest Neighbor Algorithm

Bibliography

- Lippman, David. Math in Society. 2nd ed. 16 November 2013. <http://www.opentextbookstore.com/mathinsociety/current2.php?chapter=GraphTheory.pdf>. Web.