

★ GREAT-CIRCLE DISTANCE

- ON WIKIPEDIA.

$$\Delta \sigma = 2a \sin \sqrt{\sin^2\left(\frac{\Delta \phi}{2}\right) + \cos(\phi_1) \times \cos(\phi_2) \times \sin^2\left(\frac{\Delta \lambda}{2}\right)}$$

- Multiply by Earth's radius (3,982 miles).

- Round to nearest multiple of 25.

(Ex. CAIRO, EGYPT TO KNOXVILLE, TN
↓ (30.058, 31.229) TO (35.972882, -83.942161)

CONVERT TO RADIANS w/ DEG \times π / 180.

(0.5246, 0.5450) TO (0.6278, -1.4651)
 ϕ_1 λ_1 ϕ_2 λ_2

$$\begin{aligned} \sin^2\left(\frac{\Delta \phi}{2}\right), \text{ WHERE } \Delta \phi &= |\phi_2 - \phi_1| \\ &= |0.6278 - 0.5246| \\ &= 0.1032... \end{aligned}$$

$$\begin{aligned} \sin^2\left(\frac{\Delta \lambda}{2}\right), \text{ WHERE } \Delta \lambda &= |\lambda_2 - \lambda_1| \\ &= |-1.4651 - 0.5450| \\ &= 2.0101... \end{aligned}$$

$$\begin{aligned} \Delta \sigma &= 2a \sin \sqrt{\sin^2\left(\frac{\Delta \phi}{2}\right) + \cos(\phi_1) \times \cos(\phi_2) \times \sin^2\left(\frac{\Delta \lambda}{2}\right)} \\ &= 2a \sin \sqrt{\sin^2\left(\frac{0.1032}{2}\right) + \cos(0.5246) \times \cos(0.6278) \times \sin^2\left(\frac{2.0101}{2}\right)} \\ &= 2a \sin \sqrt{0.5019...} \\ &= 1.5745... \end{aligned}$$

$$\text{DIST} = \Delta\sigma \times \text{EARTH-RADIUS}$$

$$= 1.5745 \times 3982.0$$

$$= \underline{6269.7 \text{ miles}} \Rightarrow 6275.00$$

CLOSEST MULTIPLE OF 25

- WOLFRAM: <https://tinyurl.com/qcired302>

★ CITYSIM

- 4 "versions".
- Almost **no** skeleton code.
- Most of your time will go to making the graph.
- After making it, you run **DIJKSTRA'S ALGORITHM** to find shortest route.
- Each part has an **optional function** you can write to check your work with:
 - Ver. 1: write_cityinfo
 - Ver. 2: write_traveldistance
write_traveltime
 - Ver. 3: write_citygraph
 - Ver. 4: **N/A**, but **dijkstra_route** will print paths you request.
- **Start Early**. This lab is not easy! Here's why:
 - Dr. Gregor's solution is almost **1,000** lines of code.
 - Mine is nearly **800** lines and took nearly **5 hours** to hack up.
 - While **dijkstra_route** is in **graph3_handout**, you need to make **major** adjustments to it.
 - You **will** encounter problems. Make time to post on **Piazza** for someone (probably Dr. Gregor or I) to respond.