

Problem 1

City A has a latitude of $65^{\circ} 29' 56'' N$ City B has a latitude of $20^{\circ} 59' 15'' N$

City A is due north of City B

1. Determine how far apart these cities are from each other if we assume radius of earth is about 4000 miles

a. What is the difference in latitude measures in DMS?

$$44^{\circ} 30' 41''$$

b. What is the difference in latitude measures in DD?

$$= 44 \frac{1841}{3600}^{\circ} \approx 44.511389^{\circ}$$

c. What is radian measure of the latitude difference?

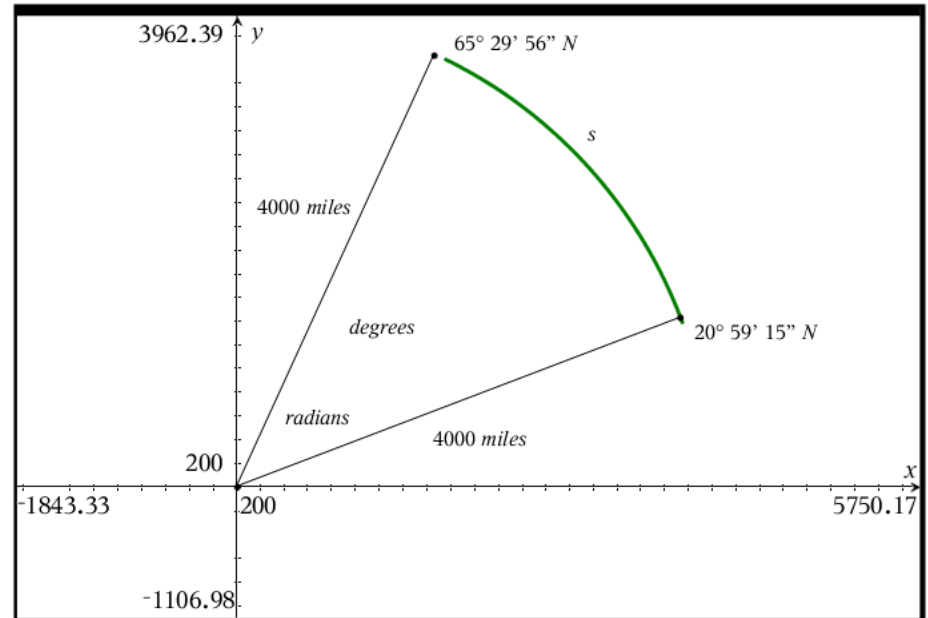
$$= \frac{160241 \cdot \pi}{648000} \text{ radians} \approx 0.247285 \pi \text{ radians} \approx 0.77687 \text{ radians}$$

d. What is the EXACT distance between cities?

$$= \frac{160241}{162} \pi \text{ miles}$$

e. What is the APPROXIMATE distance between cities?

$$\approx 989.142 \pi \text{ miles} \approx 3107.481163 \text{ miles}$$



Step 1 Determine DMS difference

$$65^{\circ} 29' 56'' N - 20^{\circ} 59' 15'' N$$

$$64^{\circ} 60' 29' 56'' N - 20^{\circ} 59' 15'' N$$

$$64^{\circ} 89' 56'' N - 20^{\circ} 59' 15'' N$$

$$44^{\circ} 30' 41''$$

Step 2 Determine DD

$$44^{\circ} 30' 41'' = 44 + \frac{30}{60} + \frac{41}{3600}^{\circ}$$

$$= 44 \frac{1841}{3600}^{\circ}$$

$$\approx 44.511389^{\circ}$$

DMS difference $44^{\circ} 30' 41''$

DD Difference $= 44 \frac{1841}{3600}^{\circ}$

$$\approx 44.511389^{\circ}$$

Step 3 Determine radians

$$\left(44 \frac{30}{60} + \frac{41}{3600} \right)^{\circ} \left(\frac{\pi \text{ radians}}{180^{\circ}} \right)$$

$$= \frac{160241 \cdot \pi}{648000} \text{ radians}$$

$$\approx 0.247285 \pi \text{ radians}$$

$$\approx 0.77687 \text{ radians}$$

