Wednesday Warm Up: Navigation, Latititude, and Longitude

Prof. Jordan C. Hanson

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1 Memory Bank

1. $s = R\theta$ ... Distance s, given Earth radius R, and change in *latitude* θ.
2. $s = \phi R \cos\theta$ ... Distance s, given Earth radius R, a fixed *latitude* θ, and change in *longitude* ϕ.
3. $v = \Delta x / \Delta t$ ... The speed, v, given the distance Δx and the time duration Δt.
4. 1 knot = 1 nautical mile per hour
5. 1 nautical mile = distance corresponding to 1 minute of latitude
6. 1 degree of latitude or longitude equals 60 minutes
7. 1 minute of latitude or longitude equals 60 seconds
8. Pythagorean theorem: $\sqrt{x^2 + y^2} = h$, where x is the horizontal distance, y is the vertical distance, and h is the distance travelled.

2 Speed, Distance, Time

1. Suppose you hike South for 10 km. If the hike takes 4 hours, what was your average speed?

2. Suppose you hike North for 3 hours. If your average speed is 1.5 km per hour, how far did you travel?

3. Suppose you hike West for 7 miles at an average pace of 3.5 miles per hour. How long does this take?

4. Suppose you hike South for 3 km, then West for 4 km. (a) How far are you from the original location? (b) If your average speed is 2 km per hour, how long does the hike take?

3 Navigation

1. Suppose we sail North at 12 knots for 24 hours. (a) How far have we travelled? (b) What is our change in latitude?

2. Suppose we sail East at 10 knots for 15 hours, and our latitude is 45 deg North. (a) How far have we travelled? (b) What is our change in longitude?