

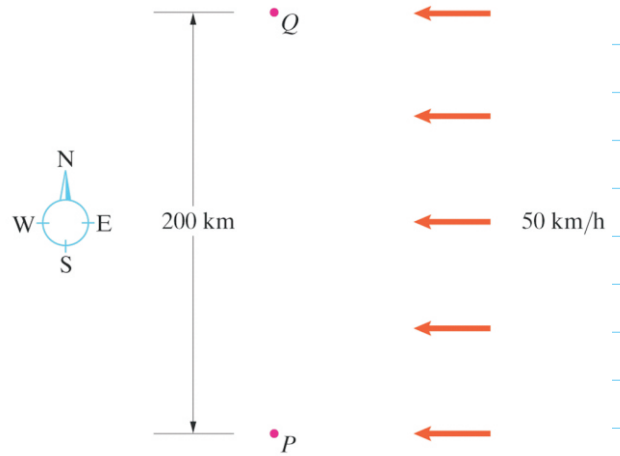
NAME _____

DATE _____

WEEK: _____ **PROBLEM:** _____

GIVEN:

A private pilot wishes to fly from a city P to a city Q that is 200 km directly north of city P . The airplane will fly with an airspeed of 290 km/h. At the altitude at which the airplane will be flying, there is an east wind (that is, the wind's direction is west) with a speed of 50 km/h. What direction should the pilot point the airplane to fly directly from city P to city Q ? How long will the trip take?



REQUIRED:

SOLUTION:

Solution: Assume an angle θ , measured ccw from the east.

$$\mathbf{V}_{Plane/Ground} = \mathbf{V}_{Plane/Air} + \mathbf{V}_{Air/Ground}$$

$$\mathbf{V}_{Plane/Air} = (290 \text{ km/h})(\cos \theta \mathbf{i} + \sin \theta \mathbf{j})$$

$$\mathbf{V}_{Air/Ground} = -(50 \text{ km/h})\mathbf{i}$$

$$\mathbf{V}_{Plane/Ground} = [(290 \cos \theta - 50)\mathbf{i} + (290 \sin \theta)\mathbf{j}] \text{ km/h}$$

We want the airplane to travel due north therefore

$$290 \cos \theta - 50 = 0 \Rightarrow \theta = \cos^{-1} \left(\frac{50}{290} \right) = 80.07^\circ$$

Thus the heading is

$$\boxed{90^\circ - 80.07^\circ = 9.93^\circ \text{ east of north}}$$

The ground speed is now

$$v = (290 \text{ km/h}) \sin(80.1^\circ) = 285.6 \text{ km/h}$$

The time is

$$\boxed{t = \frac{d}{v} = \frac{200 \text{ km}}{285.6 \text{ km/h}} = 0.700 \text{ h} = 42.0 \text{ min}}$$