5. The average velocity is given by Eq. 4-8. The total displacement $\Delta\vec{r}$ is the sum of three displacements, each result of a (constant) velocity during a given time. We use a coordinate system with $+x$ East and $+y$ North. In unit-vector notation, the first displacement is given by

$$\Delta\vec{r}_1 = \left(60\,\frac{\mathrm{km}}{\mathrm{h}}\right)\left(\frac{40\,\mathrm{min}}{60\,\mathrm{min/h}}\right)\hat{\mathrm{i}} = 40\,\hat{\mathrm{i}}$$

in kilometers. The second displacement has a magnitude of $60\,\frac{\mathrm{km}}{\mathrm{h}} \cdot \frac{20\,\mathrm{min}}{60\,\mathrm{min/h}} = 20$ km, and its direction is 40° north of east. Therefore,

$$\Delta\vec{r}_2 = 20\cos(40^\circ)\,\hat{\mathrm{i}} + 20\sin(40^\circ)\,\hat{\mathrm{j}} = 15.3\,\hat{\mathrm{i}} + 12.9\,\hat{\mathrm{j}}$$

in kilometers. And the third displacement is

$$\Delta\vec{r}_3 = -\left(60\,\frac{\mathrm{km}}{\mathrm{h}}\right)\left(\frac{50\,\mathrm{min}}{60\,\mathrm{min/h}}\right)\hat{\mathrm{i}} = -50\,\hat{\mathrm{i}}$$

in kilometers. The total displacement is

$$\begin{aligned}\Delta\vec{r} &= \Delta\vec{r}_1 + \Delta\vec{r}_2 + \Delta\vec{r}_3 \\ &= 40\,\hat{\mathrm{i}} + 15.3\,\hat{\mathrm{i}} + 12.9\,\hat{\mathrm{j}} - 50\,\hat{\mathrm{i}} \\ &= 5.3\,\hat{\mathrm{i}} + 12.9\,\hat{\mathrm{j}} \quad (\mathrm{km})\ .\end{aligned}$$

The time for the trip is $40 + 20 + 50 = 110$ min, which is equivalent to 1.83 h. Eq. 4-8 then yields

$$\vec{v}_{\mathrm{avg}} = \left(\frac{5.3\,\mathrm{km}}{1.83\,\mathrm{h}}\right)\hat{\mathrm{i}} + \left(\frac{12.9\,\mathrm{km}}{1.83\,\mathrm{h}}\right)\hat{\mathrm{j}} = 2.90\,\hat{\mathrm{i}} + 7.01\,\hat{\mathrm{j}}$$

in kilometers-per-hour. If it is desired to express this in magnitude-angle notation, then this is equivalent to a vector of magnitude $\sqrt{2.9^2 + 7.01^2} = 7.59$ km/h, which is inclined 67.5° north of east (or, 22.5° east of north). If unit-vector notation is not a priority in this problem, then the computation can be approached in a variety of ways – particularly in view of the fact that a number of vector capable calculators are on the market which reduce this problem to a very few keystrokes (using magnitude-angle notation throughout).