

## Module 03 - Lesson 1

### Velocity in Two Dimensions

**Question 1:** Use unit vectors to express an instantaneous velocity of 120 km/h oriented at  $30^\circ$  counter-clockwise from the positive  $x$ -axis.

**Question 2:** On the way to the grocery store, you drive North at 40 km/h for 10 min, then turn East and go 10.0 km at 60 km/h. Finally, you turn South-West and drive at 50 km/h for 4.0 min. Determine the car's (a) displacement and (b) average velocity for this trip.

**Problem:** A biologist is monitoring a bacterium through a microscope. She initially sees the bacterium at  $\vec{r}_1 = (2.2\hat{i} - 3.0\hat{j}) \mu\text{m}$ . After 5.0 s, the bacterium is at  $\vec{r}_2 = (4.5\hat{i} + 1.5\hat{j}) \mu\text{m}$ . Find (a) its average velocity, expressed in unit vectors, and (b) its average speed.