The only interstate signed in metric in the US is Interstate 19, running between Nogales on the Mexican border (kilometer marker 0) and Tucson, AZ (kilometer marker 101).

1. A car leaves Nogales driving north to Tucson at 2PM. How fast must the driver travel to reach Tucson by 3PM? What about 3:10PM?

2. Draw on one graph the car's position as a function of time in both cases. You may measure distance and time in any units you choose, but label your axes!

3. Suppose instead that the car drives at a constant 120 km/hr. How many hours will it take to reach Tucson?

A bus leaves Tucson headed for Mexico. One of the passengers realizes that he forgot his passport, and calls his friend to bring it to him. She finds it and sets off after him, entering I-19 ten minutes after the bus. If the bus drives at 80 km/hr, how fast must she drive to catch the bus before the Mexican border?

1. On a single set of axes, sketch graphs of the position of the bus and the position of our forgetful passenger's friend if she drives just fast enough to catch him as he gets to Mexico. (You can make a rough sketch before doing any mathematics; this is a good way to get an idea of how to attack the problem.)

2. What choice did you have to make to do this problem? Would your answer to the previous question change if the "zero-km" marker were on the Tucson end of the highway?

Two runners start at opposite ends of a 100m long soccer pitch and sprint toward each other. One runs at 8 m/s and starts on the east side, while the other runs at 6 m/s and starts at the west side. The slower runner has a 2s head start. You'd like to know where they'll meet.

1. Draw position vs. time graphs for both runners on a single set of axes.

2. Write position vs. time equations ($x = x_0 + vt$) for both runners. Hint: Think carefully about their velocities...

3. How can you express 'where will they meet?' algebraically?

4. Solve the algebraic expressions from #3 and figure out where they will meet.