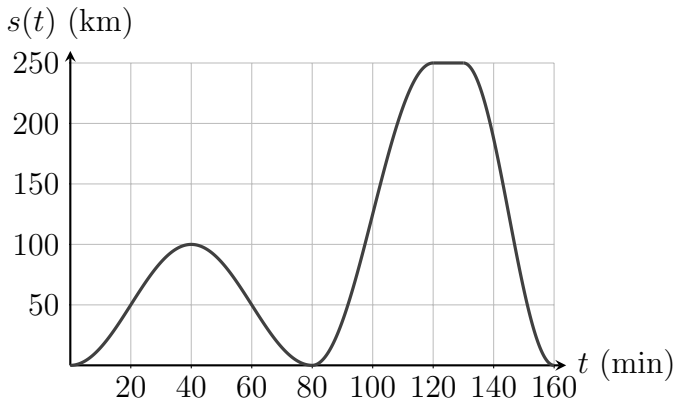
MATH 1450 **Name:**_____

Activity 3

In class we've been discussing average and instantaneous velocity and the difference between the two. This activity is intended to be a fun exploration of those ideas which will hopefully lend a new perspective on velocity. Although you'll be working in groups, each person needs to turn in their own completed copy of the activity.

1. Luke drives his landspeeder to Tosche Station to pick up some power converters. A graph of Luke's distance from his farm, $s(t)$, where t is measured in minutes after 9am, is shown below.



(a) How far from the farm is Tosche Station?

(b) At what time does Luke reach Tosche Station? About how long does he spend there? When does he return home with the power converters?

(c) Compute Luke's average velocity from the start of his trek until he gets to Tosche Station. Include the correct units in your answer.

(d) Illustrate the average velocity from (a) on the graph.

(e) Use the graph to estimate Luke's instantaneous velocity at $t = 60$. What is happening at this moment?

(f) On what time intervals is Luke's instantaneous velocity positive? negative? zero? What do these intervals tell us about his trek (which is obviously preferable to war)?

2. While trying to identify a particular infectious bacteria, Dr. Cameron tracks the movement of a cell across a petri dish. She discovers that the cell's position can be modeled by the following function:

$$s(t) = 2t^2 - 3t + 1 \quad \text{(in micrometers, where } t \text{ is in hours)}$$

(a) Compute the average velocity of the cell between the times listed below. Include the correct units in your answers.

(i) $t = 1$ and $t = 3$

(ii) $t = 0$ and $t = 4$

(b) What factor(s) might influence the cell's movement rate? What does this mean if someone is infected with this particular strain of bacteria?

3. Nuclear safety inspector Homer is monitoring a coolant fluid as it flows through a pipe in the Springfield nuclear reactor. A tracer particle is placed into the pipe and its position along the pipe is recorded in the table below.

Time t (sec)	0	2	5	8
Position x (m)	0	6.6	9.0	14.4

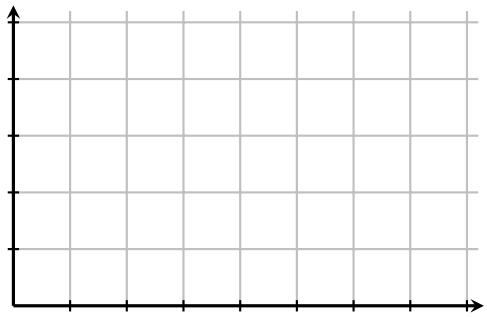
(a) Calculate the average velocity of the particle over the following intervals. Include the correct units in your answers.

(i) $0 \leq t \leq 2$

(ii) $2 \leq t \leq 5$

(iii) $5 \leq t \leq 8$

(b) Sketch a position vs. time graph using the data. Be sure to label your axes.



(c) Identify on the graph each of the average velocities computed in part **(a)**.

(d) What might cause changes in the velocity of the particle? Consider factors like pipe diameter, fluid temperature, possible leaks, etc.