# UNIT 1: STAGGERED RACES 1: VARYING THE "B" IN Y=MX+B

Activity 1: Staggered Race 1 Part 1
(SCLFU1A1.8xv)
Activity 2: Staggered Race 1 Part 2
(SCLFU1A2.8xv)

## UNIT DESCRIPTION:

In this unit, students will make a motion for Actor B by editing the function expression for Actor B. Create groups of 2-4 students, depending on class size (see Grouping Suggestions for help). Provide group numbers and count-off numbers within each group.

## FOCUS:

The primary focus should be on parallel lines and equivalent equations. In Activity 1 and Activity 2, the class collectively will create a system of parallel and coinciding lines. It is important to focus on parallel lines having the same slope, but different y-intercepts; and coinciding lines having the same slope and y-intercept. There is also an opportunity to discuss solutions to systems of equations; you can focus on the solution to the system of equations using both the motion and the graph. Equivalent equations create a system of equations where there are infinitely many solutions. In a system with "Infinitely Many Solutions," there are innumerable solutions, which will satisfy all equations—the lines will coincide, and the Actors will always be at the same place at the same time. Equations with the same slope and different y-intercepts create a system of equations where there are no solutions. In a system with "No Solution," there is no solution, which will satisfy all equations—the lines will be parallel, and the Actors will never be at the same place at the same time.

### Grouping Suggestion

You may want to create varying group sizes for count-off numbers to vary within each group. This will allow for more variations of the class set of functions. In Activity 1, the class family of functions will vary by group number and in Activity 2, the class family of functions will vary by count-off number.

## CLASS DISCUSSION

## BEGIN WITH THE CALCULATOR TEACHER DOCUMENT

Before handing out student calculators, begin a discussion about the activity. The following is suggested dialogue. This is by no means a script, just a beginning dialogue to get you started. Feel free to improvise and stay focused on a student-centered discussion. You want to guide the spirit of inquiry and discovery. Remember that you can leave Marks, and use Numeric Display when you desire.

While displaying MathWorlds, point out the World vs. the graph. Tell students the graphs control the motion of the Actors in the World.

You may want to start discussing what the students expect to see when you start the animation, **F2: View: Animation**. Prompt students to be clear in explaining their expectations.

### Activity Dialogue:

What is the goal of the activity?

Using the information from the graph, how are we measuring distance?

How are we measuring time?

What information do you need in order to meet the goals of the activity?

Let's determine the motion of Actor A.

Where does Actor A start?

How long does Actor A travel? (Remember to ask for units.)

How far does Actor A travel? (Remember to ask for units.)

What is Actor A's velocity? (Remember to ask for units and that velocity is rate and direction.)

Based on our responses, let's write a linear function to model Actor A's motion. (Remember to include the domain.)

As students work on the activity, remind them to play the motion and verify that Actor B is moving as the directions specify.

What direction will each Actor move in? What makes you think that?

Will they move for the same amount of time? Why or why not? How do you know?

It is important to let students make educated guesses and for students to determine how they will check if their guesses are correct.

Once you have completed an appropriate introduction, hand out the calculators and have students open the MathWorlds App on their calculator and then open the appropriate activity.

This is your opportunity to monitor group progress and determine what students are thinking and/or struggling with. Try not to answer questions directly, give students ways of using the motion to answer their questions. For example, "Is this function expression correct?" Answer: "Run the animation, does your Actor act as it should? How do you know?"

## Teacher Motion Dialogue:

Once students have completed their Actor B's motion, begin another class dialogue. Remind students to be specific, refer to group number and count-off number whenever it applies.

Ask students:

How many unique Actors are there in the class?

Where will the Actors be positioned in the World before animation?

What direction will the Actors travel when we animate?

How fast will the Actors travel? For how long?

Where will the Actors be positioned at the end of the animation?

Ask students in the class how their motion compares to the motion of another student in the class. Or ask the class how two different groups compare in terms of motion. What is the same about the motions and what is different?

## Teacher Graph Dialogue:

Refer to the class' set of graphs. Remind students to use group number and count-off number whenever it applies.

Ask students:

What would the graph of an individual group look like, for example, Group 2?

If I put the graph each person created onto one Coordinate Plane, how many line segments would we see? Where will they be?

Will anyone have the same graph?

What are the special characteristics of the line segments?

Refer back to any errors in the motion that would change what they should see.