UNIT 3: SACK RACE: QUANTITATIVE

Activity 1: Sack Race
(SCSRU3A1.8xv)

UNIT DESCRIPTION:

In this unit, students will make a motion for Actor B by manipulating, adding, and deleting segments to define a piecewise linear function for Actor B. Students will be creating a story depicting what occurs within their race. You do not need to group students for this activity, but you may choose to pair them to verify the validity of their first drafts.

FOCUS:

The primary focus should be on slope as rate of change and piecewise functions. This activity allows exploration of multiple types of slope; i.e., positive slope, negative slope, or zero slope for students to build their understanding of varying rate. This activity also allows for exploration of intersections of linear functions leading to an understanding of solutions to systems of equations. There is no one correct answer to this activity and students should focus on what conditions determine a correct answer. This activity will not create a class collection of functions that have a pattern or create a "nice" picture. Students' creativity will set the tone for the discussion. You may choose specific students to display their graph and discuss their story one at a time. You want students to pick out the correlation between the action and the function. For example, if someone reads a story where their Actor stops, there should be a segment with a zero slope. Students will be excited to share even when their stories are incorrect, be sure to encourage a positive environment for corrections.

Grouping Suggestion:

This activity does not rely on assigning group or count-off numbers, so it is not necessary to group students. However, you may want to pair students so they can share technology questions and answers and eventually verify each other's first drafts.

EXTENSIONS:

Ask students to create races with more rigid criteria. For example: Ask students to create a race with Actor A that ends in a tie, but Actor B travels at 3 different velocities; ask students to create a race with Actor A that ends in a tie, but Actor B stops twice and travels backwards once; ask students to create a race with Actor A that ends in a tie, but Actor B never travels backwards.

Class Discussion

Begin with Calculator Document

You may decide to start with the calculator document as is or create an exciting race before hand to discuss with students. A third option is to create a race with input from the students as part of your introduction.

Decide on as much or as little detail as you wish for an introduction. You should at least introduce adding and manipulating segments to control Actor B's function. You may want to create a story that contains some falls or mishaps, possibly some disorientation resulting in running in the wrong direction. This will spark some creativity in students and get them thinking about their options in creating their scenarios. You may also decide not to introduce negatives slopes and discuss them as an extension activity.

Students will be editing functions in the same way you will during the demonstration. **F3: Edit: POS ▸ B ▸ GrphEdit** will enable editing and provide access to Add, Insert, Delete and PtEdit. Pressing the Enter key will exit the menu and accept any changes. You may allow students to use Point Edit (PtEdit), but it is not necessary. (PtEdit allows the student to specify a coordinate pair.)

Activity Dialogue:

What do you expect to happen when you run the animation?

How long will Actor A travel?

In which direction will Actor A travel? At what rate? (What will Actor A's velocity be?)

Where does Actor A start?

Where does Actor A end? When does Actor A end?

Actor B has been ignored because the students are going to be changing Actor B's motion. Students are asked make an Exciting Sack Race that ends in a tie between Actor A and Actor B. Each student will be Actor B and will be able to edit Actor B by adding segments and manipulating segments of Actor B's position graph. But that is not all the students will also be creating a story to go along with this race.

What does it mean to end in a tie?

What is an exciting race? (Lay some ground rules, create a graph and story so that students will understand what kind of control they have.)

Remind Students:

Remind students to press the Enter key to exit the Edit Menu. Also remind students that the 2nd and left or right arrow will allow them to edit the next or previous segments.

Once you've completed an appropriate introduction, have students log on to MathWorlds and begin.

This is your opportunity to monitor student 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 story correct?" Answer: "Run the animation, does your Actor do what you say it does? How do you know?"

You may need to remind students to press the Enter key to exit the Edit Menu.

Teacher Motion Dialogue:

Once students have completed their motions and corresponding stories, begin another class dialogue. In addition, you may want to pair student up and have them swap and verify each other's stories and motions.

Ask students:

If everyone in the class were to act out their race, what would we see?

Where will each of you be positioned before we start the race?

In which direction will you move when we start the race?

Will everyone travel the same speed? Direction? Amount of time?

Where will each of you stop? When?

Once the students have determined what the race should look like if they act it out ask them how they got their Actor to do what they wanted to?

Teacher Graph Dialogue:

Refer to the class' set of graphs.

Ask students:

What do you expect to see in the Coordinate Plane?

How many functions should we see?

Will the functions intersect at all?

Could they intersect in at any points other than (0, 0) or (10, 20)? How do you know?

Ask students to individually display their graph and read their story. You may input their data into MathWorlds for you to display and animate. If a student questions the validity of a story, the animation can be run or stepped through to demonstrate the motion.