

# WARMING UP TO SIMCALC MATHWORLDS

## A Teacher-Led Demo/Discussion

This section introduces several features of MathWorlds, which can be used to explore motions and graphs. The teacher will begin with SimCalc MathWorlds for the Calculator which runs on the TI-73 Explorer™, TI-83 Plus or TI-84 Plus handhelds. If students have used MathWorlds previously, then they are already familiar with these features and may skip this part of the WarmUp. This introduction will work best as a teacher-led discussion.

### Using the TI-73 Explorer™

When using the TI-73 Explorer™ version of SimCalc MathWorlds™, please note that the **Y=** key corresponds to F1: File; the **WINDOW** key corresponds to F2: View; the **ZOOM** key corresponds to F3: Edit, the **TRACE** key corresponds to F4: Tools; and the **GRAPH** key corresponds to F5: Connect.

We assume that students are familiar with coordinate graphs and are able to recognize that the graphs in this package associated with motion are Position vs. Time graphs. If students are not familiar with coordinate graphs, then you may want to begin with another package or a unit of another package before this one.

Begin by opening the MathWorlds App on your teacher calculator. Press the APPS key and select MthWrlds. Open the Introduction activity entitled, **SCStart** (an appvar loaded on the calculator). This Introduction activity has two Actors, Cars, at the top of the screen in the World, which are controlled by two linear defined functions:  $y = 1x + 0$  and  $y = 2x + 0$  on a domain of  $[0, 10]$ .

1. Without much explanation, select **F2: View: Animation** to run the animation. A “play” icon in the upper right-hand corner indicates that you can run the animation. Press the Enter key to start the animation. During animation, the Play icon will change to a Pause icon. Pressing Enter while the animation is playing will pause your Actor’s motion. Ask the students to explain what is going on. This gets them to look more closely at the situation than if you explain it all in advance.

We want them to recognize that the motions of Actor (Car) A and Actor (Car) B relate closely to the graphs, and that, as the discussion proceeds, they should come to see them as Position vs. Time graphs for Car A’s and Car B’s motion. You may want to bring out, via discussion, that the vertical axis measures the positions of Car A and Car B while the horizontal axis gives the time. If needed, you can refer to the vertical line that slides along during the motion as the “time cursor.” Some students may confuse it with the position of Car A or Car B. Note: The time cursor slides at a constant rate, while the speed of the two motions in the animation are different.

2. When the animation has ended, press the enter button again to restart the animation.

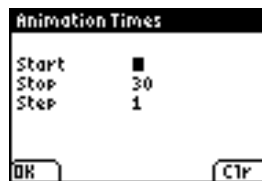
- To set a common framework and language, tell the students that we will refer to the actor above as Car “A” (Above) and the actor below as Car “B” (Below). For now we can think of them as cars moving where the ruler in the World measures feet and the horizontal coordinate axis measures seconds.

Now Ask:

- Which graph goes with Car A and which goes with Car B?
- How *fast* is Car A moving?
- How *fast* is Car B moving?

When in Animation mode, rather than pressing enter to run the animation, you can step through the animation forwards and backwards by pressing the right and left cursor keys respectively. This will slow the animation down giving you a chance to examine the motions and graphs more closely.

- At the end of the animation, step through once more using the right and left cursor keys. Notice that the time cursor changes. Each subsequent step advances the animation one Step Time value, which is controlled by the Step Time set in the Tools menu (**F4: Tools: Clock**). With each step, we can see that Car A moves 2 feet for each 1-second step. How far does Car B move with each step?



Now that we are able to run and step through the animation, we next introduce Marks as a tool for examining graphs and motion. Marks, in the Tools menu (**F4: Tools: Marks**), are dropped by objects at regular time intervals, again controlled by the Step Time.

Note: You will need to quit Animation mode in order to use the menus. (2<sup>nd</sup> + QUIT [MODE])

**F4: Tools: Marks** allows you to turn your Actors' Marks Off or On. Turn the Marks On for both Cars by pressing enter, and then use the hard key that corresponds with OK (the 'Y=' key) to get back to the animation. Marks will now be dropped at 1-second intervals.

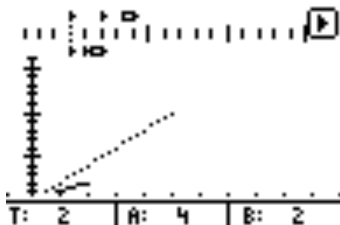
- With Marking On, run the animation again (**F2: View: Animation**). We can see that Car A and Car B leave Marks as they move. The Marks for Car A are 2 feet apart, while the Marks for Car B are 1 foot apart.

Now ask again:

- How *fast* is Car A moving?

- How *fast* is Car B moving?
- How do the Marks help you determine how fast Car A and Car B are moving?

Another useful tool is the Numeric Display in the Tools menu. **F4: Tools: NumDisp ▶ On** will turn on the Numeric Display. The Numeric Display will appear at the bottom of the screen. The display will continuously update while the animation is running, keeping a one-line display of Time, Actor A's Position and Actor B's Position. Remember, pressing Enter will pause the animation.



By now it should be apparent that the graphs are Position vs. Time graphs for the motions of Car A and Car B, respectively, although you may want to make this explicit.

Finally, ask the students: **What is the function expression for Car A's position graph and motion?** And then ask the same for Car B's position graph and motion.

Note: You can choose to display the function expression for each car, **F3: Edit: POS ▶ A ▶ FnEdit**. This will also allow you to edit the function expression for each Actor. **F3: Edit: Actor ▶ A** will allow you to change the starting position of the Actor in the World only.

For further information on each unit, please read the unit introductions.

For further help with SimCalc MathWorlds for the Calculator, please consult the Reference Guide.