This lab assignment exercises the use of a while instruction. Create an Alice scene with a red rover object; name it \textit{curiosity}, of course. In addition you should place an alien in the scene so that the alien appears to be on top of curiosity, like the figure below.

![Image of Alice Goes to Mars](image)

The basic part of this program is to make a mars rover, called "curiosity" go round and round in a smooth animation and also to be able to control how far it goes before stopping.

**Programming Steps**

1) Begin with an instruction the causes the alien to set its vehicle to be \textit{curiosity}.
2) Declare a decimal number variable, named PI, that is initialized to the value 3.14159.
3) Append an instruction to move curiosity forward by PI.
4) Append an instruction to turn curiosity right by 0.125. Now run your program.
5) The program doesn’t animate very smoothly, so in this step we make a couple of improvements to improve the animation. First, add detail to the move and turn instructions so that the animation style begins and ends abruptly. Secondly, drag a \textit{do together} instruction into the program and drag the move and turn into this do together. Now run the program and you should see a better animation.
6) Drag a \textit{while} instruction into your program, then drag the do together inside the body of the while. Now when you run the program. You should notice that curiosity goes round and round until you stop the program’s execution.
7) Now we are going to create a variable to keep track of how far curiosity has moved. To do this you need to declare another decimal number at the start of the program. Call this variable \textit{distanceTraveled} and initialize it to the value zero.
8) Every time the while body repeats curiosity moves forward by a distance of PI. Therefore, you should insert an instruction somewhere inside the while body that increases \textit{distanceTraveled} by PI. Remember to drag \textit{distanceTraveled} from its declaration - not try to relocate the declaration. It is best to first assign \textit{distanceTraveled} the value 1.0, then modify the 1.0 as shown in the picture to the right:
At this time your program should look like this:

9) Your while instruction repeats forever because it currently has a condition of true. You should change this so that the repetition only continues until curiosity has moved 40.0 units. The picture to the right shows how to do this. If you run the resulting program, curiosity should travel by about one and three-quarters revolutions.

If time permits:
10) It would be nice to make the wheels roll to correspond to the curiosity movement. The reason we chose to move curiosity forward by the distance of PI is because with a circumference of PI the wheel will match this motion by making by one complete revolution. But how do you access the wheels? The answer is in the menu used to select objects. If you slide to the right on the curiosity option you can select any one of curiosity’s wheels by choosing an option such as curiosity getFrontLeftWheel as shown below.

Once you have selected one of the wheels, insert an instruction to turn forward by 1.0 and use abrupt begin and end. The newly-inserted instruction should be dropped inside the do together instruction.

11) Repeat what you did in Step 11 for the other three curiosity wheels.

With still more time:
12) Create a second while instruction that follows after the first with the following changes:
   a) the condition should repeat so long as distanceTraveled is less than 80
   b) all forward moves should be replaced by backward moves