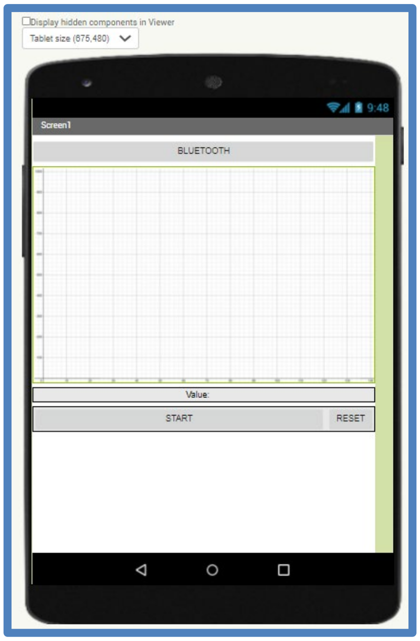
Name: **Date:** **Class:**

Activity Part 4 Worksheet: Scrolling Graph

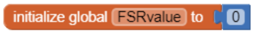
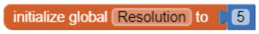
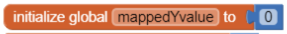
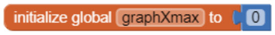
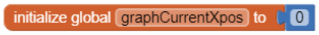
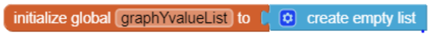
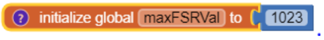


Additional Equipment Needed: None

Procedure:

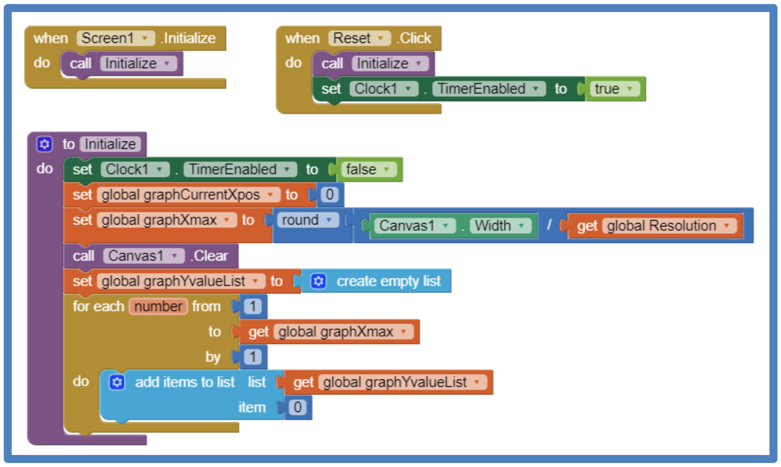
In the previous activity you added the code and user interface to display the force sensor values. In this last activity you will add a scrolling graph. MIT App Inventor is not meant to display real-time data. However, with the Arduino handling any buffering, you will still be able to chart the data with a small delay.

1. Use Desmos and Snipping Tools to create a grid. Or find a free image online. Save it as a .PNG or.JPG format.
2. On the Design tab of MIT App Inventor 2, add a canvas that fill the parent width. You can try different settings for the height. The example shown uses 300 pixels, intended for a tablet. Add a horizontal arrangement with a START and RESET button. You should already have a START/PAUSE button from the previous activity and will only need to add the RESET button..
3. You will need to initialize seven different variables, one of which you should already have from the previous code.

Variable Name and Initial Value	Description
 initialize global FSRvalue to 0	Holds the digital value of the sensor from 0–1023; or the voltage value from 0–5000 mV. Initialize the value to 0 in either case.
 initialize global Resolution to 5	The horizontal distance between sensor reading plot points. The recommended value is 5 pixels.
 initialize global mappedYvalue to 0	The raw sensor value proportioned to the vertical height of the canvas. Initialize the value to 0.
 initialize global graphXmax to 0	The maximum x-value that can be plotted which is derived from the canvas width and the resolution.
 initialize global graphCurrentXpos to 0	Keeps track of the most recent horizontal pixel value on the graph.
 initialize global graphYvalueList to create empty list	A list of all of the mapped sensor values (the y-values).
 initialize global maxFSRVal to 1023	The maximum y-value that corresponds to the height of the canvas. If plotting, digital values, the maximum will be 1023. If plotting voltage values, the maximum will be 5000 (mv).

Name: **Date:** **Class:**

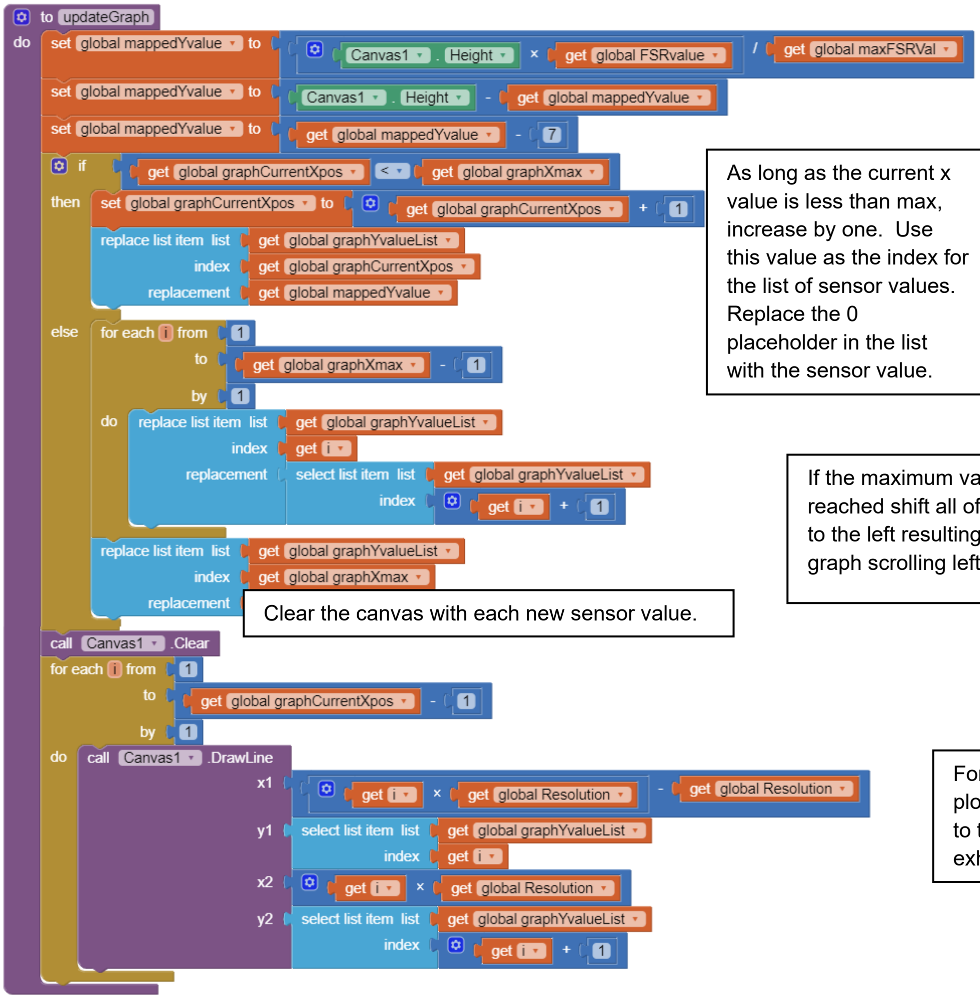
4. When the screen initializes or when the RESET button is clicked, you need to control the clock (disabled upon initialize but enabled for RESET) as well as set the beginning x-value to 0, calculate the maximum x-value. You also want to clear the canvas, create an empty list of y-values and then fill them with 0s to start.
5. Create an UpdateGraph function which you will need to call from the Clock set of blocks.



```
when Screen1 .Initialize
do  call Initialize

when Reset .Click
do  call Initialize
    set Clock1 . TimerEnabled to true

to Initialize
do  set Clock1 . TimerEnabled to false
    set global graphCurrentXpos to 0
    set global graphXmax to round Canvas1 . Width / get global Resolution
    call Canvas1 .Clear
    set global graphYvalueList to create empty list
    for each number from 1
                    to get global graphXmax
                    by 1
    do  add items to list  list get global graphYvalueList
                           item 0
```



```
to updateGraph
do  set global mappedYvalue to Canvas1 . Height × get global FSRvalue / get global maxFSRVal
    set global mappedYvalue to Canvas1 . Height - get global mappedYvalue
    set global mappedYvalue to get global mappedYvalue - 7
    if   get global graphCurrentXpos < get global graphXmax
    then set global graphCurrentXpos to get global graphCurrentXpos + 1
         replace list item  list get global graphYvalueList
                            index get global graphCurrentXpos
                      replacement get global mappedYvalue
    else for each i from 1
                      to get global graphXmax - 1
                      by 1
         do  replace list item  list get global graphYvalueList
                                index get i
                          replacement select list item  list get global graphYvalueList
                                                       index get i + 1
         replace list item  list get global graphYvalueList
                            index get global graphXmax
                      replacement
    call Canvas1 .Clear
    for each i from 1
               to get global graphCurrentXpos - 1
               by 1
    do  call Canvas1 .DrawLine
                x1 get i × get global Resolution - get global Resolution
                y1 select list item  list get global graphYvalueList
                                    index get i
                x2 get i × get global Resolution
                y2 select list item  list get global graphYvalueList
                                    index get i + 1
```

Map the sensor value proportionally to the canvas height and subtract it from the height since the x-values increase to the right while the y-values increase going down. Then adjust a few pixels to account for the axis labels on the image.

As long as the current x value is less than max, increase by one. Use this value as the index for the list of sensor values. Replace the 0 placeholder in the list with the sensor value.

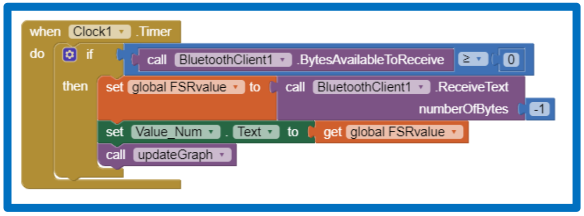
If the maximum value is reached shift all of the values to the left resulting in the graph scrolling left.

Clear the canvas with each new sensor value.

For each consecutive value, plot the sensor values from one to the next until the list is exhausted.

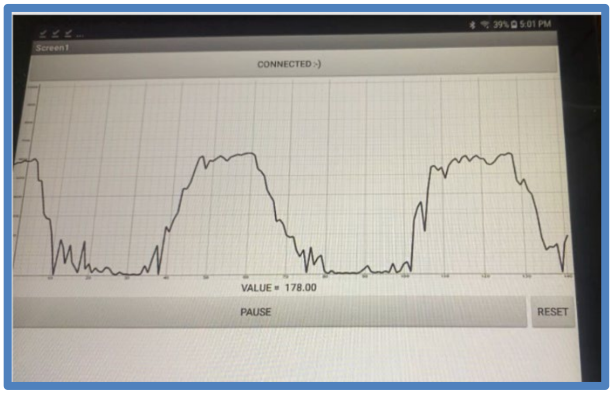
Name: **Date:** **Class:**

6. Call the UpdateGraph function from the Clock blocks.



```
when Clock1 .Timer
do  if  call BluetoothClient1 .BytesAvailableToReceive ≥ 0
    then  set global FSRvalue to  call BluetoothClient1 .ReceiveText
                                              numberOfBytes -1
          set Value_Num . Text to  get global FSRvalue
          call updateGraph
```

7. Upload the new code to the Android tablet and test. Use your finger to simulate a labor curve as shown. Test the scrolling function as well as the START/PAUSE and RESET buttons.


Screen1
CONNECTED :)
VALUE = 178.00
PAUSE
RESET