The TI-Innovator Piano	Mini Project 5: Play the Piano Using the TI-Innovator Rover
In this last mini-project, you will import the piano code from the brightness sensor. You will use the ultrasonic sensor and the TI-Innovator Hub to measure distances to the sensor. Based on the distance, draw a circle on the correct key and play the corresponding note.	**Objectives:** • import PIANOBRT to draw your keyboard and import the loop • use the range sensor on TI-Rover • use IF statements to make decisions • use LISTS to store information • use a WHILE statement to repeat code

The Piano Project Overview:

After completing a series of 5 mini-projects, you will have several ways to play a piano. You will be able to play the piano using the keys on your handheld, using the brightness sensor on the TI-Innovator Hub, using a separate ultrasonic sensor or using the ultrasonic sensor on the TI-Rover. *If you are unfamiliar with using the getKey command, you should do mini-project 1 "Detect which keys are pressed" in the Maze project first.*

Mini-project order:

1. Piano setup
2. Play the piano using the keypress event.
3. Play the piano using the brightness sensor on the TI-Innovator Hub
4. Play the piano using an ultrasonic sensor an the TI-Innovator Hub
5. **<u>Play the piano using the ultrasonic sensor on the TI-Innovator Rover</u>**

Teacher Tip:
This activity can be completed without doing mini-project 4. This is an alternative way to using an external sensor, depending on material availability.

1. Let's make sure your TI-Rover is working. Create a temporary project named T.
   Type the following lines of code
   You will get most of the code in the ROVER menu located in the HUB menu.

```
:Send("CONNECT RV")
:getKey →K
:While K≠45
:getKey →K
:Send("READ RV.RANGER")
:Get(D)
:Output(6,1,D)
:End
```

Ultrasonic Sensor

Execute your code. Hover your hand over the sensor. What types of

values do you get?

Teacher Tip:
Make sure the calculator is plugged into the TI-Innovator. Make sure the TI-Innovator Rover is turned on. The default reading for the sensor is meters. Therefore, students should get reading between 0 and 0.5.

2. Create a program named PIANORVR

On the first line, use recall to import the keyboard code
rcl (2nd sto→)
prgm
EXEC
Select PIANOBRT
Press the enter key

Execute your code. It should draw the keyboard first, then display the brightness sensor data. The display should override your keyboard, which is ok for now. Make sure you don't have any errors.

3. Remove the three lines of code from the brightness sensor. You will insert code to read from the TI-Innovator Rover.

```
  :0→K
  :While K≠45
  :getKey →K
1 :Send("READ BRIGHTNESS")
2 :Get(B)
3 :iPart(B/7.14) →N
  : Send("SET SOUND eval(261.14*2^(N/12))")
  :End
```

4. Insert the line to read from the TI-Innovator Rover.

```
:0→K
:Send("CONNECT RV")
:While K≠45
:getKey →K
:Send("READ RV.RANGER")
:Get(D)
:
:Send("SET SOUND eval(261.14*2^(N/12))")
```

Using the numbers from your investigation and project 4, what do you think goes in the missing line to produce the various notes?

5. If your ranger is reading in meters, most of your numbers in the temporary project where under 1. If you multiply the distance by 100, your distance values will be about the same as the brightness variables from project 3. Therefore we can use the following code

```
:0→K
:Send("CONNECT RV")
:While K≠45
:getKey →K
:Send("READ RV.RANGER")
:Get(D)
:iPart(D*100/7.14) →N
:Send("SET SOUND eval(261.14*2^(N/12))")
```

Teacher Tip:
If students deleted the draw Circle command the frequencies will change more often.

```
NORMAL FLOAT AUTO REAL DEGREE MP
EDIT MENU: [alpha] [f5]
PROGRAM:PIANORVR
:0→Xmin
:264→Xmax
:0→Ymin
:164→Ymax
:FnOn
:PlotsOff
:BackgroundOn Image1
:ClrDraw
:DispGraph
:
:0→K
:Send("CONNECT RV")
:{0,2,4,5,7,9,11,12}→L1
:{1,3,-1,6,8,10,-1,13}→L2
:While K≠45
:getKey→K
:Send("READ RV.RANGER")
:Get(D)
:iPart(D*100/7.14)→N
:Send("SET SOUND eval(261.
16*2^(N/12))")
:For(L,1,8)
:If L1(L)=N
:Then
:ClrDraw
:Pt-On(25+30*L,30,2,MAGENT
A)
```

```
:End
:End
:For(L,1,8)
:If L2(L)=N and L2(L)≠-1
:Then
:ClrDraw
:Pt-On(41+30*L,90,2,MAGENT
A)
:End
:End
:End
```