In the Classroom:

Grade Level: 5-12
Building Skills: None
Time: 45 min
Programming Skills: Light sensors

Musical Instrument

Build an instrument that plays according to light values.

Challenge

Program a LEGO Pitch Pipe that plays higher pitches when the light is bright and lower pitches when the light is dim.

Materials

NXT car
Flashlight or Light Source

Skills Learned

This activity introduces a way to expand the power of blocks through data hubs.

Procedure

Building

Step 1: Connect one Light Sensor to Input Port 2.

OR

Step 1: Use a previously built NXT 2-motor vehicle with a Light Sensor. (See Building Instructions for NXT – Section B.)

Step 2: Connect one Light Sensor to Input Port 2.

Output Port	Hardware	Input Port	Sensor
A	NONE	1	NONE
B	NONE	2	Light Sensor
C	NONE	3	NONE
		4	NONE

NOTE: You will not need to attach the motors of your NXT vehicle to the Output Ports for this activity.

Programming

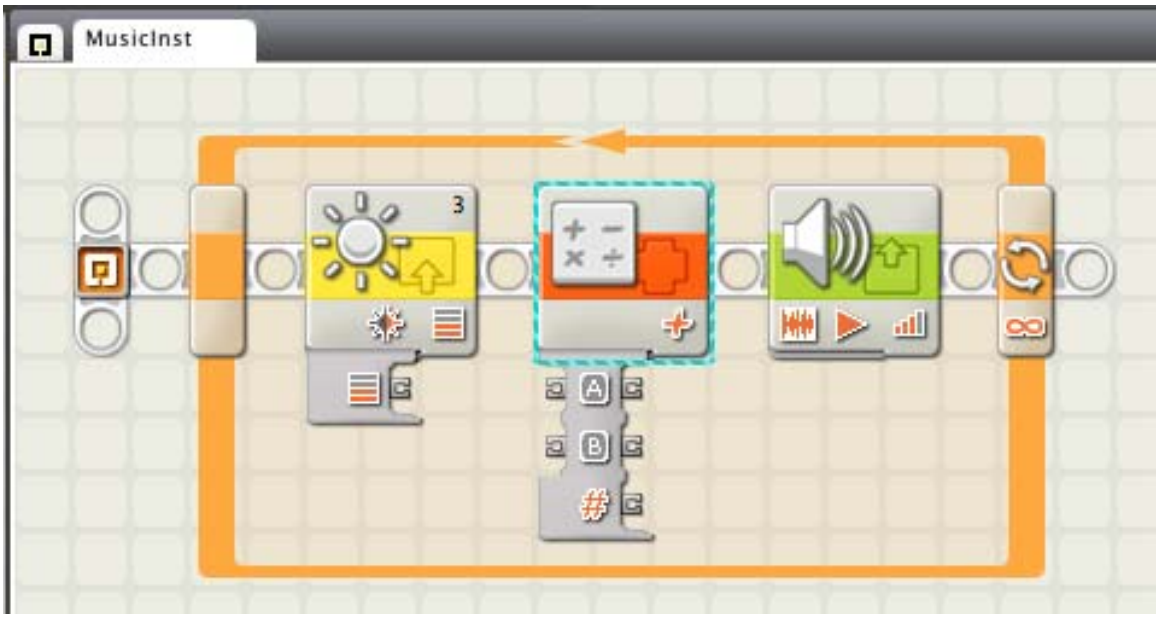
Step 1: Open the LEGO MINDSTORMS program and start a new program called *MusicInst*.

Step 2: Click on the  tab at the bottom to the Common Block Palette to open the Complete Block Palette.

Step 3: Select blocks from the Complete Block Palette to create a four-block NXT program that matches the one below. You will use the directions in

Step 4: To configure these blocks to make the *Musical Instrument* program.

(Step 4 continued on next page)

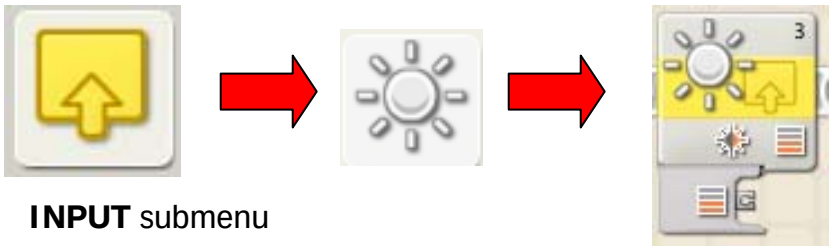


The **Loop** block is available in both the Common and in the Complete Block Palette. Since we're using the Complete Block Palette, select the **Loop** Block from the **FLOW** submenu.

FLOW submenu

Loop Block

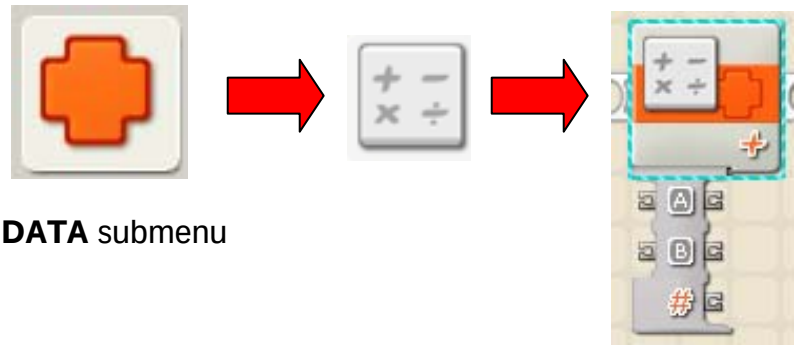
The next block in this program is the **LIGHT** block and is under the **INPUT** submenu.



INPUT submenu

Light Block

The third block in the program is called the **Math** Block and is found under the **DATA** submenu.



DATA submenu

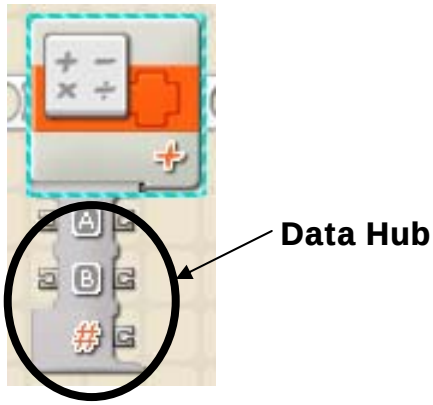
Math Block

The final block in the program, the **Sound** block, is found in the Complete Block Palette under the **ACTION** submenu.

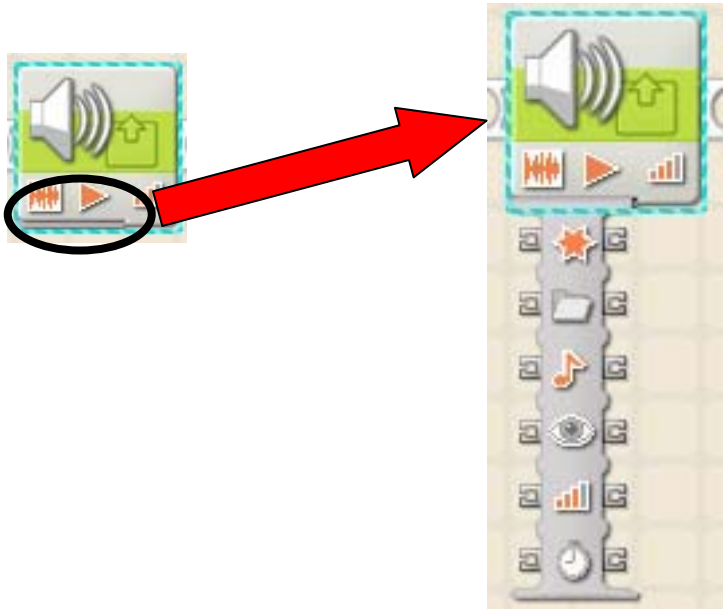
ACTION submenu

Sound Block

Step 4: For the **Music Box** program, you will need to access the data hubs of the **Math** and **Sound** blocks. The **Math** block will automatically have a data hub that sits below the block.

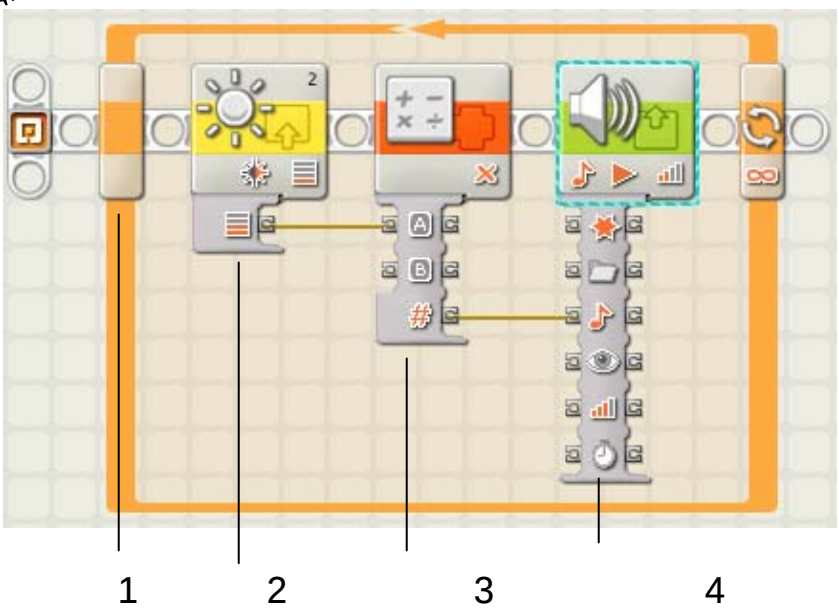


Click on the double line on the bottom-left side of the **Sound** Block to reveal the hidden data hub.



Sample Configuration for Musical Instrument

In this program, the light sensor (block 2) will detect a light level and then the NXT brick will play a tone (block 4) corresponding to that reading before looping (block 1) back to the beginning of the program. The light reading needs to be multiplied (block 3) by 20 to make the value become a tone that the NXT brick can produce.



(Step 4 continued on next page.)

Block # *Block* *Configuration*

1 Loop

Control:	Forever
Show:	

2 Light Sensor

Port:	2	
Compare:	>	49
Function:	Generate light	

3 Math

Operation:	Multiplication			
A			B	20

4 Sound

Action:	Tone	Note:			
Control:	Play	A	for:	0.1	seconds
Volume:	50				
Repeat	Repeat	Wait:	Wait for Completion		

NOTE: This program will require you to connect the light value detected by the **Light Sensor** Block (block 2) using **Math** Block (block 3) and onto the **Sound** Block (block 4).

Step 5: Download this program to your NXT brick. (See previous programs for details.)

Step 6: Run this program and listen to the music produced as you move your NXT brick around.