Smart Irrigation System: Challenge #2

In this activity you will use a Soil Moisture Sensor to read and report the soil moisture level. You will use the measured moisture level to display if the soil is dry or moist.

Goals:

1. Use the read command to read moisture levels
2. Use the range command to scale values
3. Use a For loop to repeat code.

Background:

Humans invented agriculture over 6000 years ago as a way to produce more food than could be hunted and gathered from the environment. This increase in food availability produced a rapid increase in population that was totally dependent on agriculture for survival. Today, the world's large population requires sophisticated large-scale agriculture to keep everyone fed. Climate changes can have severe consequences on the food production required to keep the large human populations fed. Natural and man-made ecological disasters, such as the Dust Bowl of the 1930's, can have severe consequences on the dependent populations. A more recent example, told in April 2016 The Guardian article*, describes the devastating effects on the local population of a severe drought in Zimbabwe. Science and technology can help to optimize food production and mitigate the effects of climate change and poor farming practices

Command	Example	Behavior
CONNECT <type> <number> TO <port>	Send "CONNECT LIGHTLEVEL 1 TO IN1"	Associates the first LIGHTLEVEL object with a light sensor plugged into port IN1 on the Hub.
SET <type> <number> TO <value>	Send "SET ANALOG.OUT 1 TO 128"	Turns on an analog.out1 object, such as a pump, to a power setting of 128
RANGE <type> <number> <min value> <max value>	Send "RANGE LIGHTLEVEL 1 0 100"	Scales the measured values read from LIGHTLEVEL 1 to return in the range 0 to 100.
READ <type> <number>	Send "READ MOISTURE 1"	Reads one measurement from the first moisture sensor.
Get <variable>	Get m	Stores the moisture measurement into the variable named m. *Note a get command must immediately follow a read command. The value stored will contain the measurement from the immediately preceding READ command."
DispAt <line #> , <"text"> , <variable name>	DispAt 3, "Moisture level = ", m	When variable m has a value of 26, "Moisture level = 26" is displayed on line 3 of the calculator.
For <var>,<start>,<stop> <statements> EndFor	For count, 1, 5 Send "READ MOISTURE 1" Get m DispAt 3,"Moisture level = ",m Wait 1 EndFor	The commands inside the For structure will execute 5 times. The variable *count* is initially assigned a value of 1 then increases by 1 each time through the loop.

If <Boolean expression 1> Then
  <statements 1>
ElseIf <Boolean expression 2> Then
  <statements 2>
Else
  <statements 3>
EndIf
	If t >=40 Then
	  DispAt 3,"It is Hot"
	ElseIf t >=25 and t < 40 Then
	  DispAt 3,"It is Warm"
	Else
	  DispAt 3,"It is Cool"
	EndIf
		If the first Boolean expression is true, the corresponding statements are executed and the decision tree is immediately exited. In the example, if t=30 then the first expression is false and the <statements 1> are skipped, the second expression is true and <statements 2> are executed and the tree is exited. Additional ElseIf statements may be inserted if needed.

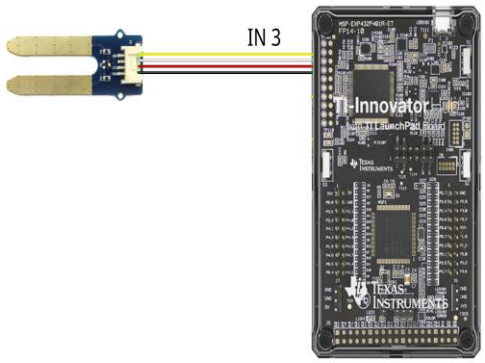
The soil moisture sensor produces an output from 0 to 2^{14} based on the conductivity (dielectric permittivity) of the soil which is dependent on water content. The sensor output is proportional with the volumetric water content; however, it is not calibrated in a particular unit or percentage. Like the light level sensor, it is useful to use the RANGE function to scale the sensor output from 0 to 100.

Water interacts differently with different soil types. Fill in the missing information on the table below.

	Clay	Sand	Loam
Infiltration Rate			
Water Retention			
Texture			
Erosion			

Challenge:

Write a program named *c2* that measures soil moisture every two seconds for a total of twenty times. The program should display if the soil is dry or moist based on the sensor reading.



Explore:

1.) If permitted by your teacher, choose three different locations to measure. Record your results below.

Condition: _____ Soil Moisture Level _____

Condition: _____ Soil Moisture Level _____

Condition: _____ Soil Moisture Level _____

2.) Give a range of reading levels you think would be ideal for growing crops. Why did you choose this range?

3.) Do you think the ideal moisture levels change based on the plants growing in the soil? Can you give some examples?