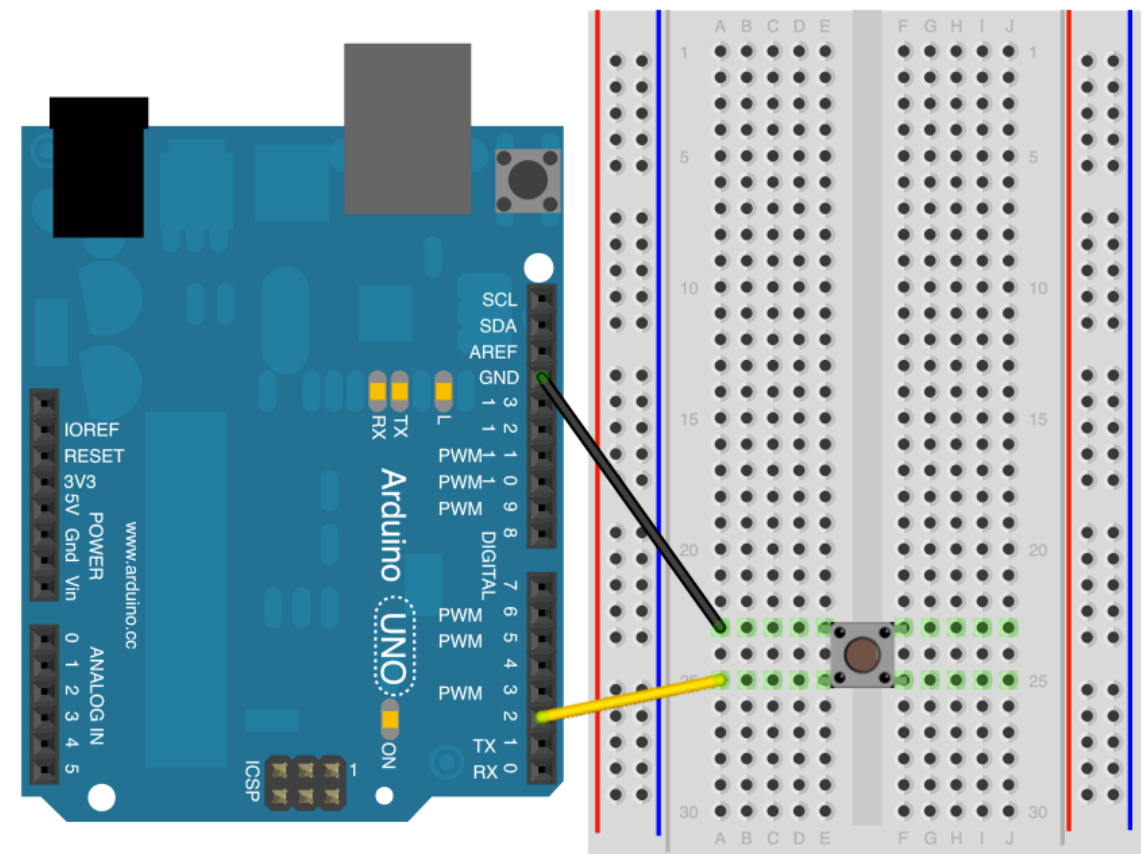
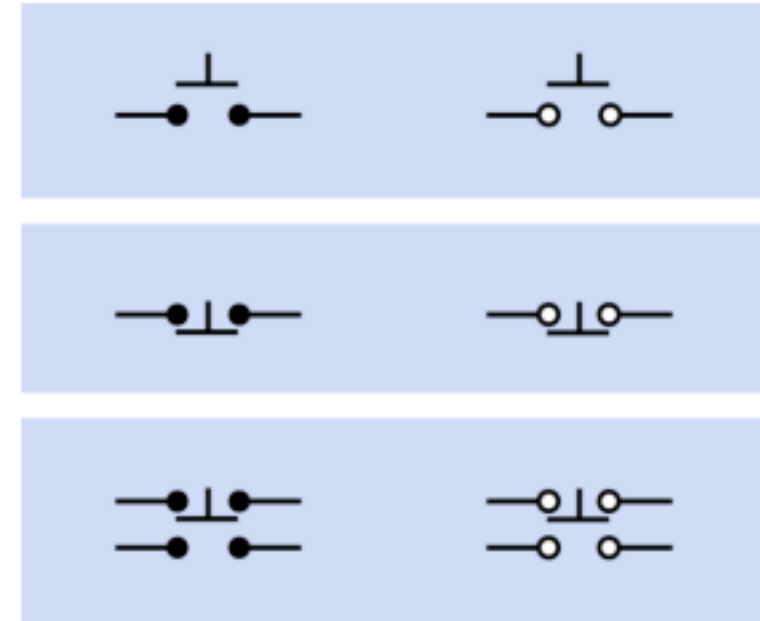


PHYSICAL COMPUTING

WEEK 02

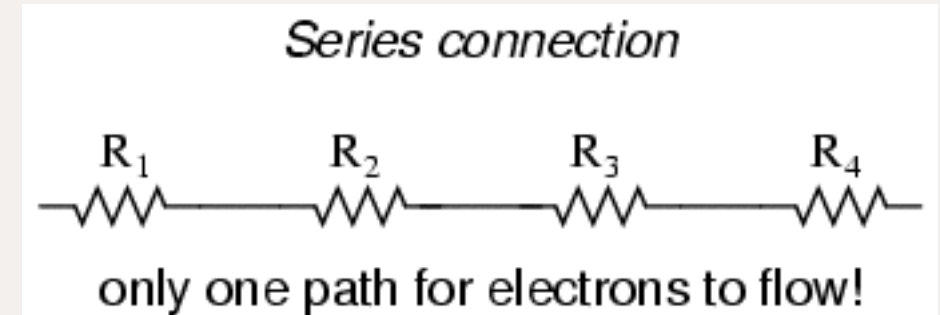
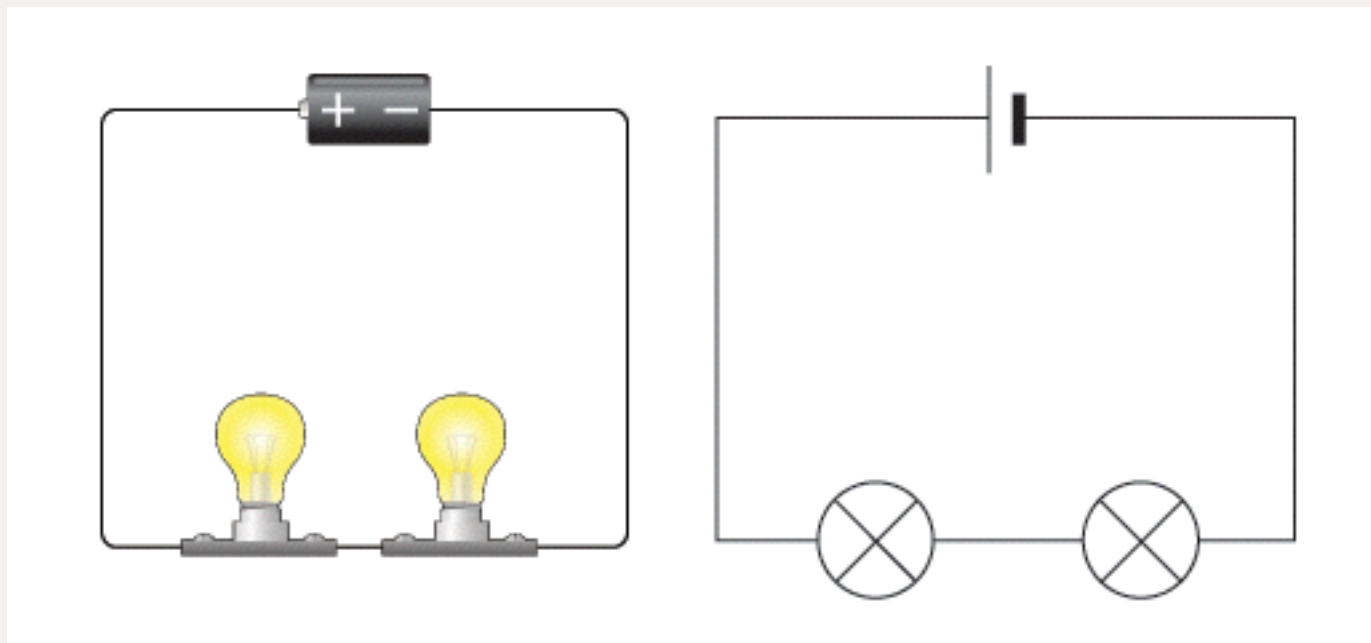
Reviewing and Deepening Understanding of Push buttons and LEDs

a single pushbutton may close or open two separate pairs of contacts



Serial Circuit

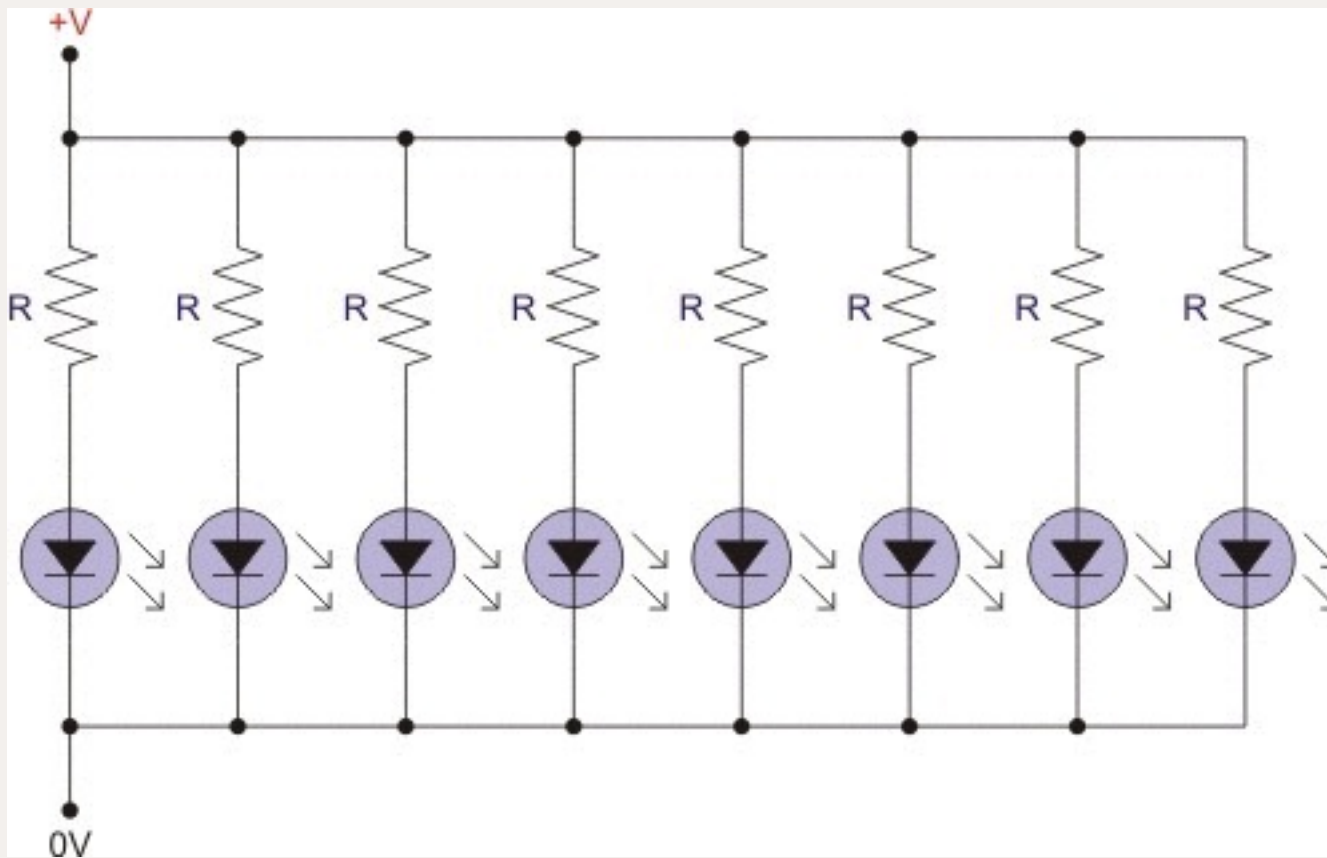
Serial = One after the other in order



$$R_T = R_1 + R_2 + R_3$$

Parallel Circuit

All just connected to the same power and ground



$$R_{\text{total}} = 1/r_1 + 1/r_2 + 1/r_3 + \dots$$

$$R_{\text{total}} = 1/r_1 + 1/r_2 + 1/r_3 + \dots$$

For example, suppose we have a parallel circuit with resistors of 30 Ohms, 60 Ohms, 20 Ohms and 10 Ohms. Then the total resistance is:

$$\frac{1}{R_t} = \frac{1}{30} + \frac{1}{60} + \frac{1}{20} + \frac{1}{10}$$

$$= \frac{2}{60} + \frac{1}{60} + \frac{3}{60} + \frac{6}{60}$$

$$= \frac{12}{60} = \frac{1}{5}$$

Thus

$$R_t = \frac{1}{1/5} = 5 \text{ Ohms}$$

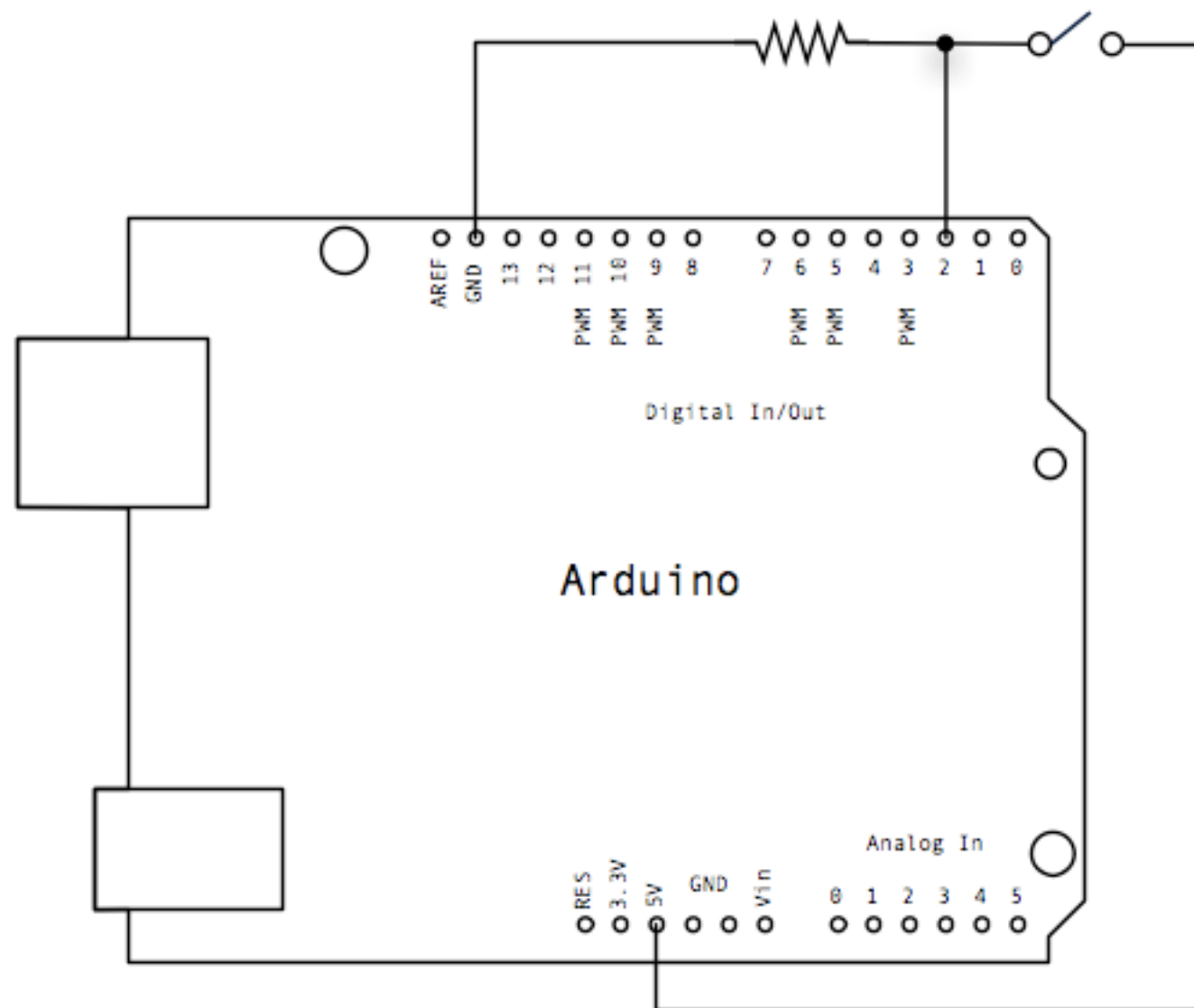
How you hook it up changes the
amount of current you have

Eventually, you're going to run
out of pins, voltage or current.

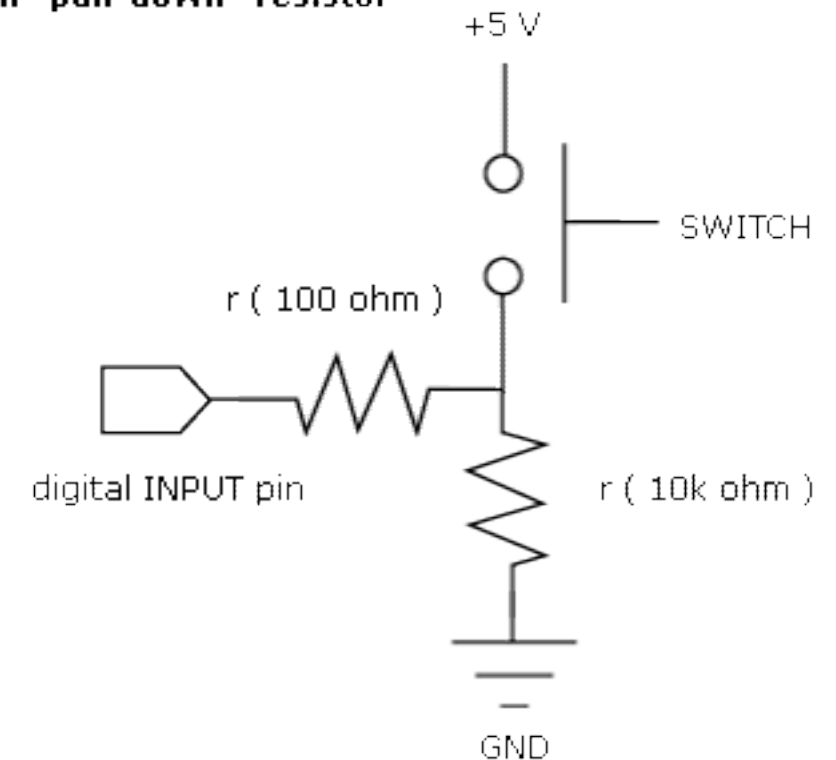
The solution is multiplexing

but to do it we will want to learn a few things
first.... (so next week more to see here)

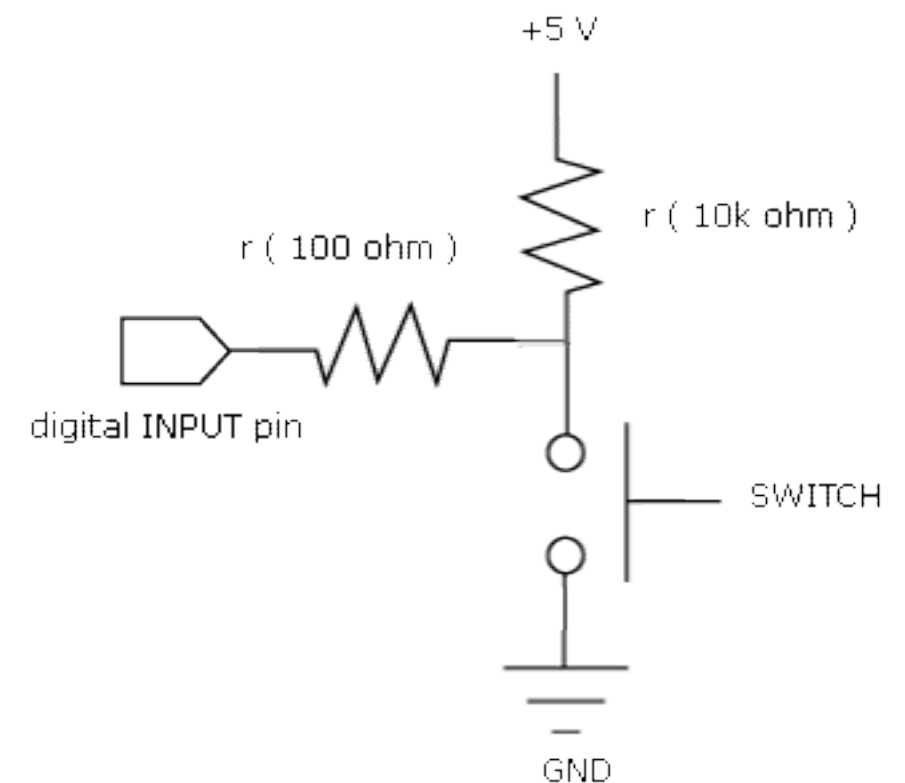
Current flows down the
path (of least resistance)



Switch with "pull-down" resistor

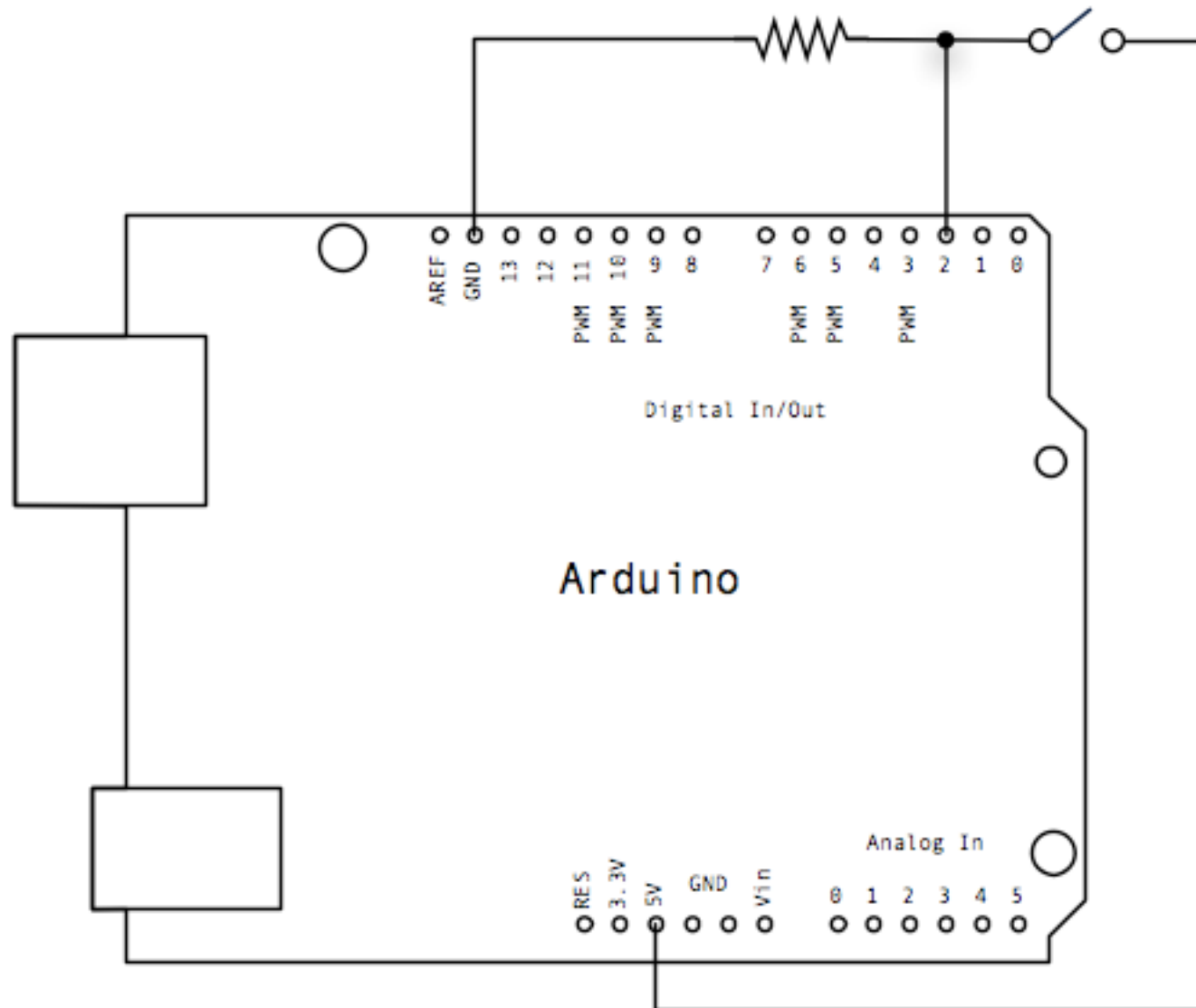


Switch with "pull-up" resistor

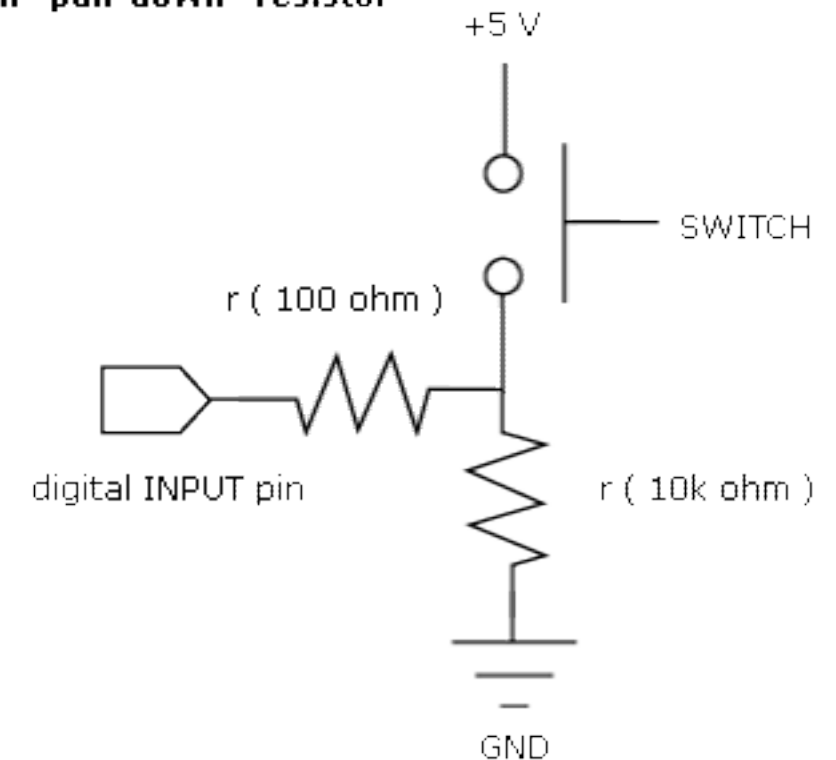


digitalRead(pinNumber)

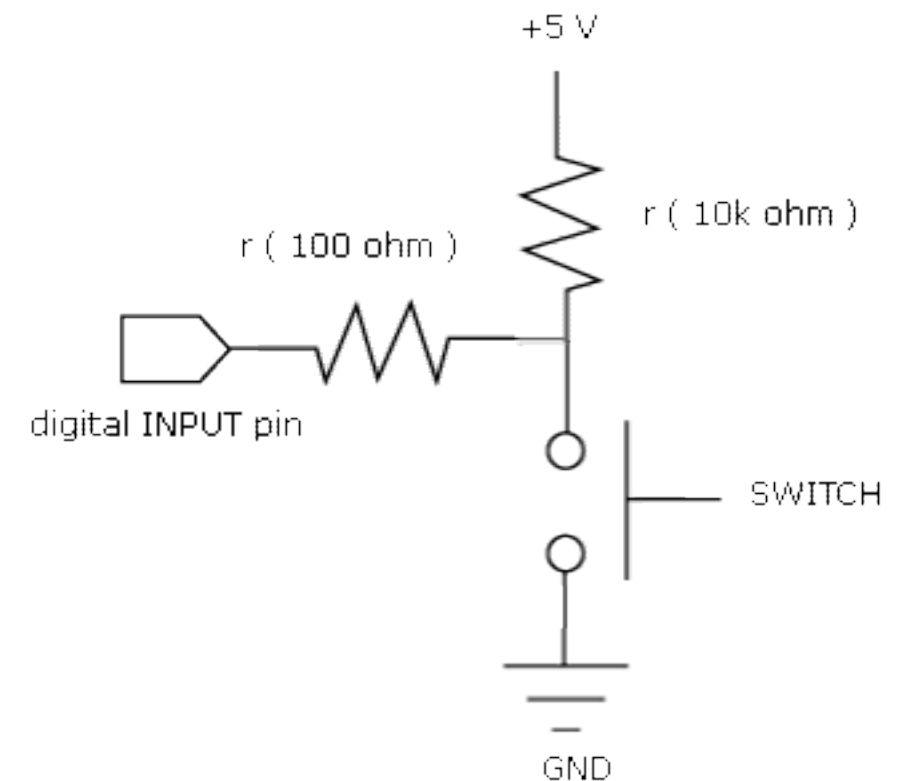
use this function to measure
a closed (or open) connection



Switch with "pull-down" resistor



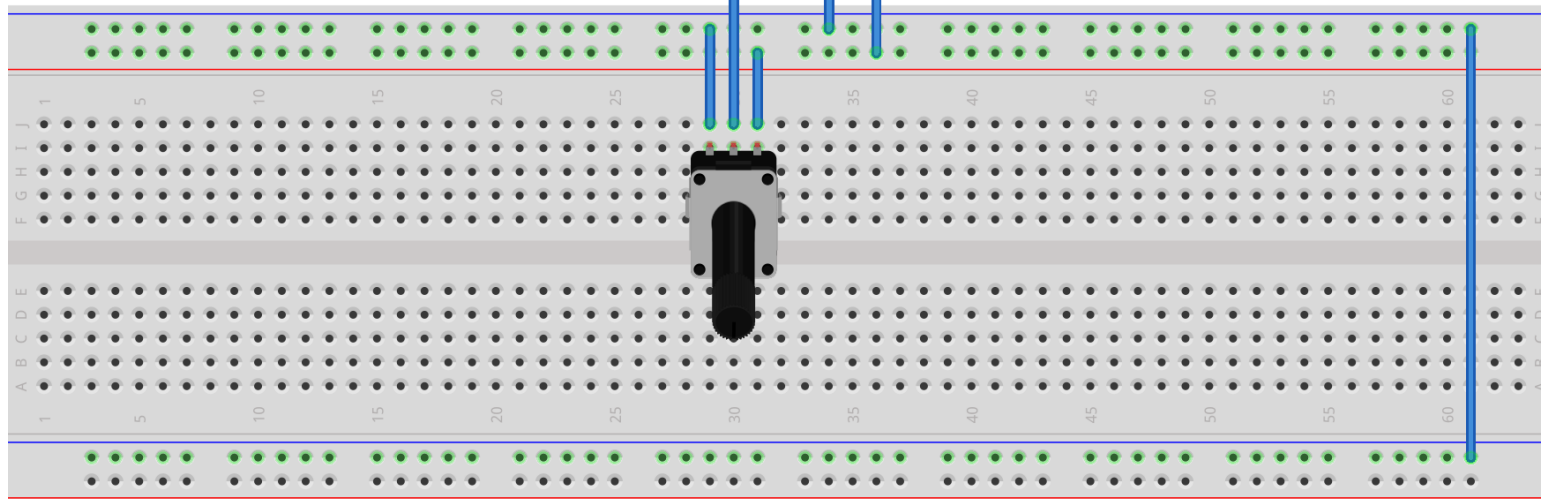
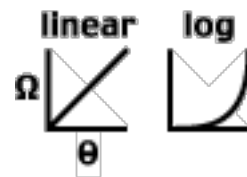
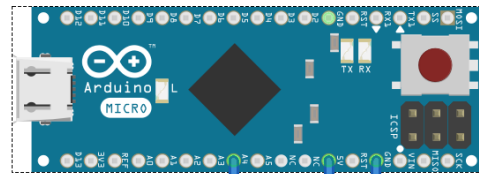
Switch with "pull-up" resistor



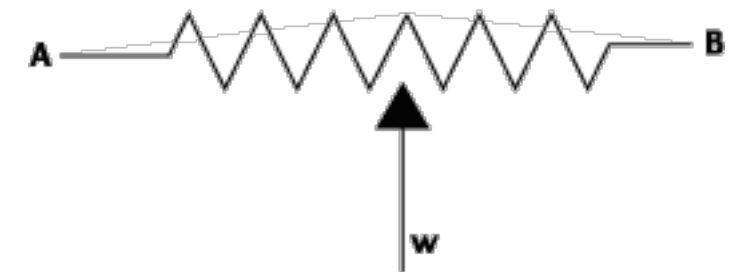
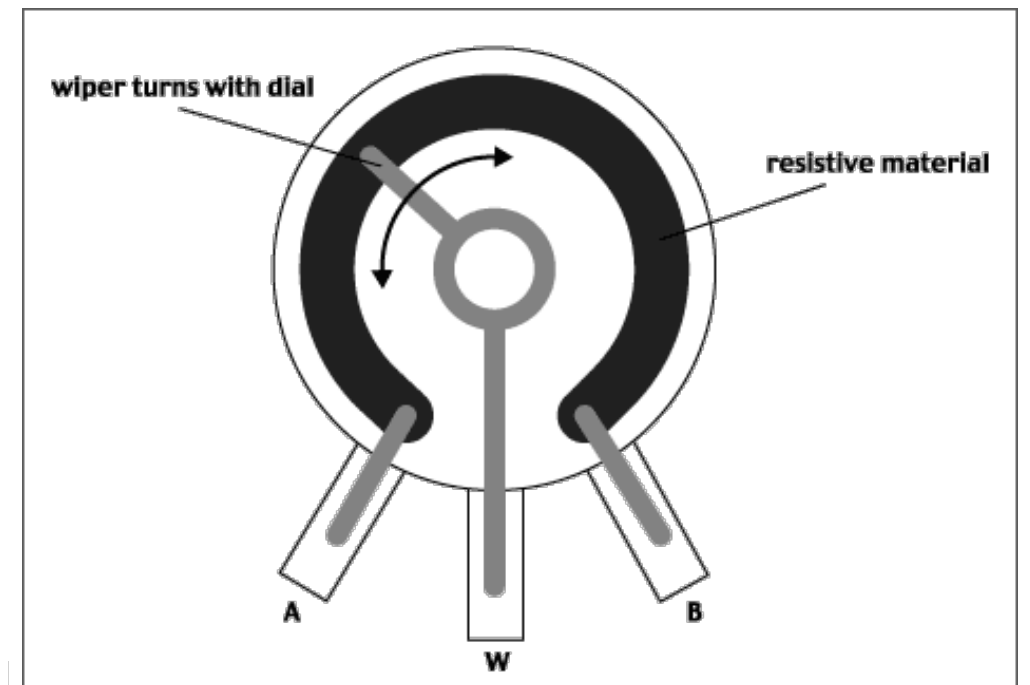


Potentiometer

A variable resistor



fritzing



Sensors and actuators

Input and Output

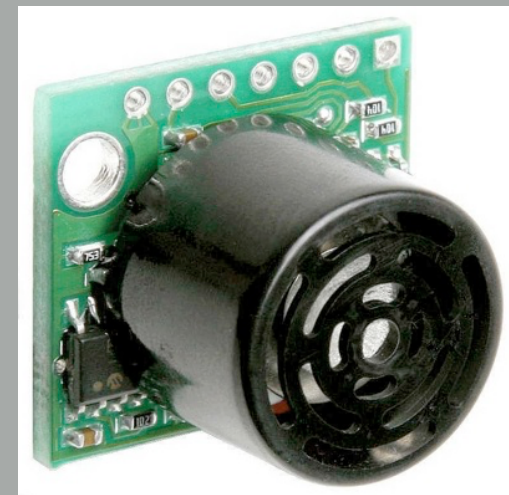
There are many different kinds of sensors



ir



light



sonar (proximity)



sound



touch



bend

What is a multimeter?



a word about
testing and debugging

Serial Data

Your friendly output

A word about types...