Introductory Concepts and Tools
Computer Science 240

Laboratory 1

- Administrivia
- Lab Environment
- Basic Electronics (Ohm's law, transistors, logic gates)

Lab Environment

- All lab exercises and reports will be *Google Docs*, and should be shared with lab partner and the instructor
- Bring a laptop to lab if you have it (helpful to use a second computer for the lab report)
- From lab machine booted to Linux, you can enter Linux commands using a **terminal/shell**
- You can also use a terminal from either

Mac (*Terminal*) or PC (*PuTTY*) to open a remote connection to a Linux machine for command-line entry

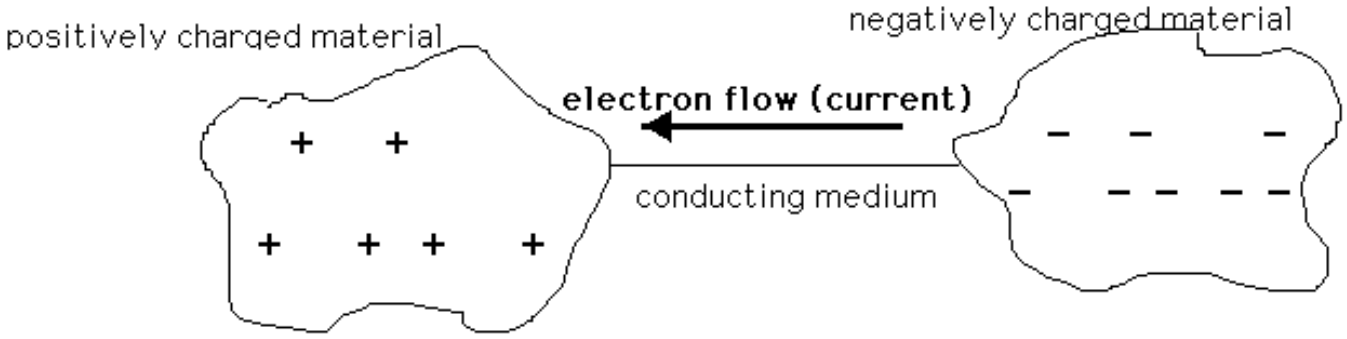
NOTE: for some exercises and assignments, you will be required to use the lab machines to compile and run your programs

Basic Concepts of Electricity

Electricity = **the movement of electrons** in a material

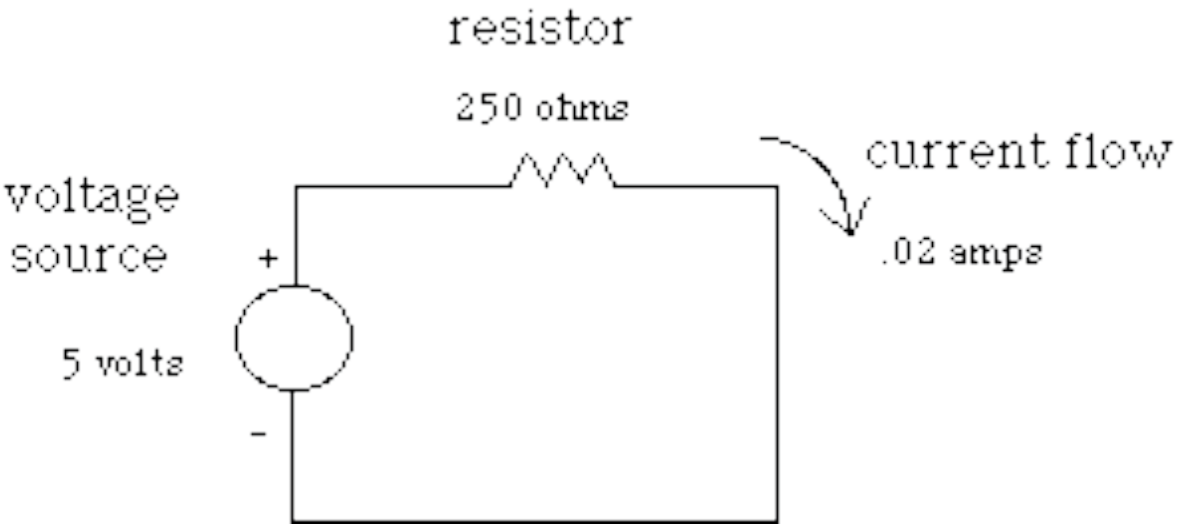
Materials tend to have a net negative or positive charge

Difference of charge between two points = **potential difference (V)**



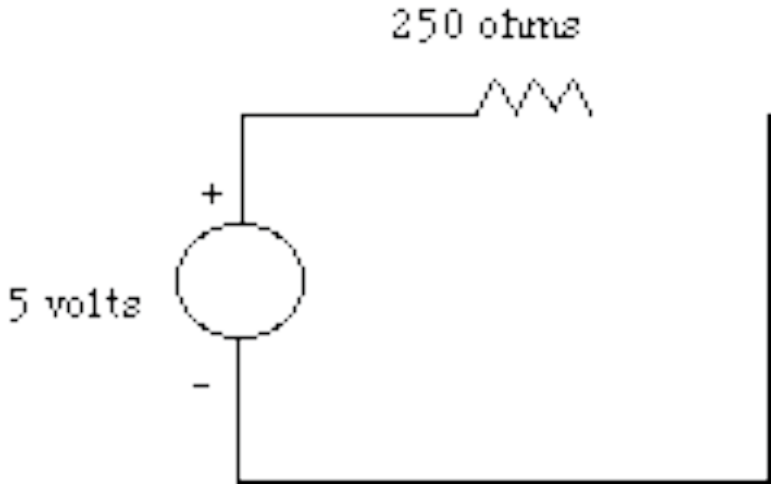
Rate at which electrons flow through = **current (A)**.

Ease of conduction, or current flow = **resistance (Ω)**

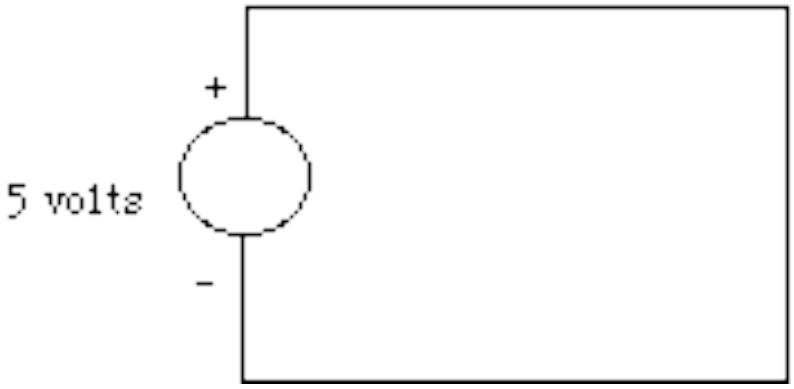


Ohm's Law, V = IR.

Open circuit = no current

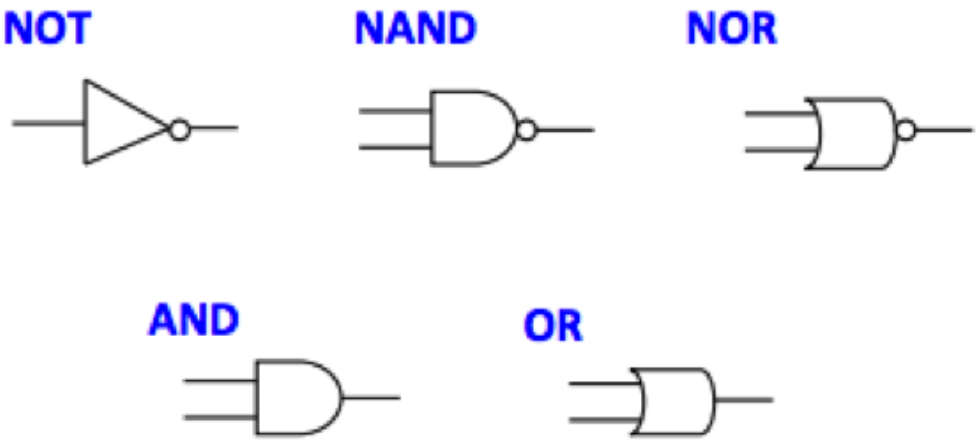


Short circuit = infinite current, since V/0 = infinite current:



Infinite current swiftly results in the destruction of the circuit!

Basic Gate Symbols



Notation and Truth Tables for Basic Logic Gates

NOT **F = A′**

A	F
0	1
1	0

NAND **F = (AB)′**

A	B	F
0	0	1
0	1	1
1	0	1
1	1	0

NOR **F = (A+B)′**

A	B	F
0	0	1
0	1	0
1	0	0
1	1	0

AND **F = AB**

A	B	F
0	0	0
0	1	0
1	0	0
1	1	1

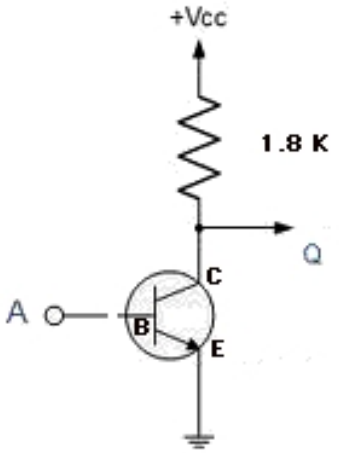
OR **F = A + B**

A	B	F
0	0	0
0	1	1
1	0	1
1	1	1

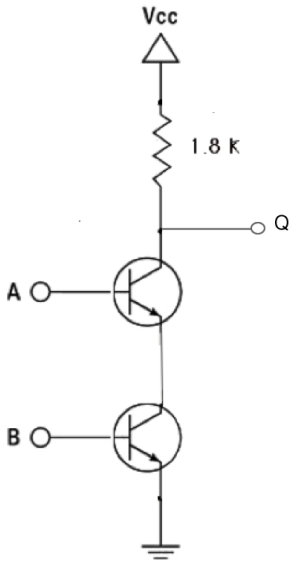
Basic Gates are built using Transistors

You have seen the circuits for NOT and NAND in lecture:

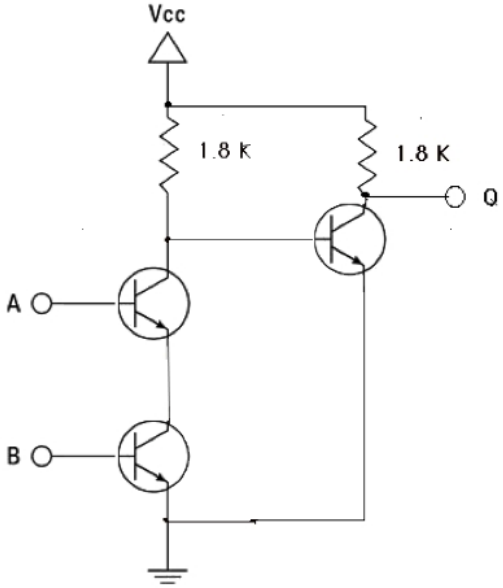
NOT – 1 transistor



NAND - 2 transistors

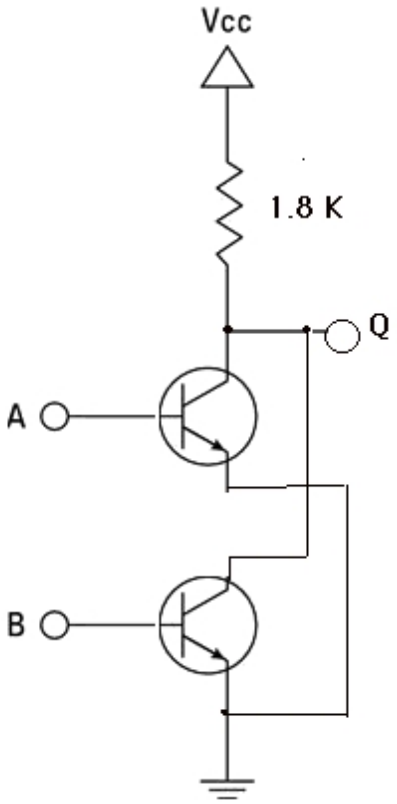


AND – uses 3 transistors (send the output of a NAND through another transistor acting as a NOT gate to complement the result):



Similarly, these are the transistor circuits for a NOR and OR gate:

NOR – 2 transistors



OR – 3 transistors