

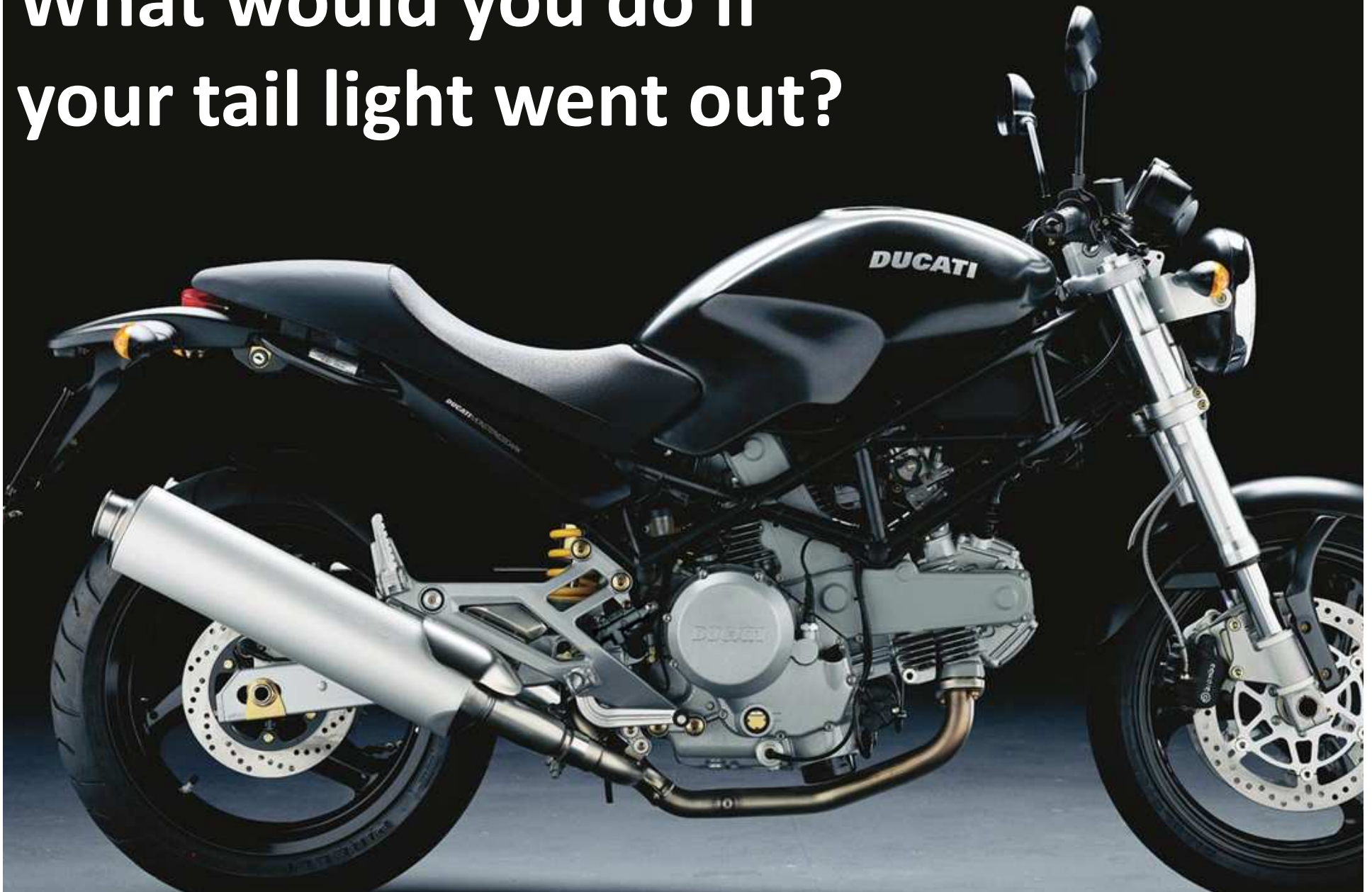
# Exploring Computer Science

Electronics

# Warm up

- On a piece of scratch paper, answer the following:
  - List the electric or electronic devices you use in a day
  - How different would your life be without them?
  - How well do you understand them?

**What would you do if  
your tail light went out?**



# Why electronics?

- They're in practically everything we use
- Basic skills can save us lots of money
- Understanding electricity can save time and lives
- It's fun!

# Safety

1. Avoid damp and wet areas when working with electricity.
2. Only wire components when the power is off
3. Show your circuits to me before turning on
4. Assume circuits are on and check with voltmeter before handling wires.
5. Take your time

# What is electricity?

- Flow of charged particles from one point to another
- Batteries, generators produce electrical energy
- Conductors carry electric charge

# Current and voltage

- Current is flow of charges and measured in amperes or amps
- Voltage is difference in electrical charge between two points and measured in volts
- There needs to be a voltage across a wire for current to flow
- Current kills!!

# Resistance

- Resisting the flow of electric current
- Measured in Ohms
- Causes “friction” so heat is released
- Lightbulbs, toasters, etc, are big resistors!



# Electricity can be dangerous

- Dry human skin has resistance of 1,000 – 100,000 Ohms

Current	Required Voltage		Comments
	1,000 $\Omega$	100,000 $\Omega$	
1 mA	1 volt	100 volts	Threshold of feeling, tingling sensation.
15 mA	5 volts	500 volts	Maximum current level a human can withstand before sustaining injury.
15-20 mA	10 volts	1000 volts	Beginning of sustained muscular contraction ("Can't let go" current.)
100-300 mA	100 volts	10,000 volts	Ventricular fibrillation, fatal if continued. Respiratory function continues.
6 A	6000 volts	600,000 volts	Sustained ventricular contraction followed by normal heart rhythm. (defibrillation). Temporary respiratory paralysis and burns.

# Ohm's Law

- Current, voltage and resistance are related

$$V = IR$$

# Multimeter

- Give us info on our circuits
- Careful, ours are a little flaky!



# Continuity test

- In my house, is a fuse blown?
- On my motorcycle, why isn't my break light lighting?

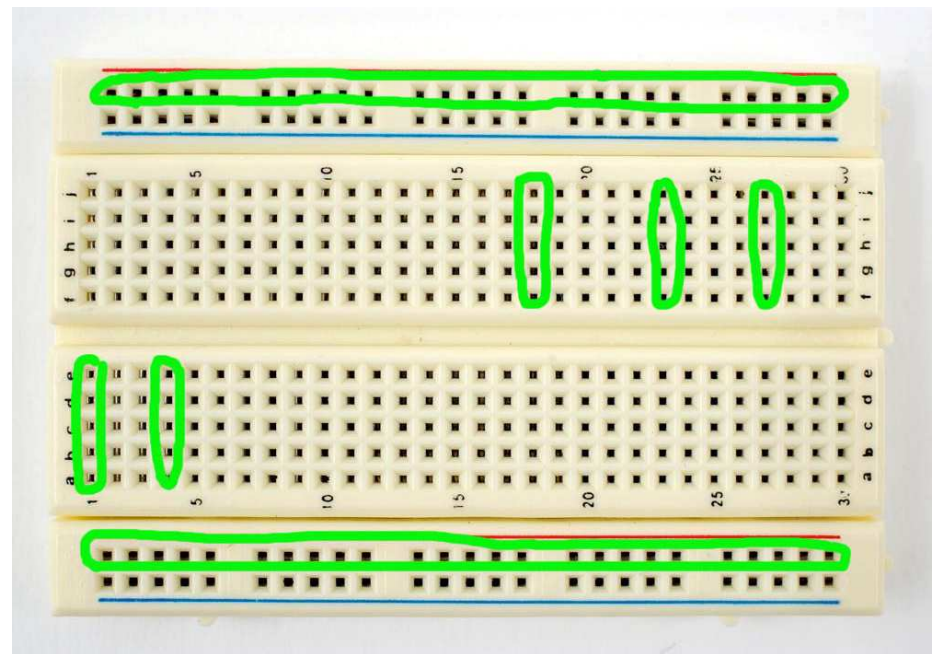
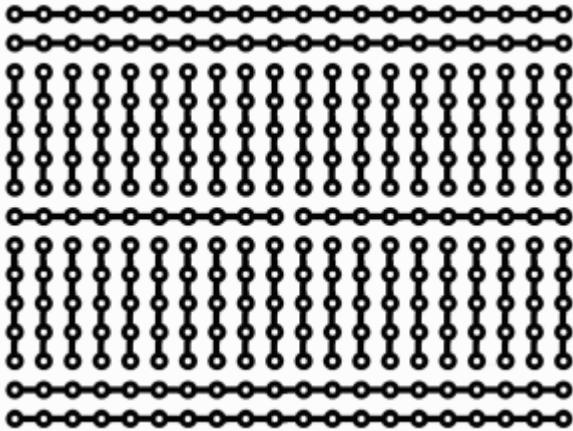


# Breadboard

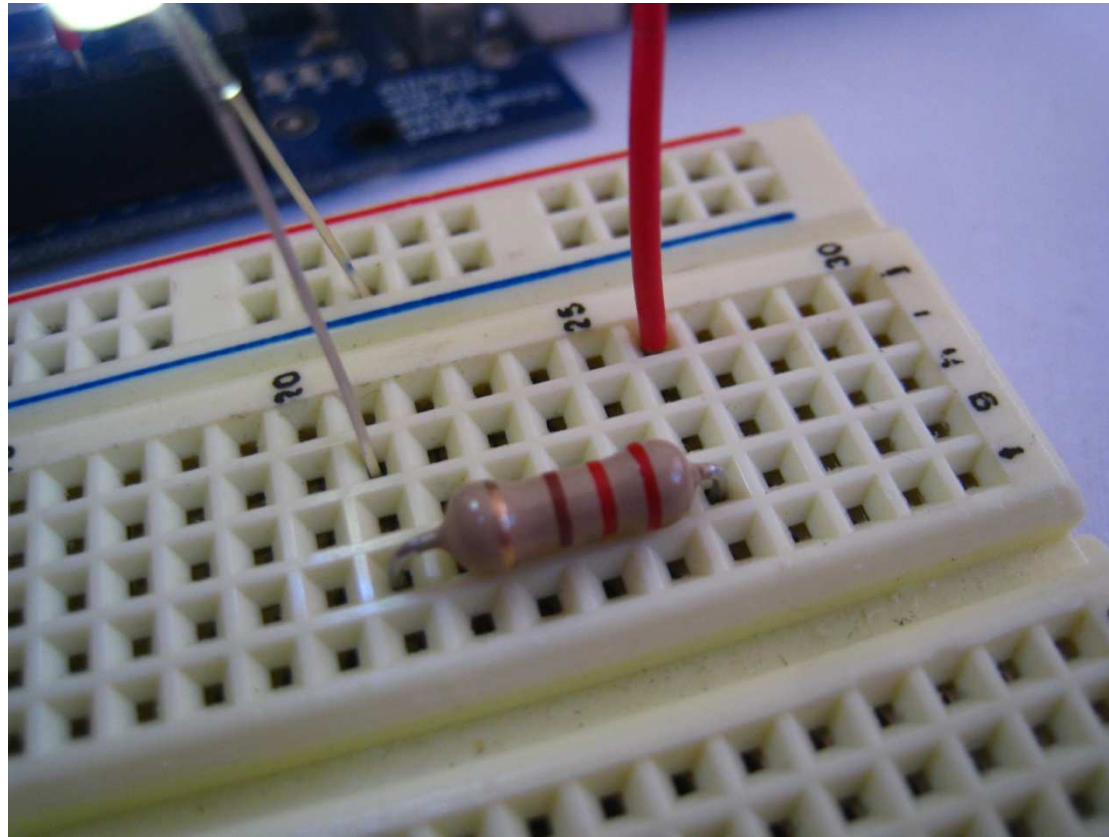
- Originally people used cutting boards to connect electronics!
- Now it's a piece of plastic with metal conductors inside
- How is it wired? Find out using the continuity test.

# Breadboard

- Power lines are connected all the way across
- Connected groups of 5



# Connecting to breadboard



# Our power supply

- Converts alternating current into direct current
- We'll use +5
- Connect the breadboard using stripped wires
- Measure voltage using multimeter

