Basic Electronics - 2
Hamtronics

Voltage and Resistance

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@Sunlife ARC

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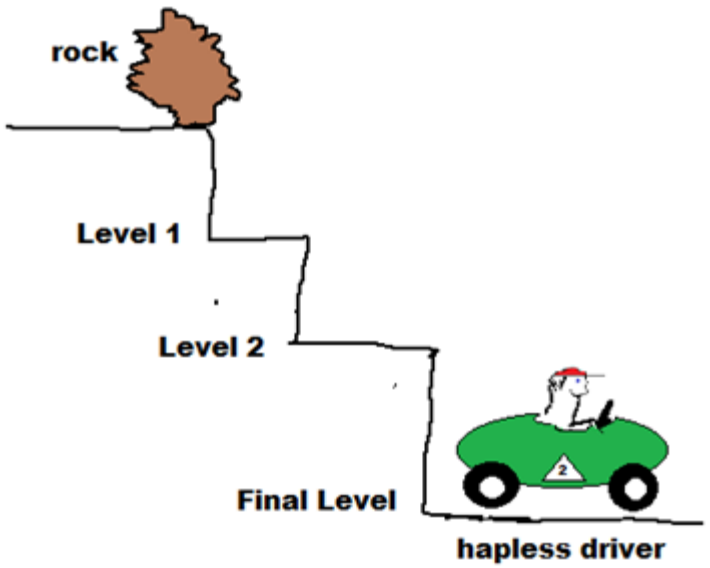
- We will continue looking at voltage and resistance.
- First voltage …



Remember voltage is energy/charge or Joule/ Coulomb
So it is similar to a potential energy. With out a current the voltage is there to work but needs something to call it into use. Like a rock on cliff above a car

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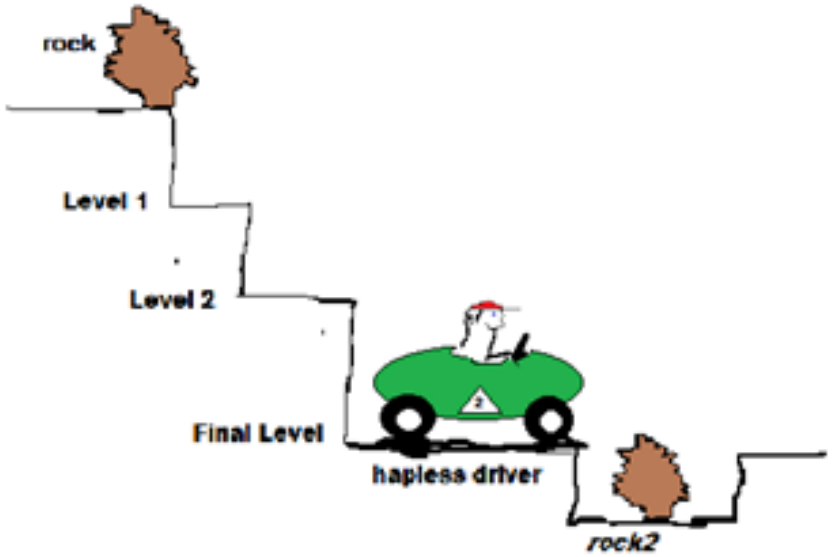
- So the potential energy is positive. The energy can be viewed in 3 stages.



Here the rock 2 has negative energy. We must do work to move it up to the car. Slim chance the rock2 will spontaneously jump up to and hit the car.

Rock1 has positive energy with respect to ground and rock2 has negative energy with respect to ground!

So what, this is electronics!

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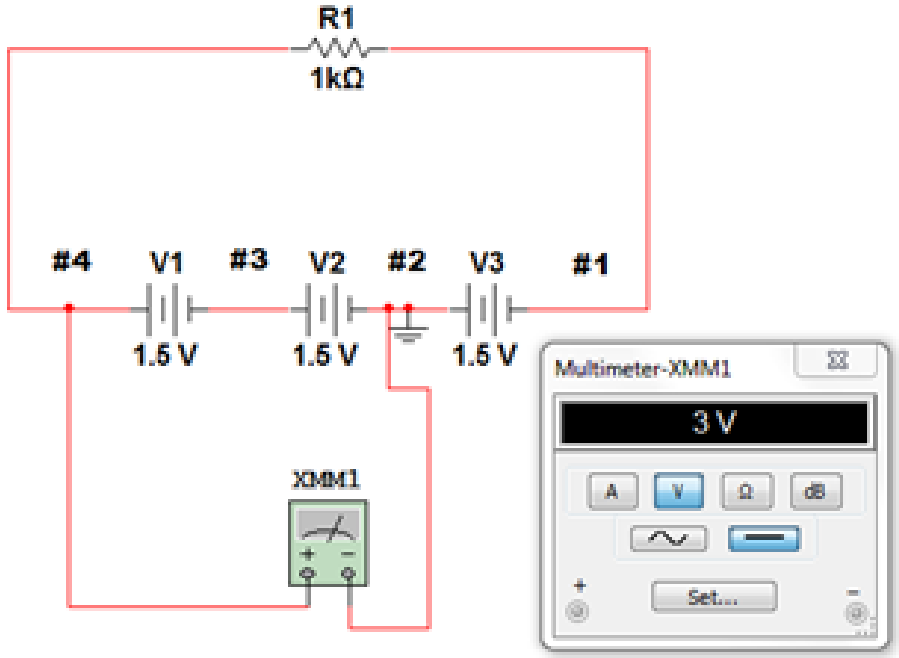
- Kirchoff's Law is **Almost** as famous as Ohm's Law.
- Kirchoff states that voltages in series add.



Here the reading over two batteries is 3V.

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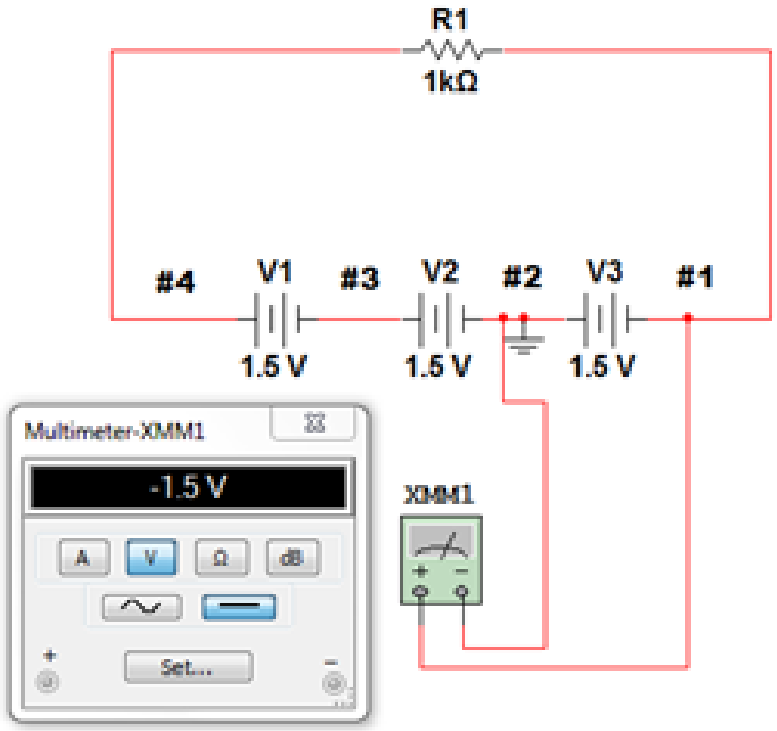

Note that the reading across the right hand battery is -1.5V

The negative value shows it is below ground. See the ground symbol between V2 and V3!

We usually measure volage with respect to where the neg (or black) lead of the meter to the ground of the circuit.

Analogous to the car sitting at ground.

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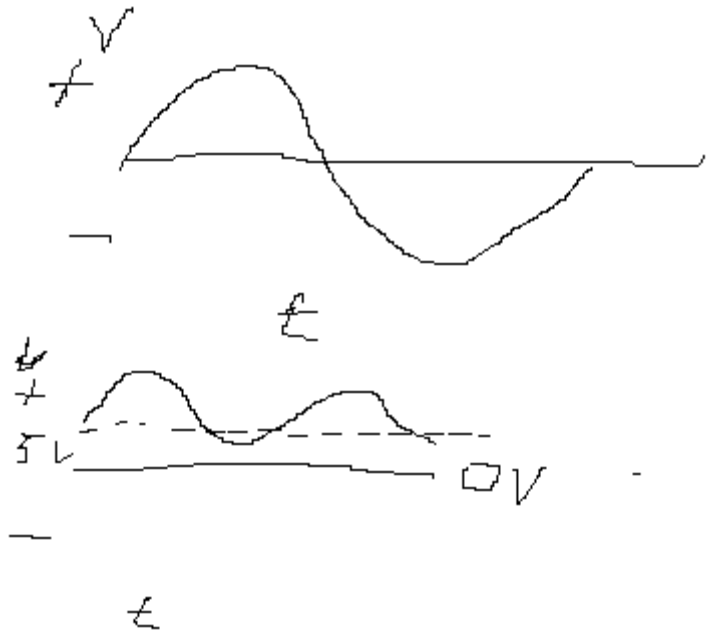
- So why do we want "dual polarity" power supplies?



With dual polarity we can have + and – values.

With single polarity our signal must ride on a DC level to avoid any – polarity.

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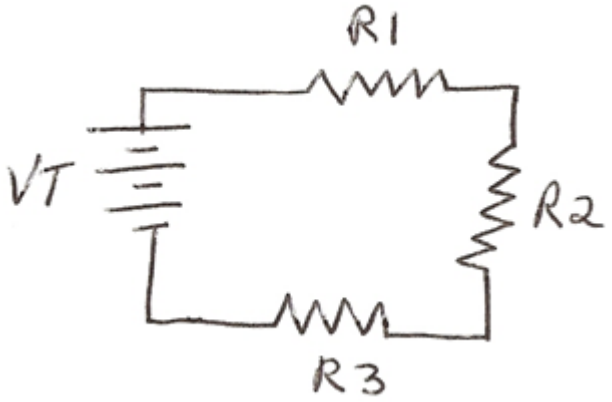
- Now, lets look at resistors. Two possible wiring arrangements Series and Parallel.
- In series all the current goes through each resistor.



VT = V1 + V2 + V3

But I1=I2=I3=IT
This is Kirchoff's Current Law

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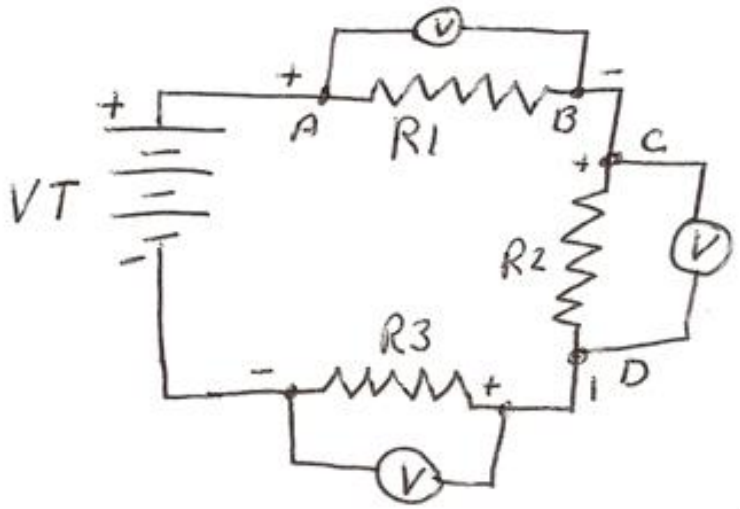
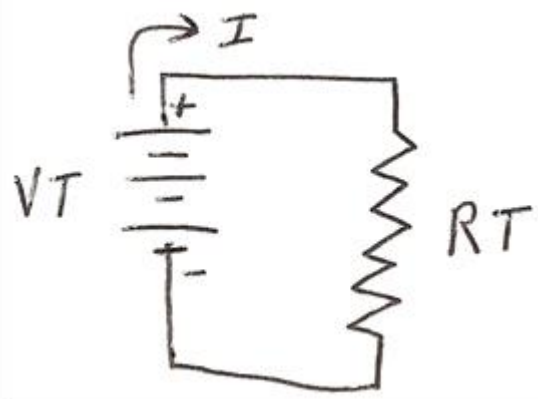


$$VT = I * R1 + I * R2 + I * R3$$

$$I * RT = I * R1 + I * R2 + I * R3$$

$$RT = R1 + R2 + R3$$



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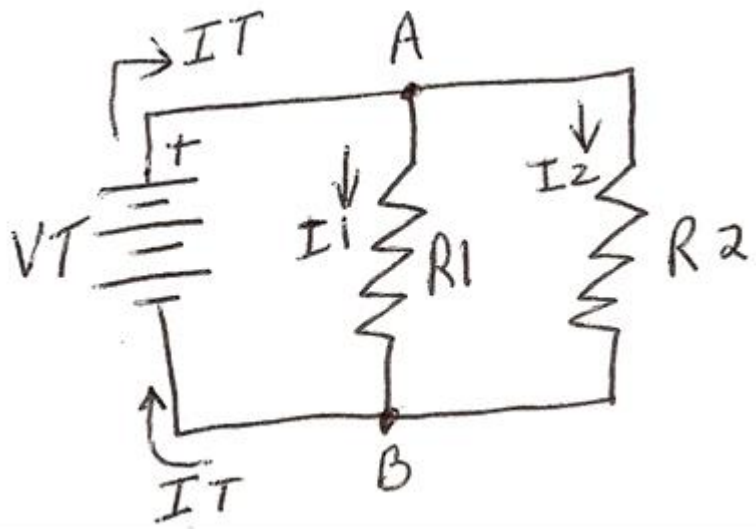
- Now parallel circuits provide multiple paths for the current.



$IT = I1 + I2$

Now it gets a bit complicated

Here $IT = VT/RT$ and
$IT = I1 + I2$ so $\frac{VT}{RT} = \frac{VT}{R1} + \frac{VT}{R2}$

$$\frac{1}{RT} = \frac{1}{R1} + \frac{1}{R2}$$

$$RT = \frac{R1*R2}{R1 + R2}$$ (or product /sum)

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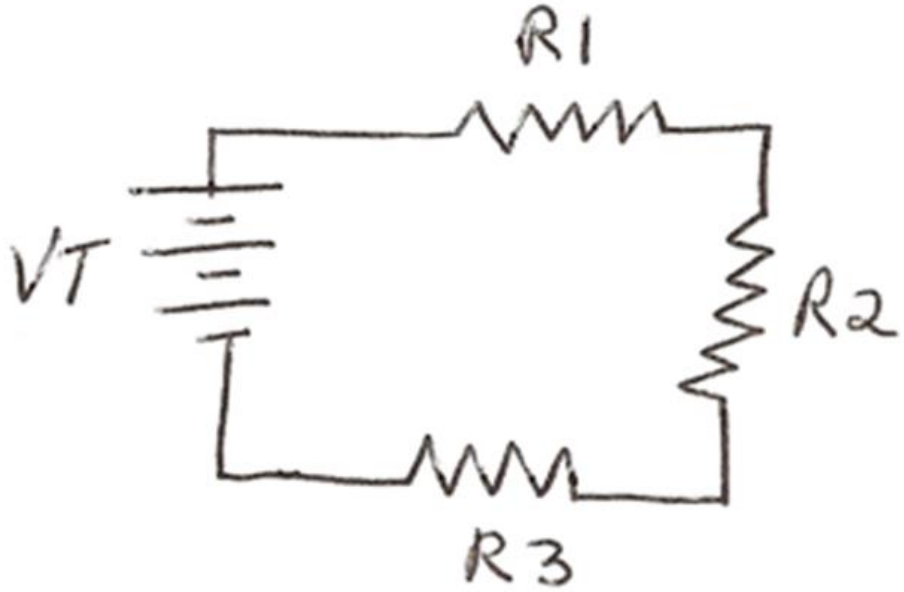
- Let's look at an example … (with Smath)

Series

$R1 := 1500 \qquad R2 := 870 \qquad R3 := 2500$

$RTs := R1 + R2 + R3$

$RTs = 4870$



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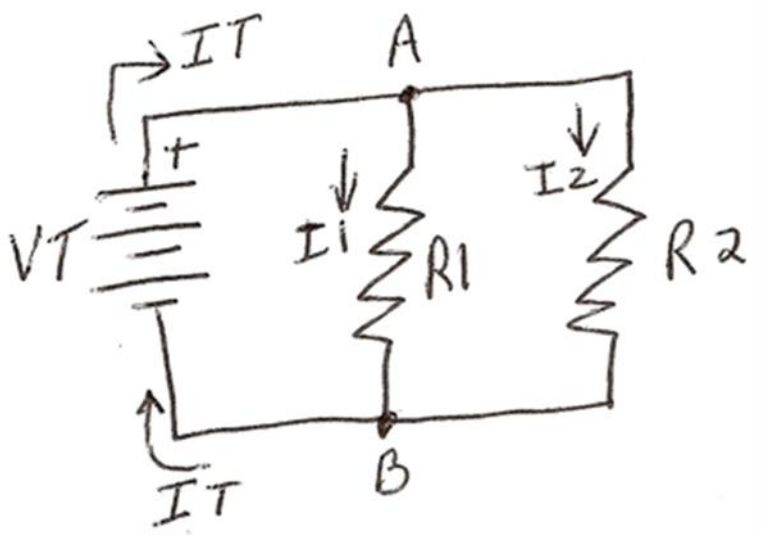
- Let's look at an example … (with Smath)

Parallel

$R1 := 1500 \qquad R2 := 870$

$$RTp := \frac{(R1 \cdot R2)}{R1 + R2}$$

$RTp = 550.6329$



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Questions? Comments?

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