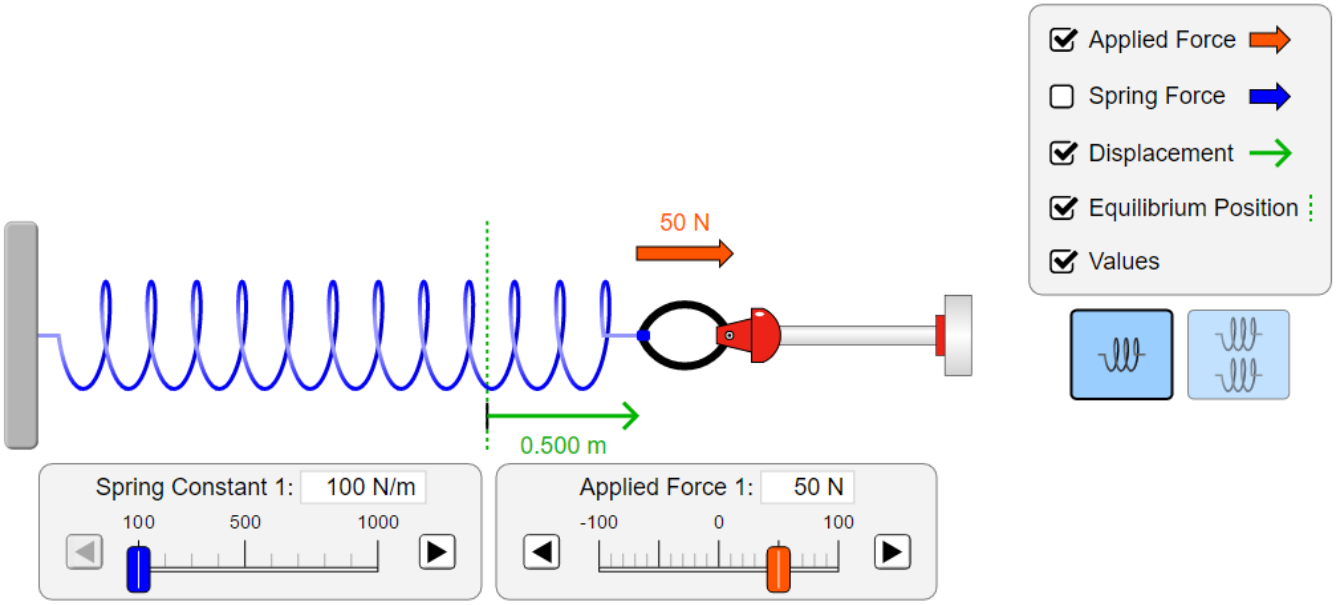
Worksheet Science can be simple

Hooke's Law Activity

Go to PhET activity website (Google: PhET Simulations → Hooke Law ; or: https://phet.colorado.edu/en/simulation/hookes-law)

Goal: Find out how forces change the length of a spring.

Directions:
Click on the "play" button triangle and start the sim. Then choose "intro". The screen shown in Figure should appear.



Check all five boxes on the right hand side (applied force (F), spring force, displacement ($\Delta\ell$), equilibrium, values). Leave the blue slider control, which affects the spring constant, also sometimes called the constant of elasticity, but always abbreviated with k, always in the same value, for exemple 100 N/m.
Play around with the red slider control for the applied force. Use only positive values.

- VARIABLES: List your independent and dependent variables on the top of the table. In this case the control variable is the spring constant, k
- RESULTS: Recorded your results on the table. From your results plot a graph of the extension (displacement), $\Delta\ell$ against stretching force.

Table

- DRAWING A CONCLUSION: Look at the table. Do you see how force and extension are connected? If force doubles, extension so does, etc
  In mathematical languages we say that the force is directly proportional to extension (observe the Maths Box)

- CONCLUSION: The extension is _____ to the stretching force (Hooke's Law).

Maths Box

Directly proportional

Look at the table. Do you see how ***Y*** and ***X*** are connected?
If ***X*** doubles, so does ***Y***. If ***X*** halves, so does ***Y***, etc.

Y	***X***
3	1
6	2
9	3
12	4

We say: ***Y*** is directly proportional to ***X***

In symbols: $Y \propto X$

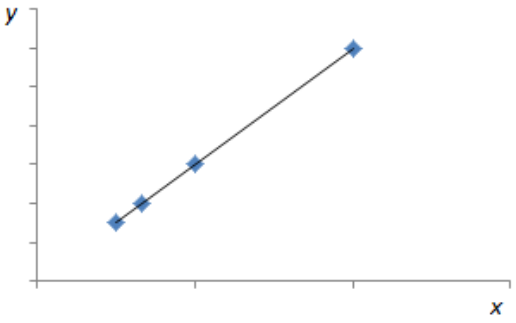
Making an equation

We can always change a proportion into an equation by putting in a constant k: $Y = k X$

In the example table k = 3

Graphs

For an equation $Y = k X$ the graph is a straight line, through the origin
The slope = k



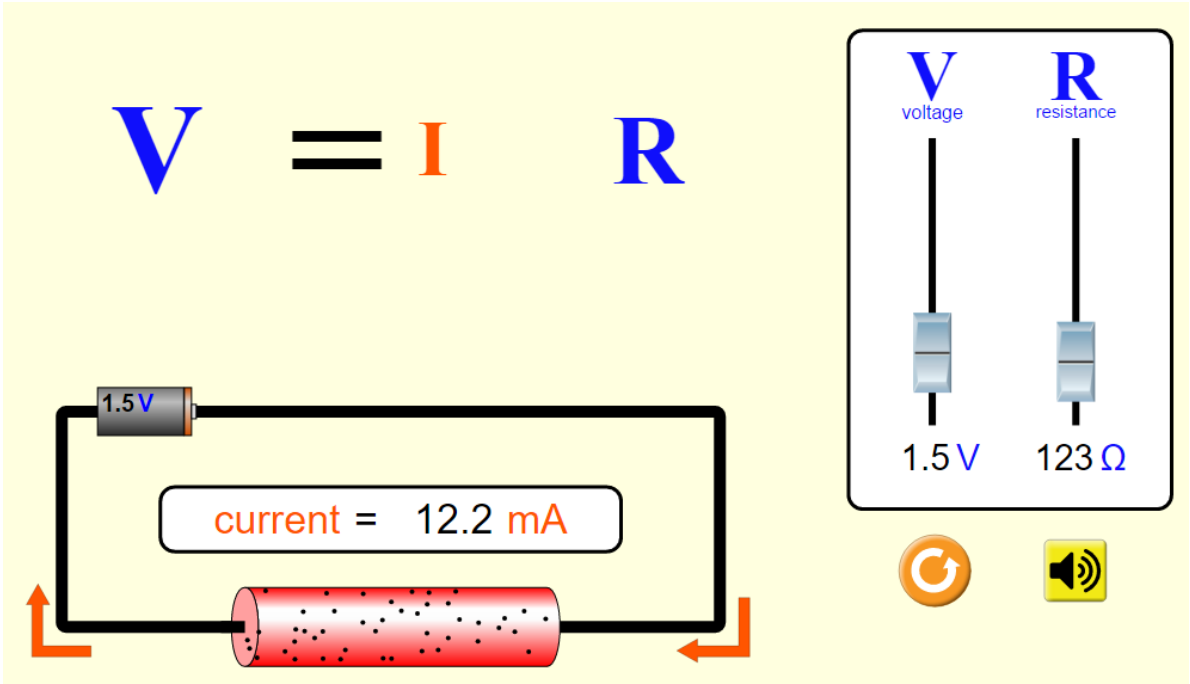
Ohm's Law Activity

Go to PhET activity website (Google: PhET Simulations → Ohm Law; or: https://phet.colorado.edu/ohms-law/latest/ohms-law)

Goal: Determine the relationship between current and resistance in a simple circuit

Directions:

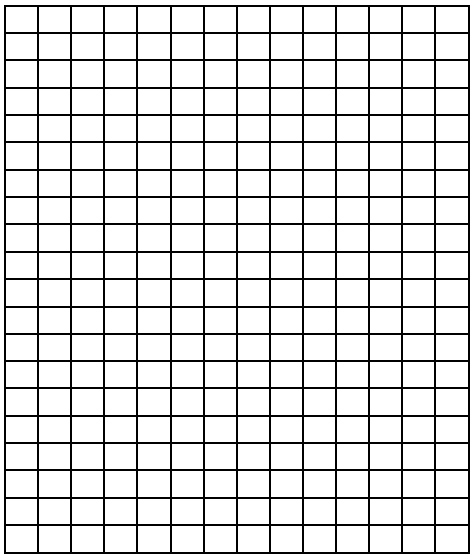
Click on the "Run Now" button. The screen shown in Figure should appear.

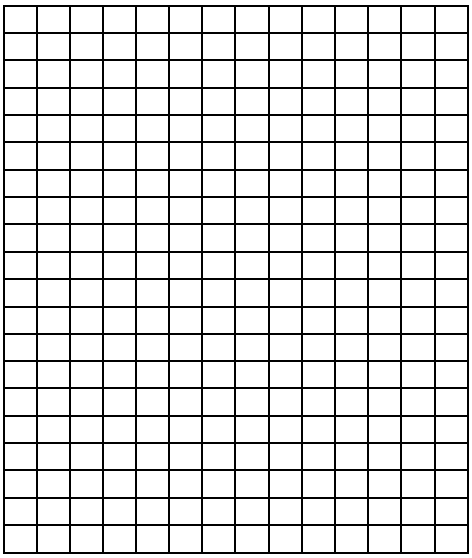


Leave Voltage Slider always in the same value, for exemple to 4.5 V and use the Resistance slider to set the Resistor to the values in the table.

- VARIABLES: Now the independent variable is the resistance (*R*) , the dependent variable is current (*I*) and the control variable is the voltage (*U*).
- RESULTS: Fill table with your data. Plot a graph of the current *I* as the ordinate (y-axis) and the resistance R as the abscissa (x-axis) and another graph *I* vs $\frac{1}{R}$.

Resistence *R* (ohms)	Current *I* (mA)	$\frac{1}{R}$





- DRAWING A CONCLUSION: Look at the table. Do you see how resistance and current are connected? If resistance doubles, current halves, etc
  In mathematical languages we say that the current is inversely proportional to resistance (observe the Maths Box)
- CONCLUSION: The current is _____ to the resistance of the conductor.

Maths Box

Inversely proportional

Look at the table. Do you see how ***Y*** and ***X*** are connected?

If ***X*** doubles, ***Y*** halves.

We say: ***Y*** is inversely proportional to ***X***

In symbols: $Y \propto \frac{1}{X}$

Y	***X***
12	1
6	2
4	3
3	4

Making an equation

We make an equation in the same way as before: $Y = k \times \frac{1}{X}$

In the example table k = 12

Graphs