Variables

New Physics for You
Nelson Thornes

Variables

Variables are things that vary and change

New Physics for You
Nelson Thornes

Variables

In any experiment there are 3 variables:

- an independent (or input) variable
- a dependent (or outcome) variable
- some control variables

Let's look at each type….

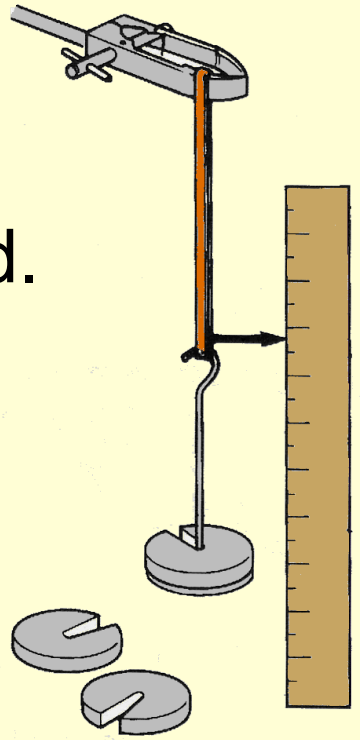
New Physics for You
Nelson Thornes

Independent (input) variable

This is the thing that you decide to change.

Example 1

Investigating how a weight affects the length of an elastic band.



You decide the weight to apply, so:

Weight is the independent variable.

New Physics for You
Nelson Thornes

Independent (input) variable

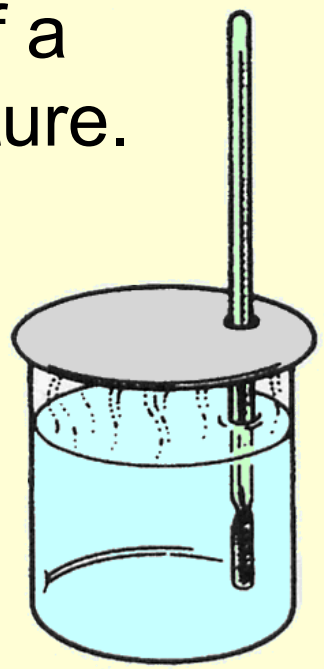
This is the thing that you decide to change.

Example 2

Investigating how the rate of cooling of a beaker depends on the initial temperature.

You decide the initial temperature, so:

initial temperature is the independent variable.



New Physics for You
Nelson Thornes

Independent (input) variable

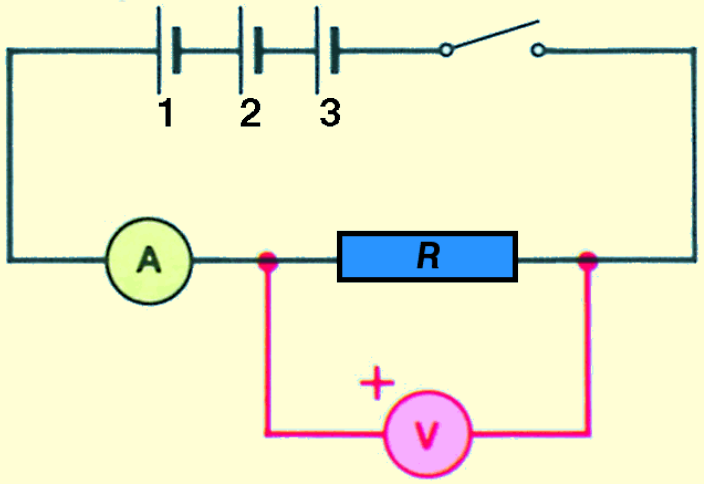
This is the thing that you decide to change.

Example 3

Investigating how the current through a resistor depends on the voltage across it.

Which is the independent variable as you add cells?

The voltage is the independent variable.



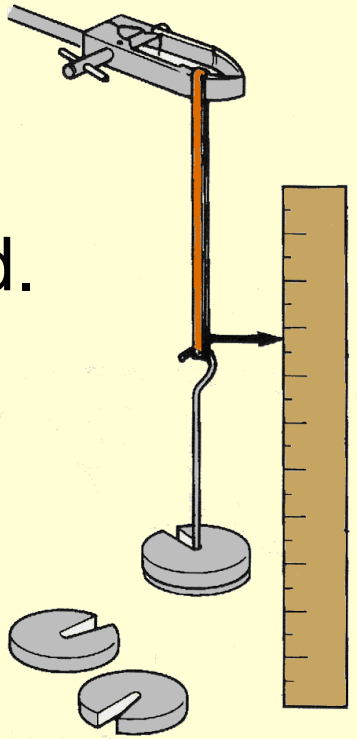
New Physics for You
Nelson Thornes

Dependent (outcome) variable

This is the variable that changes as a result.
It is the variable that you measure.

Example 1

Investigating how a weight
affects the length of an elastic band.



You measure the resulting length
of the elastic band, so:

Length is the dependent
variable.

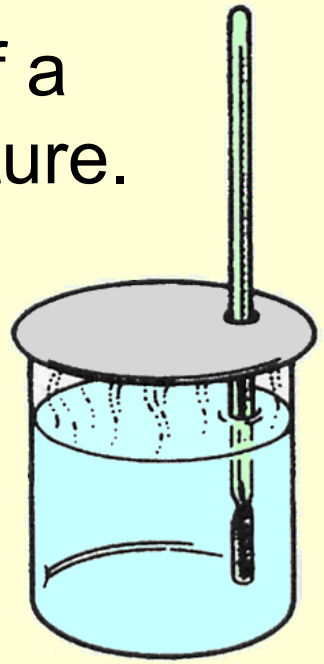
New Physics for You
Nelson Thornes

Dependent (outcome) variable

This is the variable that changes as a result.
It is the variable that you measure.

Example 2

Investigating how the rate of cooling of a beaker depends on the initial temperature.



You measure the temperature every minute as it cools, so:

temperature is the dependent variable.

New Physics for You
Nelson Thornes

Dependent (outcome) variable

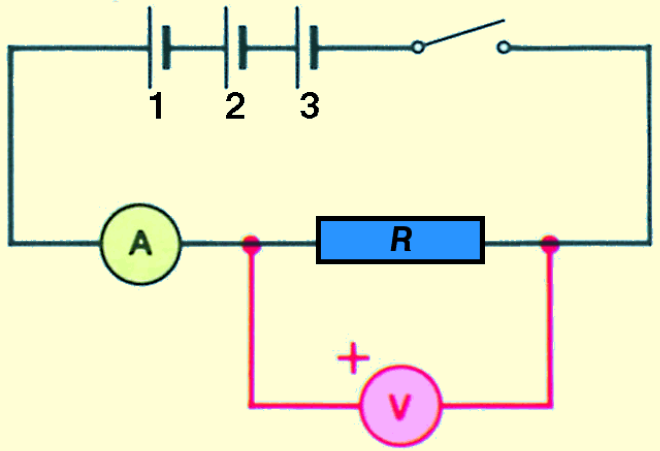
This is the variable that changes as a result.
It is the variable that you measure.

Example 3

Investigating how the current through a resistor depends on the voltage across it.

Which is the dependent variable here?

The current is the dependent variable.



New Physics for You
Nelson Thornes

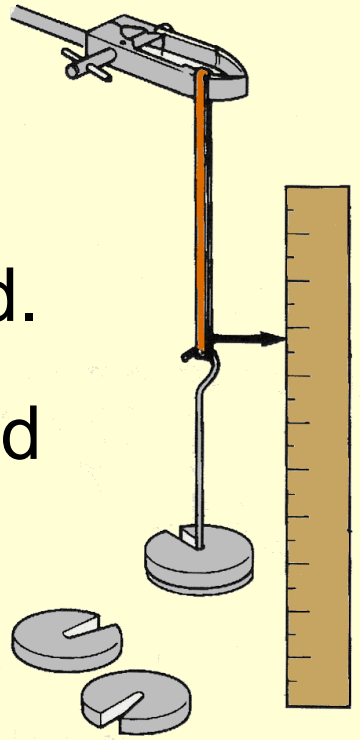
Control variables

These are all the variables that must not change, to make sure it is a fair test.

Example 1

Investigating how a weight affects the length of an elastic band.

You must use the same elastic band all the time,
and the same scale etc,
so it is a fair test.



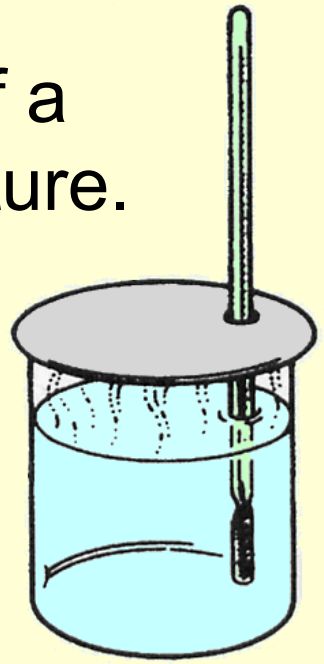
New Physics for You
Nelson Thornes

Control variables

These are all the variables that must not change, to make sure it is a fair test.

Example 2

Investigating how the rate of cooling of a beaker depends on the initial temperature.



You must use the same beaker,
with the same amount of water,
in the same position in the room,
at the same room temperature,
so it is a fair test.

New Physics for You
Nelson Thornes

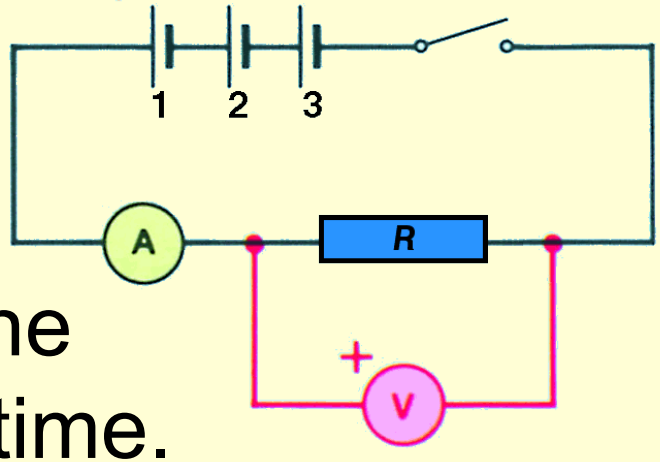
Control variables

These are all the variables that must <u>not</u> change, to make sure it is a fair test.

Example 3

Investigating how the current through a resistor depends on the voltage across it.

Which are the control variables here?



Use the <u>same</u> circuit at the <u>same</u> temperature each time.

New Physics for You
Nelson Thornes

Tables

When you draw up a table of your results,

the independent variable goes in the first column, like this:

independent variable	dependent variable			
	1st reading	2nd reading	3rd reading	Mean (average)

If you take several readings of the dependent variable, then you can calculate the mean (average)

Then your results will be more reliable.

New Physics for You
Nelson Thornes

In Summary

Example 1

The independent variable is

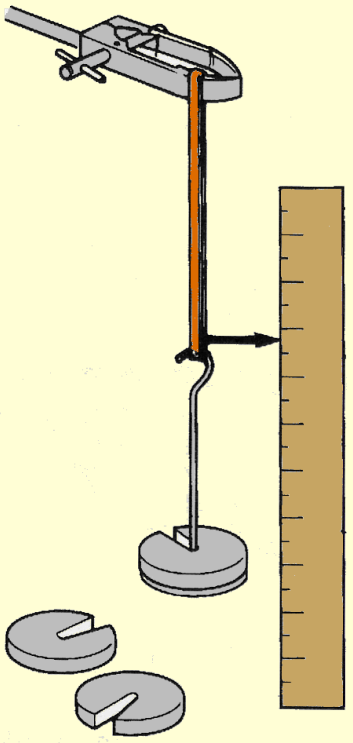
- weight

The dependent variable is

- length of the elastic

The control variables are

same elastic band,
same scale, etc,
so it is a fair test.



New Physics for You
Nelson Thornes

In Summary

Example 2

The independent variable is

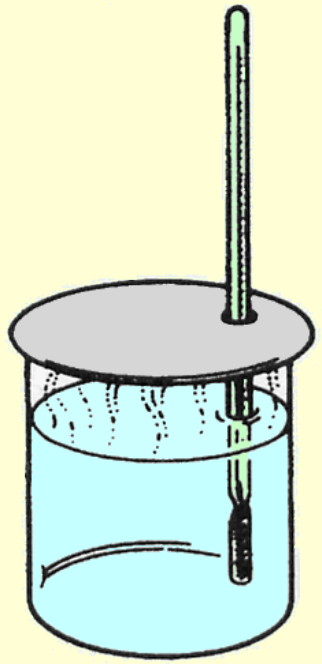
- initial temperature

The dependent variable is

- temperature as it cools

The control variables are

the same beaker,
with the same amount of water,
in the same position in the room,
at the same room temperature,
so it is a fair test.



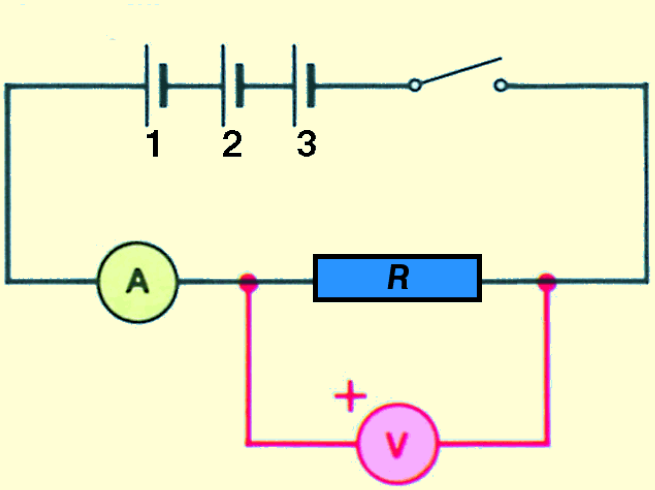
New Physics for You
Nelson Thornes

In Summary

Example 3

The independent variable is

- voltage (p.d.)



The dependent variable is

- current

The control variables are

the same circuit,
at the same temperature each time,
so it is a fair test.

New Physics for You
Nelson Thornes

Learning Outcomes

You should now:

- Understand the difference between
  - independent,
  - dependent, and
  - control variables
- Be able to identify these variables when doing your practical work.

New Physics for You
Nelson Thornes

For more details, see:

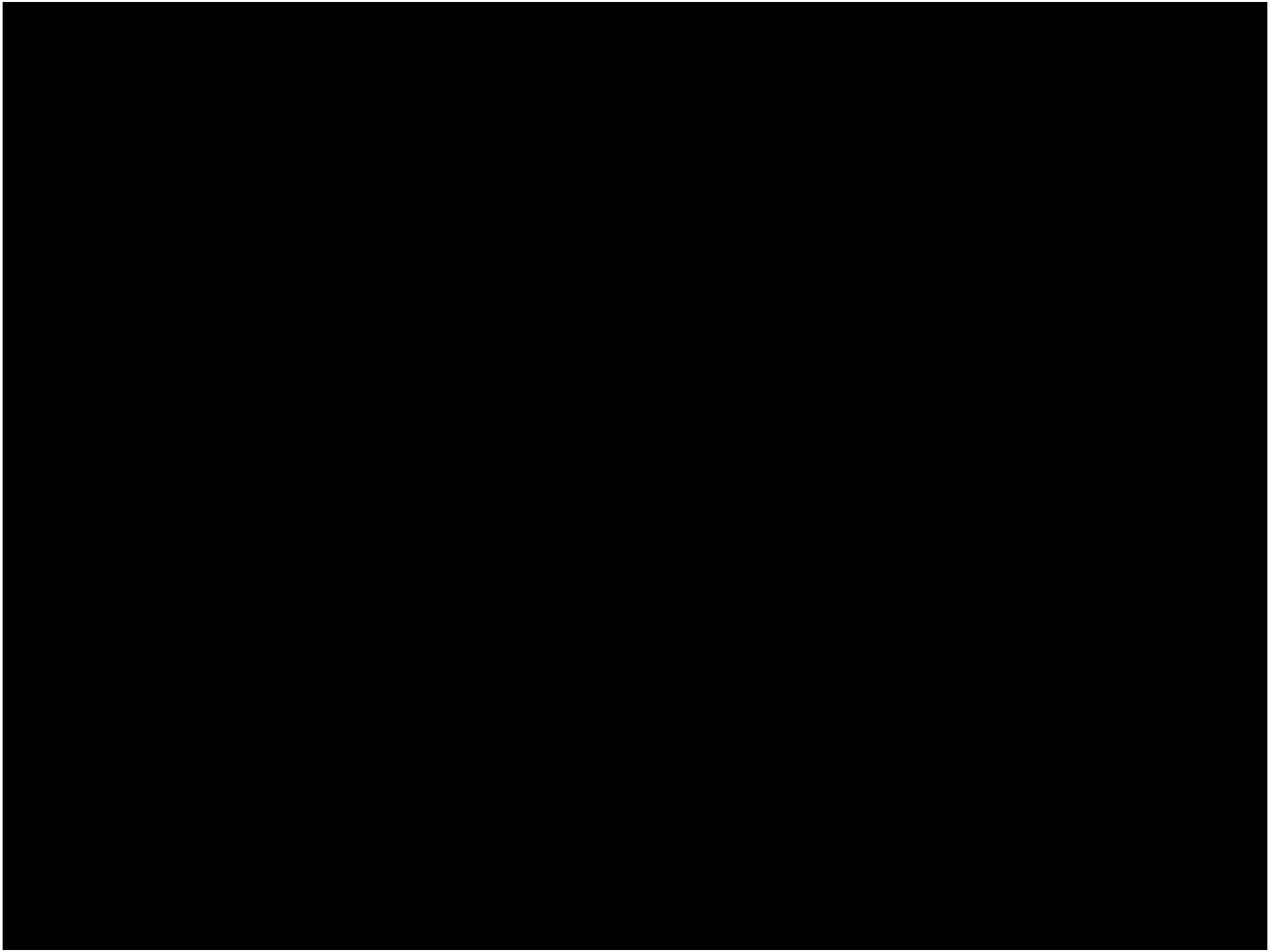
- ***New Physics for You***, pages 7, 360

For more free PowerPoints, visit

- the web-site at **www.physics4u.co.uk**

New Physics for You
Nelson Thornes

If you are connected to the web at the moment, click below to see what's available:

http://www.physics4u.co.uk/

New Physics for You
Nelson Thornes