Teacher's Notes

This sequence of slides is designed to introduce, and explain,
the idea of **Graphs** in practical work, as explained on
pages **363-364** in ***New Physics for You***, 2006 edition or later.

On each slide the key points are revealed step by step,
at the click of your mouse (or the press of a key such as the space-bar).

Before making the next mouse-click you can ask questions of the class
or make statements about what is about to be revealed.

This should help students to become clearer about the ideas involved.

Naturally it pays to have quick practice-run first.

To start the slide-show, press function-key **F5**
(or right-click->Full Screen)
(to return to 'normal view' press the <Esc> key).

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How Science works:

Graphs

New Physics for You, pages 363-4

Learning Objectives

You should learn :

- About different types of graphs,
- How to draw them when you are doing your practical work,
- How to interpret the different shapes.

Drawing a graph

…and when should I draw a line-graph?

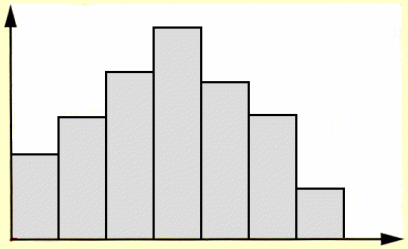
Drawing a graph

Look at the table of your results:

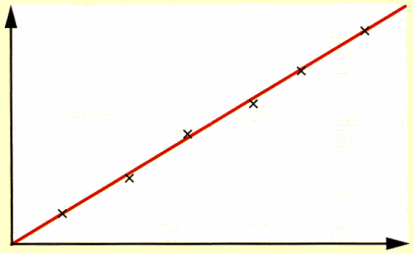
independent variable	dependent variable			
	1st reading	2nd reading	3rd reading	Mean (average)

If this column has

- only certain fixed values, use a bar-chart:



- a continuous range of values, use a line-graph:



Drawing a graph

What is the best way to draw a line-graph?

5 steps in drawing a graph

1. Choose simple scales.

For example:
1 large square = 1 newton (1 N)
or
1 large square = 2 N, or 5 N, or 10 N

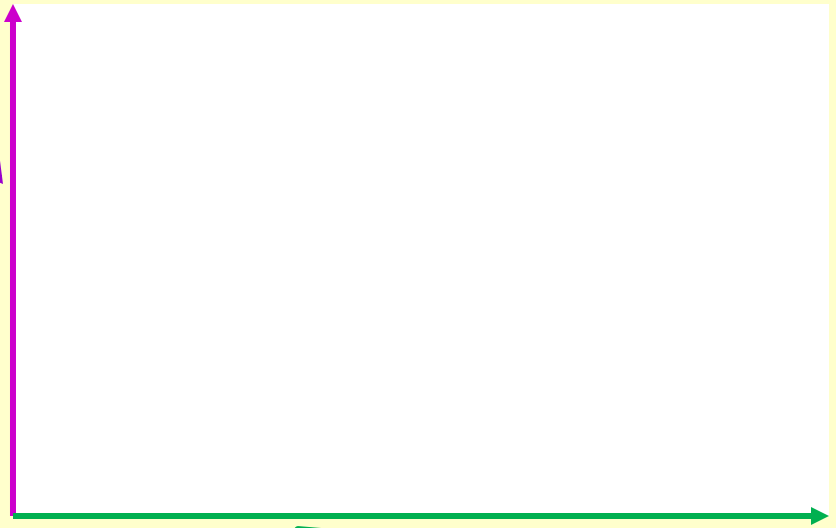
But never choose an awkward scale,
like 1 square = 3 N or 7 N

Choose a scale that will make your graph use most of the sheet of paper.

5 steps in drawing a graph

1. Choose simple scales.

Put the dependent variable
on the ‘y-axis’



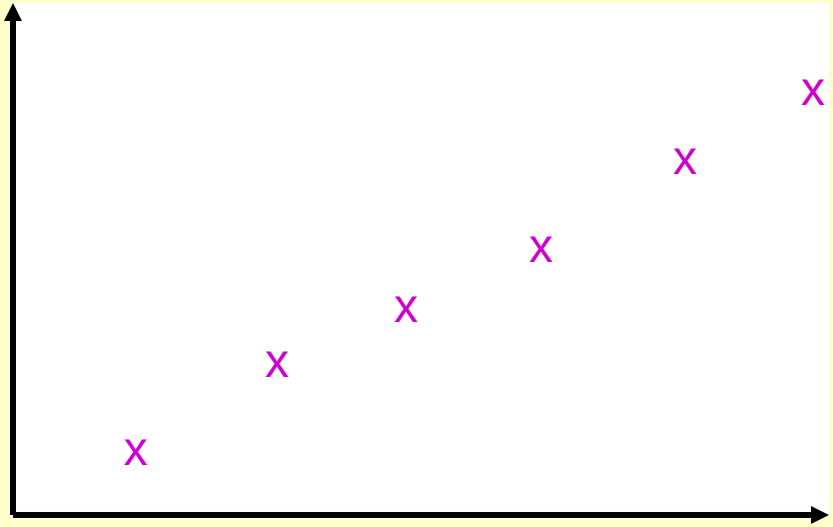
and
the independent variable on the ‘x-axis’

5 steps in drawing a graph

2. Plot the points neatly.

To mark the points we usually use an X

Usually you need
5 or more points
for the graph.

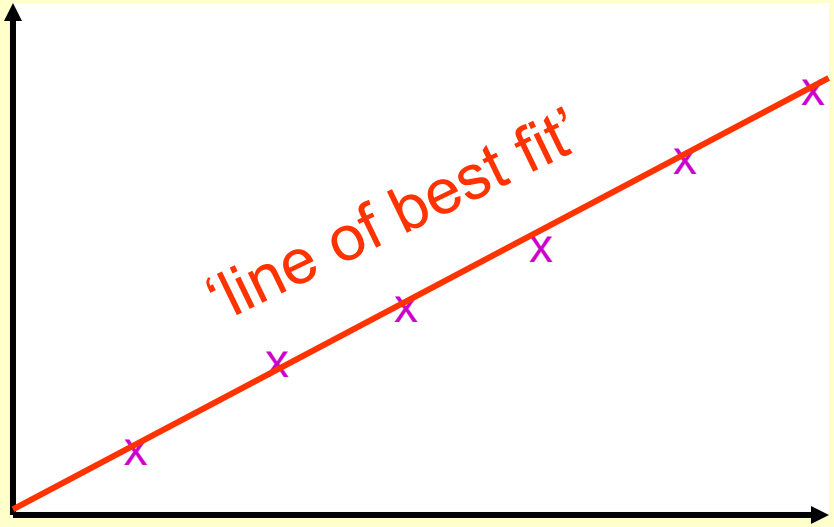


Re-check each one before your next step.

5 steps in drawing a graph

3. If the points form a straight line…

…draw the best straight line through them

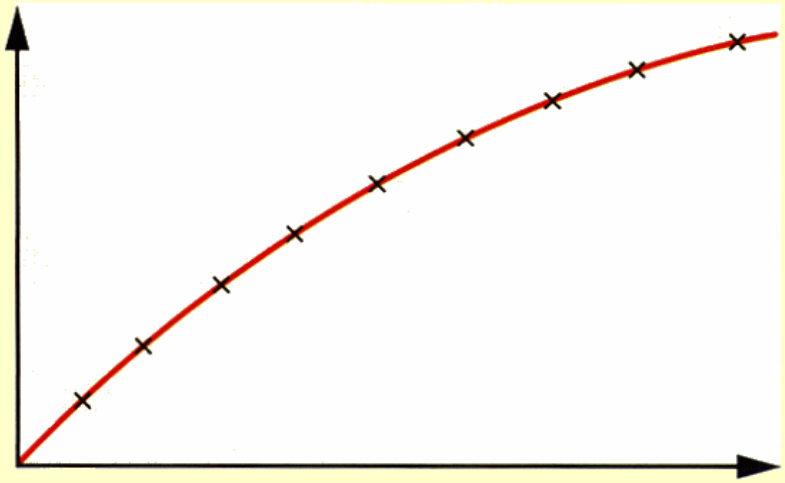


Check that it looks the **best** straight line.

5 steps in drawing a graph

4. If the points form a curve…

…draw a free-hand curve of best fit



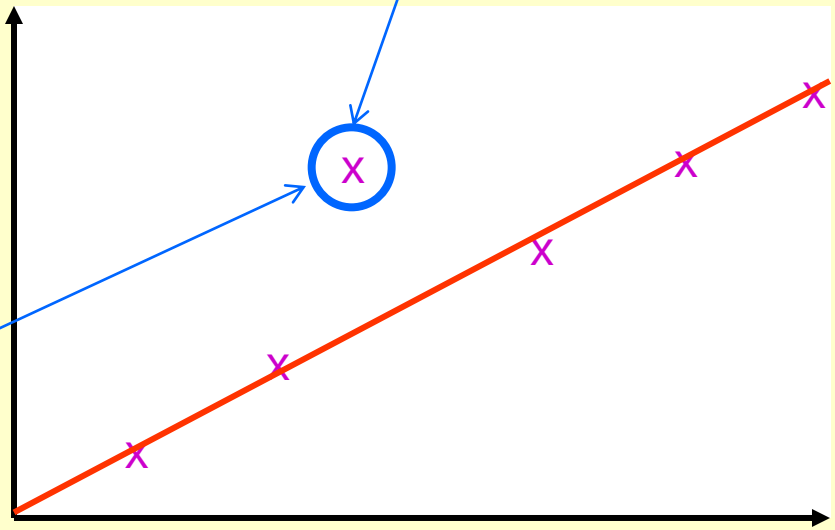
Do **not** join the points like a ‘dot-to-dot’.

5 steps in drawing a graph

5. If a point is not on the line…

…use your apparatus to check this measurement again

This is called an anomalous point.



You can decide to ignore anomalous points.

5 steps in drawing a graph

In summary:

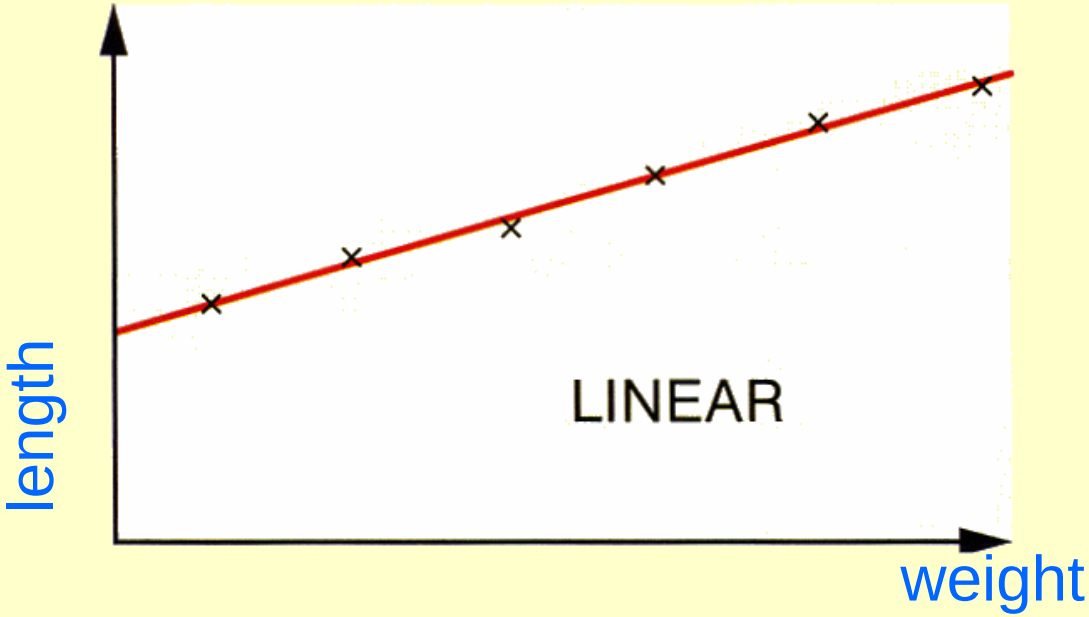
1. Choose good scales,
   with the dependent variable on the y-axis
2. Plot the points carefully
3. Draw a line of best fit
   using a ruler for a straight line graph,
4. or draw free-hand for a curved graph
5. Check anomalous points.

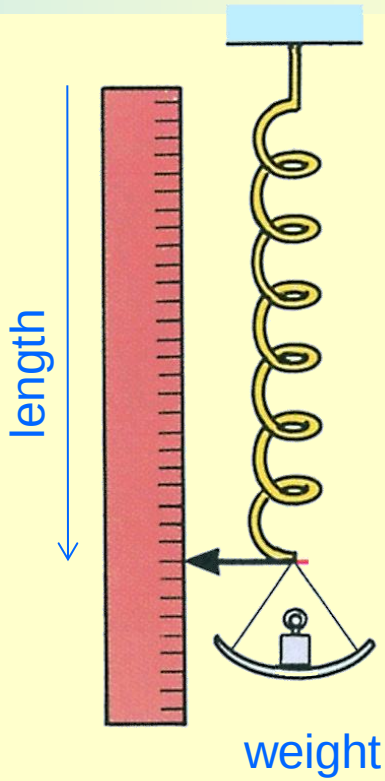
Types of graphs

Let’s look at some examples of graphs

Types of graphs 1

A **straight line** graph:

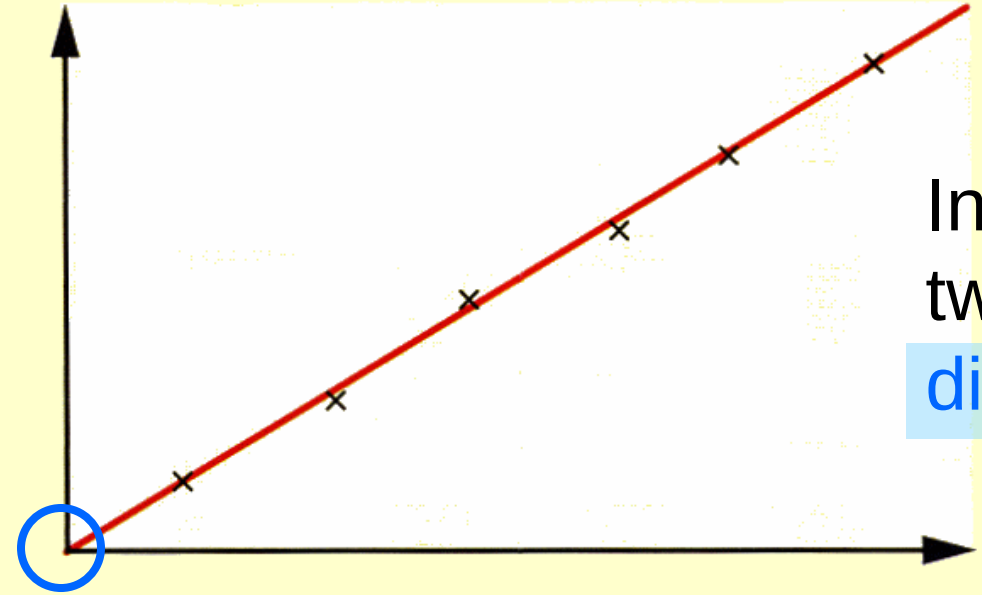




An example would be the **length** of a spring against the **weight** on it.

Types of graphs 2

A special case is when the **straight line** goes through the **origin** :

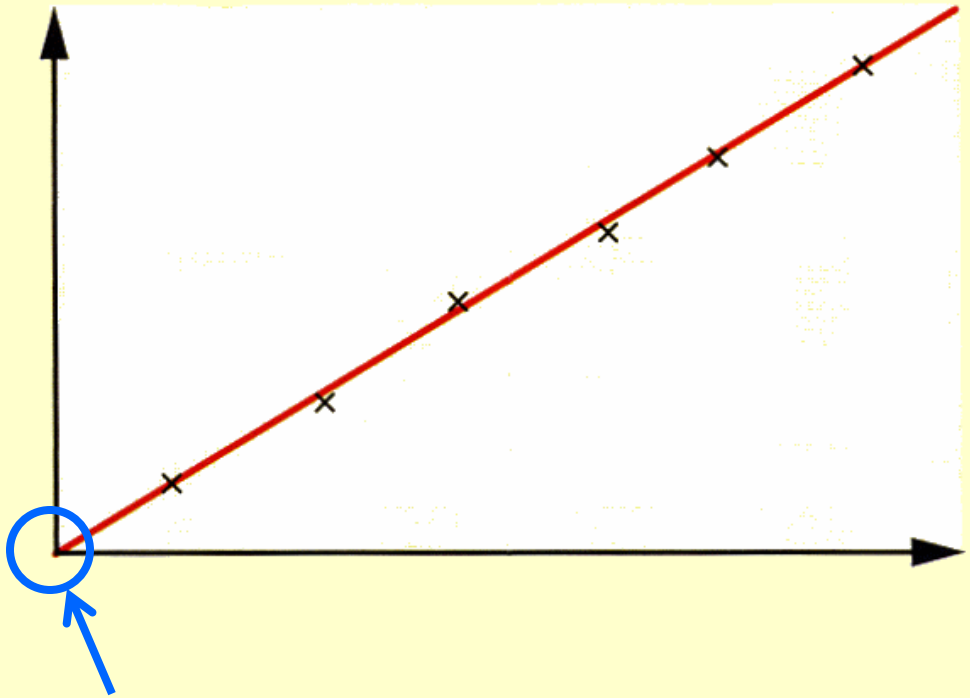


In this case the two quantities are directly proportional.

If one doubles, then the other one also doubles.

See page 390.

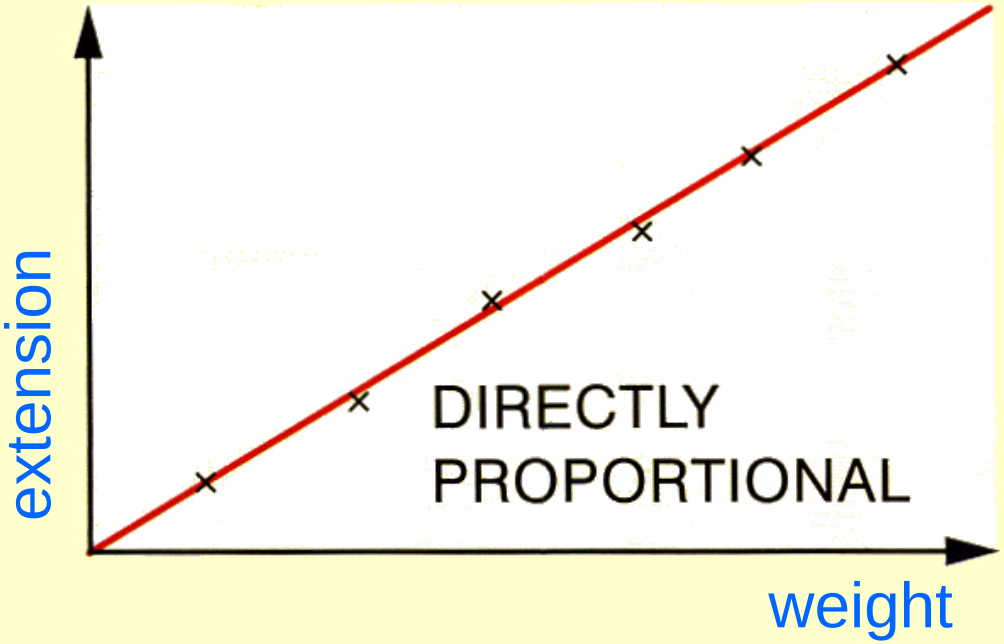
Types of graphs 2

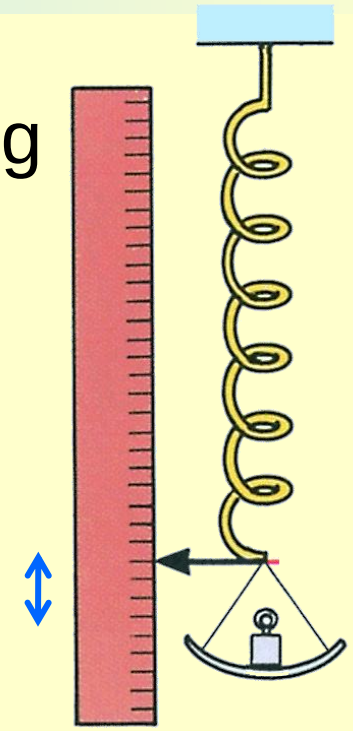


If you think your graph should go through the origin, then draw it exactly through the origin.

Types of graphs 2

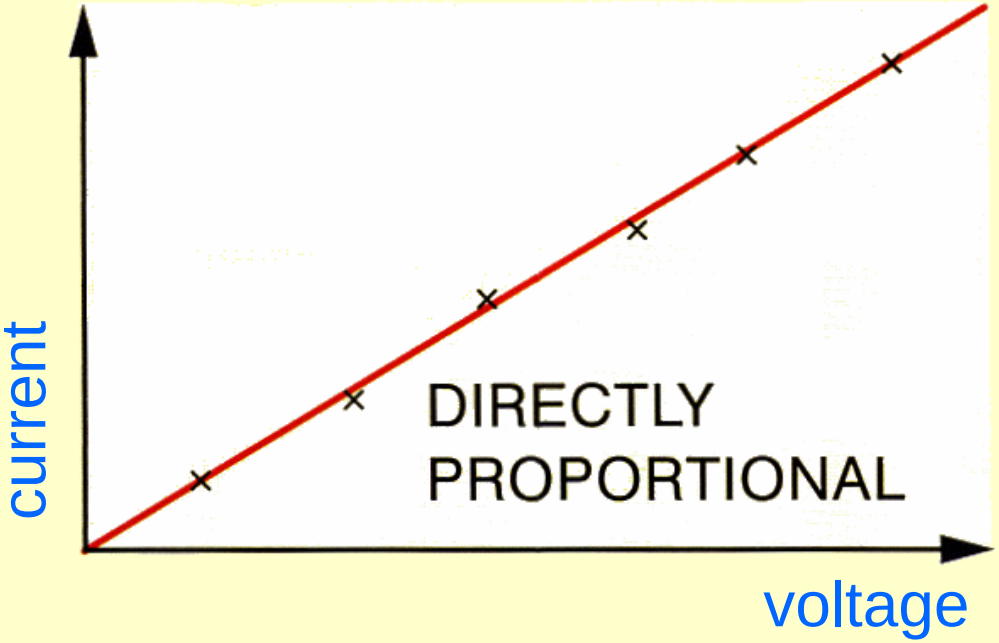
Example 1: the **extension** of a spring against the **weight** on it.

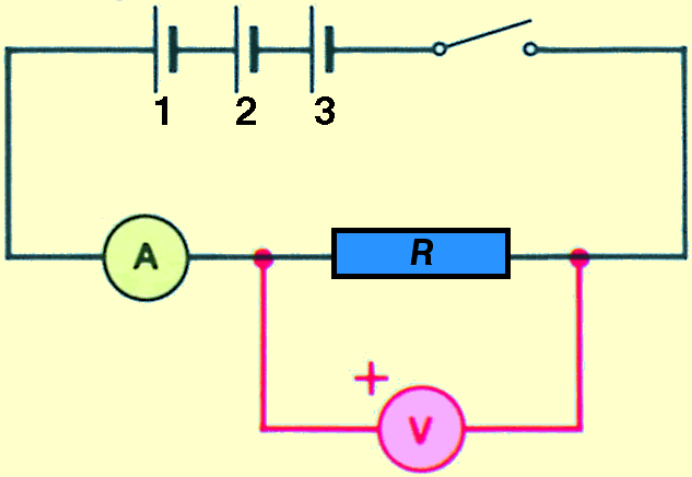




Types of graphs 2

Example 2: the **current** in a resistor against the **p.d.** across it.

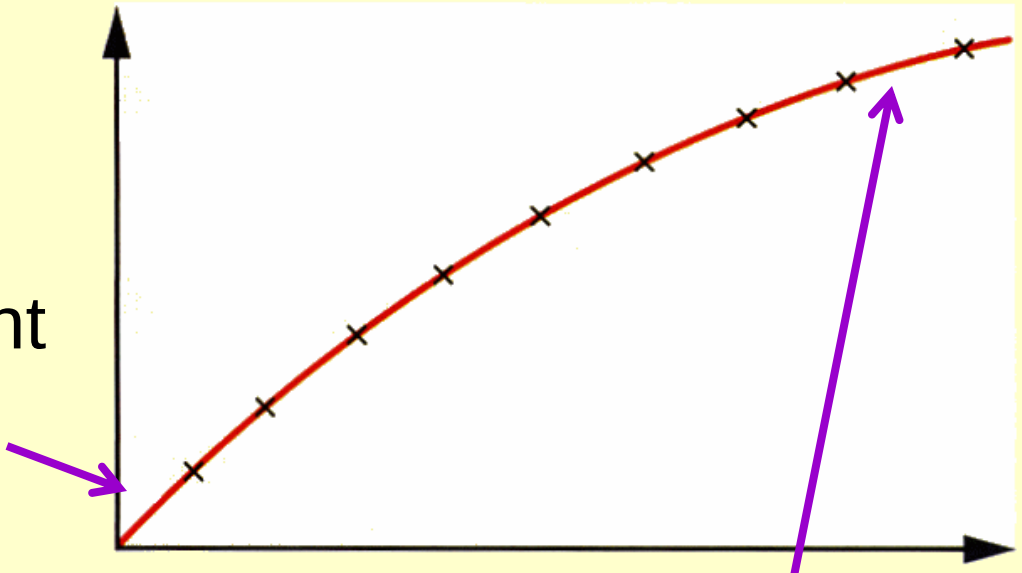




This illustrates Ohm's Law.

Types of graphs 3

A **curved** graph, rising :



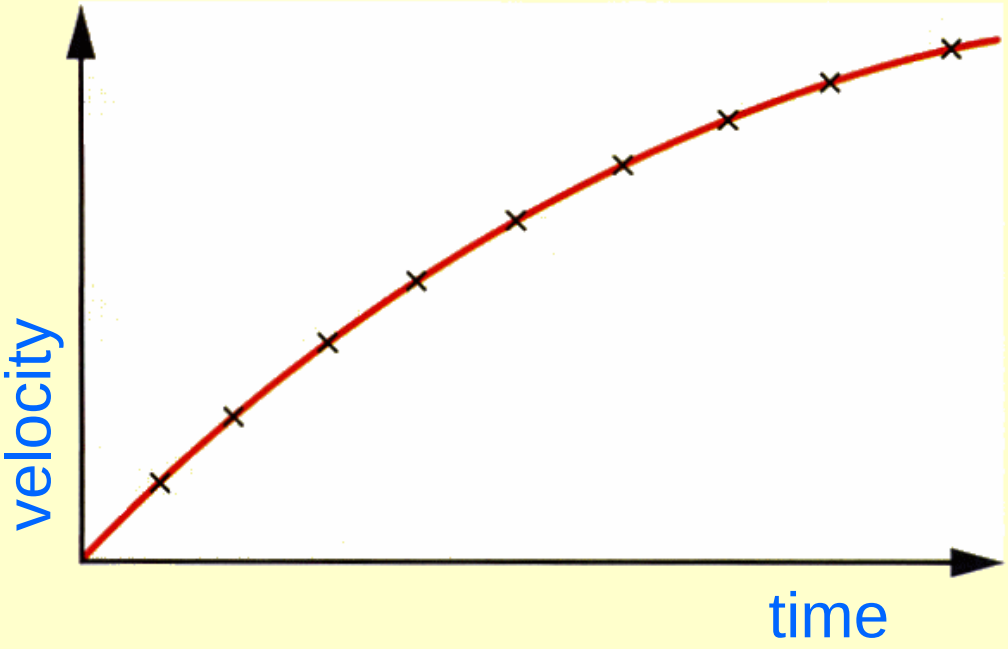
The dependent variable rises quickly at first

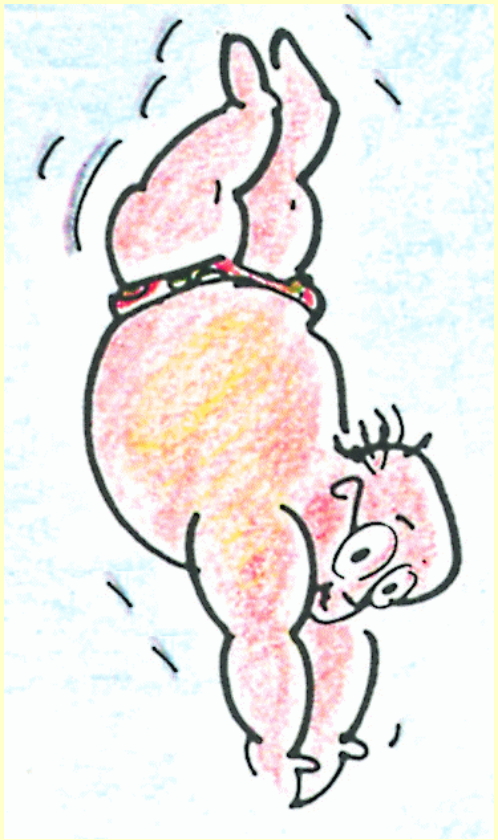
and then more slowly

Here are some examples:

Types of graphs 3

Example 1: the **velocity** of a falling object against the **time**.

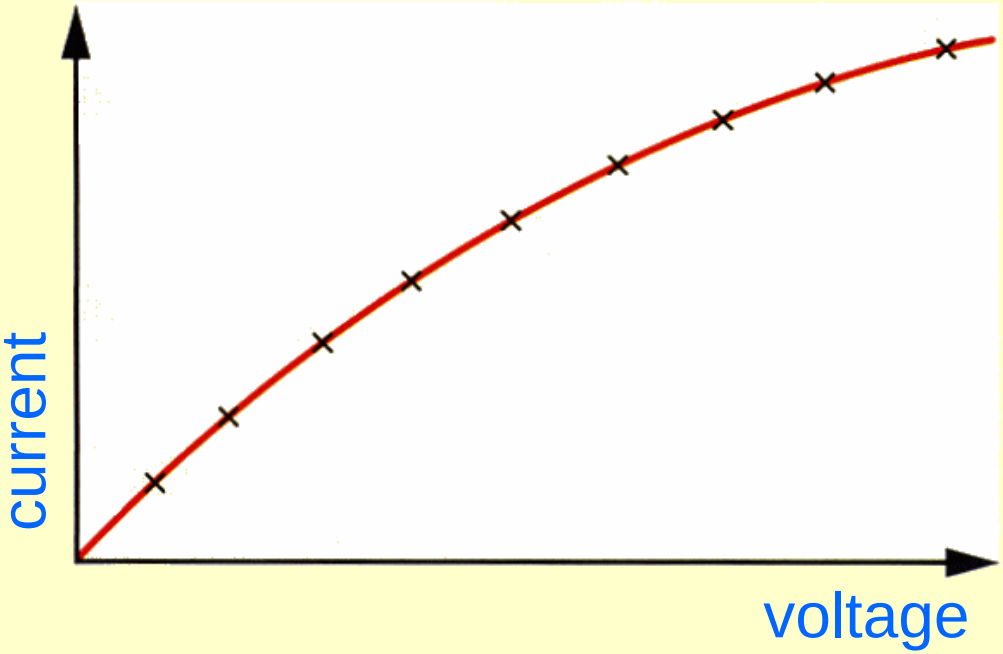




Eventually the object will reach its terminal velocity.

Types of graphs 3

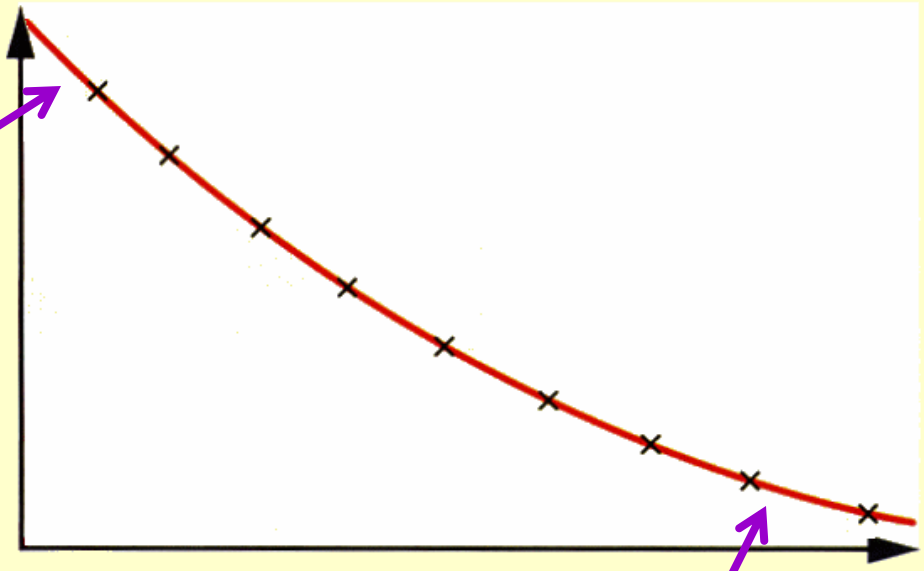
Example 2: the **current** in a filament lamp against the **p.d**.



Types of graphs 4

A **curved** graph, falling :

The dependent variable falls quickly at first

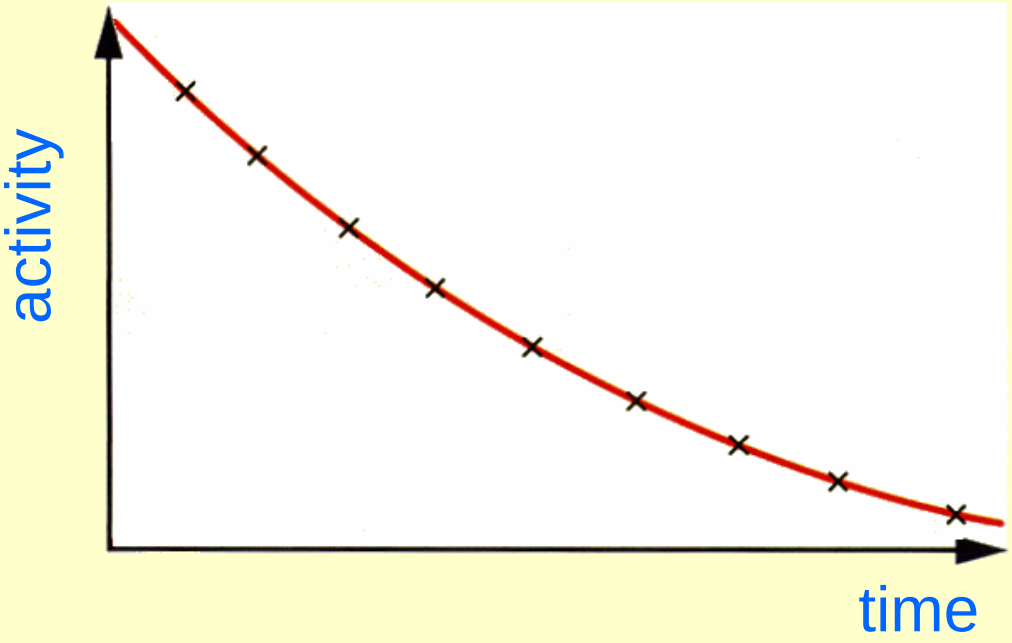


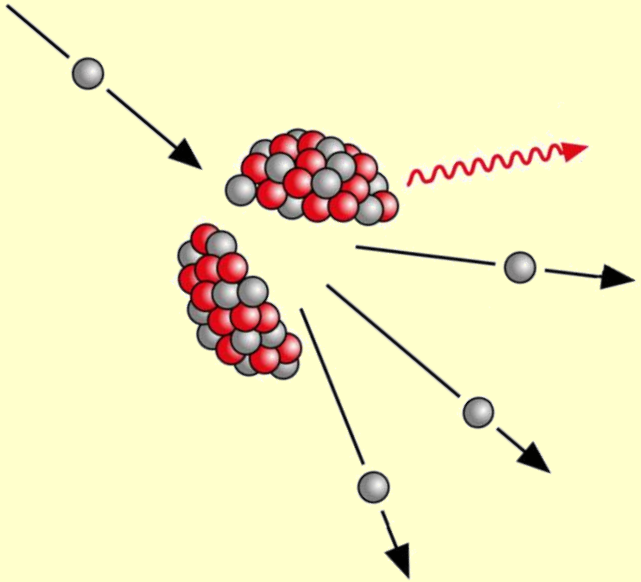
and then more slowly

Here are some examples:

Types of graphs 4

Example 1: the **activity** of a radioactive source against the **time**.

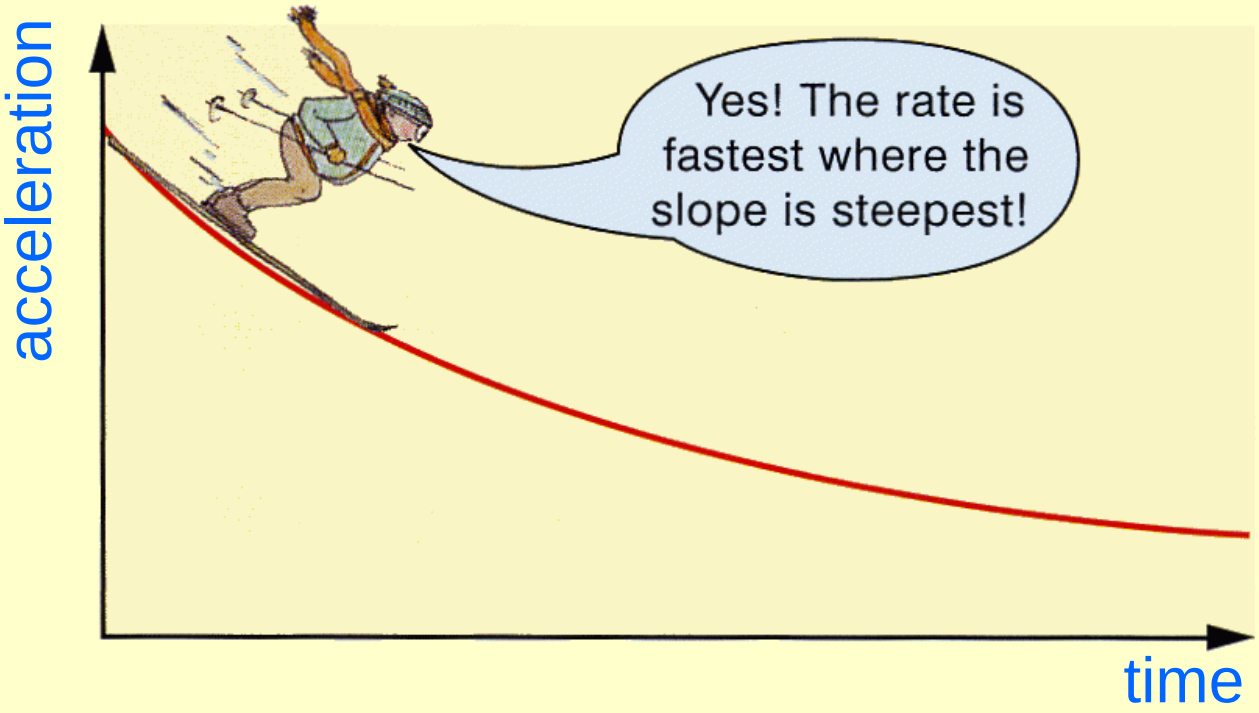




The time to fall to half is called the half-life.

Types of graphs 4

Example 2: the **rate of change** is shown by the **gradient** of the graph.



This is discussed in the next PowerPoint.

Learning Outcomes

You should now:

- Know how to draw a line-graph correctly,
- Be able to give examples of graphs with different shapes,
- Be able to interpret graphs with different shapes.

For more details, see:

- ***New Physics for You***, page 364, 391

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