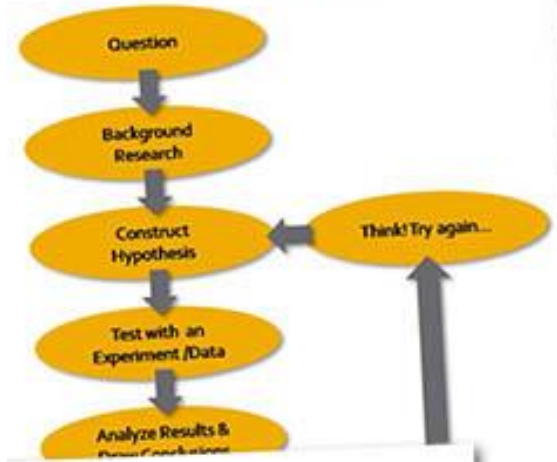
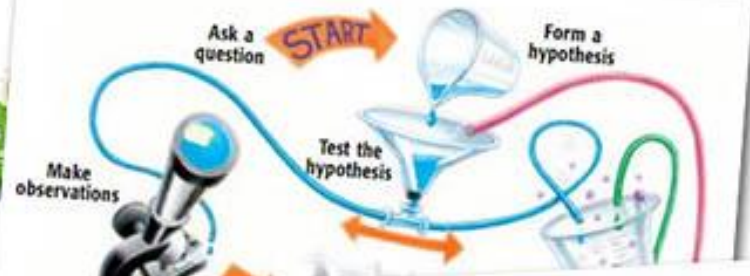
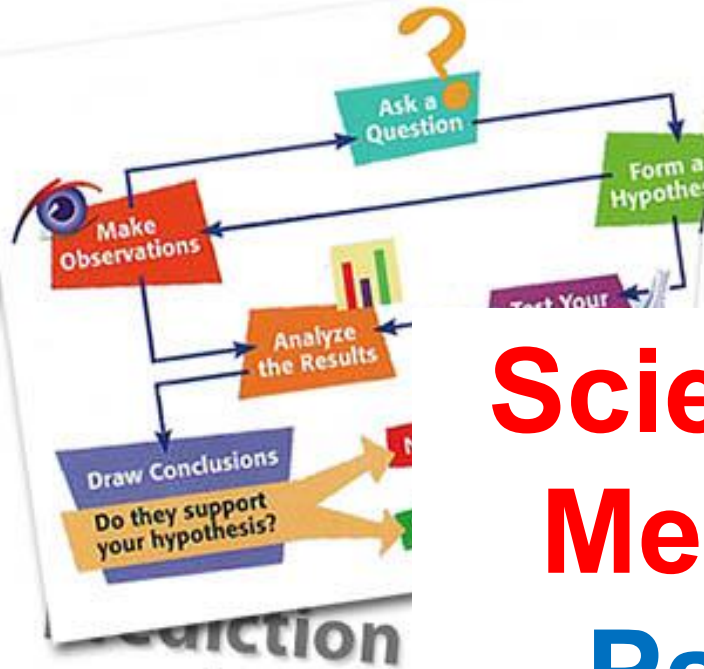


Scientific Method

Part 3



Analyzing results of the experiment

1. **Organize** your observations:

- ✓ Make a table.
- ✓ Make a graph.

2. **Review** data (look with a **critical eye**):

- ✓ Is it **complete**, or did you forget something?
- ✓ Do you need to collect **more data**?
- ✓ Did you make any **mistakes**?
- ✓ Decide on the next actions to take (repeat? analyze?).

3. **Analyze**:

- ✓ If appropriate, **calculate an average** for the different trials of your experiment.
- ✓ Observe **trends** (increasing or decreasing numbers), outcome **frequency**, and note **correlations**.



Working with your data

Excellent way to organize your data: **a table.**

Table 1.

**Water Temperatures at
Various Depths**

Water Depth (meters)	Temperature (°C)
50	18
75	15
100	12
150	5
200	4

Table 2.

**Effect of Soil Temperature
on the Germination Rate
of Pumpkin Seeds**

Soil Temperature (°C)	Germination Rate (%)			Average Germination Rate (%)
	X	X	X	
20	60	64	70	65
24	75	78	82	78
28	86	84	83	84
32	69	65	63	66

Famous Table:

¹ H																	² He														
³ Li	⁴ Be																	⁵ B	⁶ C	⁷ N	⁸ O	⁹ F	¹⁰ Ne								
¹¹ Na	¹² Mg																	¹³ Al	¹⁴ Si	¹⁵ P	¹⁶ S	¹⁷ Cl	¹⁸ Ar								
¹⁹ K	²⁰ Ca	²¹ Sc	²² Ti	²³ V	²⁴ Cr	²⁵ Mn	²⁶ Fe	²⁷ Co	²⁸ Ni	²⁹ Cu	³⁰ Zn	³¹ Ga	³² Ge	³³ As	³⁴ Se	³⁵ Br	³⁶ Kr														
³⁷ Rb	³⁸ Sr	³⁹ Y	⁴⁰ Zr	⁴¹ Nb	⁴² Mo	⁴³ Tc	⁴⁴ Ru	⁴⁵ Rh	⁴⁶ Pd	⁴⁷ Ag	⁴⁸ Cd	⁴⁹ In	⁵⁰ Sn	⁵¹ Sb	⁵² Te	⁵³ I	⁵⁴ Xe														
⁵⁵ Cs	⁵⁶ Ba	⁵⁷ La	⁷² Hf	⁷³ Ta	⁷⁴ W	⁷⁵ Re	⁷⁶ Os	⁷⁷ Ir	⁷⁸ Pt	⁷⁹ Au	⁸⁰ Hg	⁸¹ Tl	⁸² Pb	⁸³ Bi	⁸⁴ Po	⁸⁵ At	⁸⁶ Rn														
⁸⁷ Fr	⁸⁸ Ra	⁸⁹ Ac	¹⁰⁴ Unq	¹⁰⁵ Unp	¹⁰⁶ Unh	¹⁰⁷ Uns	¹⁰⁸ Uno	¹⁰⁹ Une	¹¹⁰ Unn																						
																		⁵⁸ Ce	⁵⁹ Pr	⁶⁰ Nd	⁶¹ Pm	⁶² Sm	⁶³ Eu	⁶⁴ Gd	⁶⁵ Tb	⁶⁶ Dy	⁶⁷ Ho	⁶⁸ Er	⁶⁹ Tm	⁷⁰ Yb	⁷¹ Lu
																		⁹⁰ Th	⁹¹ Pa	⁹² U	⁹³ Np	⁹⁴ Pu	⁹⁵ Am	⁹⁶ Cm	⁹⁷ Bk	⁹⁸ Cf	⁹⁹ Es	¹⁰⁰ Fm	¹⁰¹ Md	¹⁰² No	¹⁰³ Lr

hydrogen

alkali metals

alkali earth metals

transition metals

poor metals

nonmetals

noble gases

rare earth metals

Dmitri Mendeleev, 1869, and Julius Lothar Meyer, 1870.

(And it all started...with just a short list!)

John Dalton

- 1803-1805: **first list** of **relative atomic weights** containing just **6 elements**, namely *hydrogen* (conventionally assumed to weigh 1), *oxygen*, *nitrogen*, *carbon*, *sulfur*, and *phosphorus*.

- 1808:
expanded
list of
elements

ELEMENTS		
Hydrogen	1	Strontian
Nitrogen	5	Barytes
Carbon	5	Iron
Oxygen	7	Zinc
Phosphorus	9	Copper
Sulphur	16	Lead
Magnesia	20	Silver
Lime	24	Gold
Soda	28	Platina
Potash	32	Mercury

Dmitri Mendeleev

- 1869: **original periodic table** of 66 elements ordered and grouped according to their atomic weight.

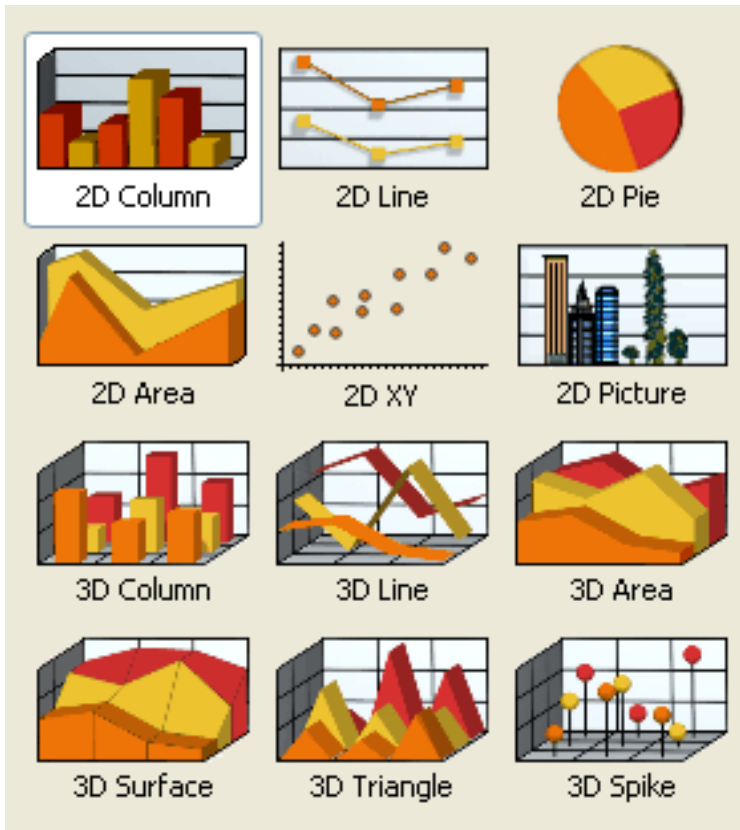
ОПЫТЪ СИСТЕМЫ ЭЛЕМЕНТОВЪ.
ОСНОВАННОЙ НА ИХЪ АТОМНОМЪ ВѢСѢ И ХИМИЧЕСКОМЪ СХОДСТВѢ.

<i>ВѢСЪ</i> H = 1 Li = 7 Na = 23 K = 39 Rb = 85,4 Cs = 133 Tl = 204. ? = 45 Ce = 92 ?Er = 56 La = 94 ?Yt = 60 Di = 95 ?In = 75,4 Th = 118?			Ti = 50 Zr = 90 ? = 180. V = 51 Nb = 94 Ta = 182. Cr = 52 Mo = 96 W = 186. Mn = 55 Rh = 104,4 Pt = 197,1 Fe = 56 Ru = 104,4 Ir = 198. Ni = Co = 59 Pt = 106,4 Os = 199. Cu = 63,4 Ag = 108 Hg = 200. Be = 9,4 Mg = 24 Zn = 65,2 Cd = 112 B = 11 Al = 27,1 ? = 68 Ur = 116 Au = 197? C = 12 Si = 28 ? = 70 Sn = 118 N = 14 P = 31 As = 75 Sb = 122 Bi = 210? O = 16 S = 32 Se = 79,4 Te = 128? F = 19 Cl = 35,5 Br = 80 I = 127 Ca = 40 Sr = 87,6 Ba = 137 Pb = 207. ? = 45 Ce = 92 ?Er = 56 La = 94 ?Yt = 60 Di = 95 ?In = 75,4 Th = 118?		
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Д. Менделѣевъ

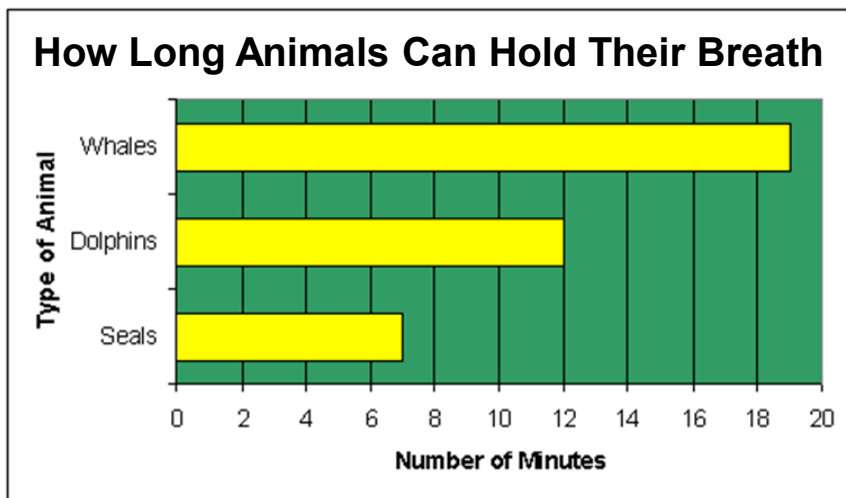
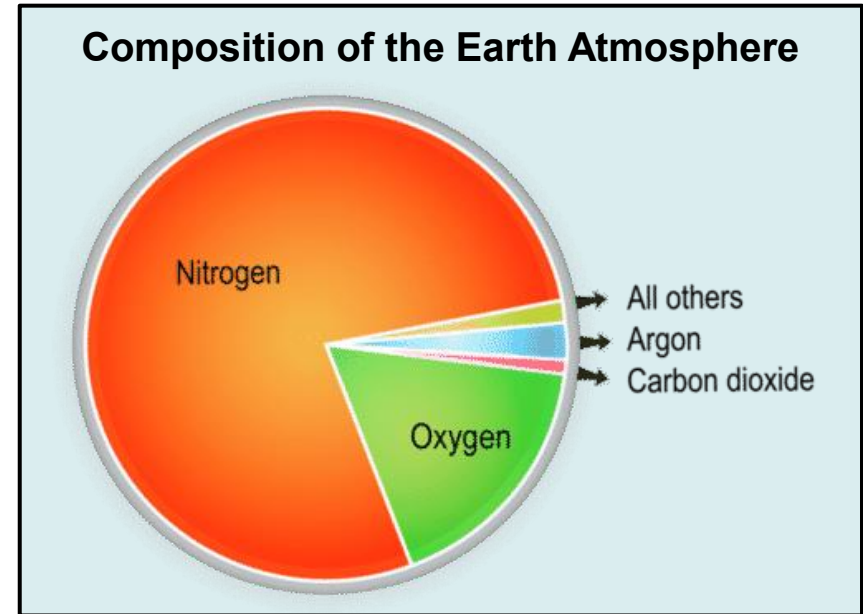
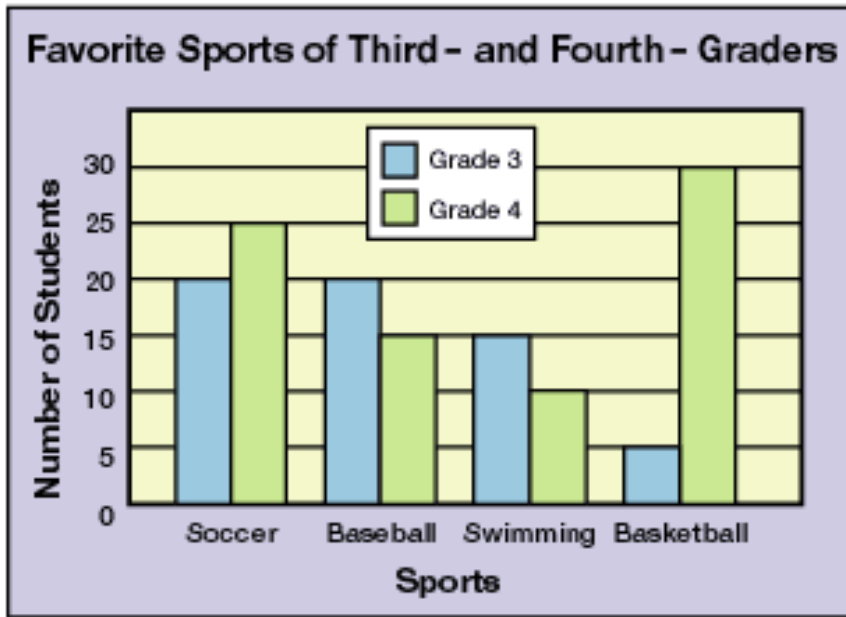
Working with your results

Excellent way to display your results: a graph.



Different types of graphs are appropriate for different experiments!

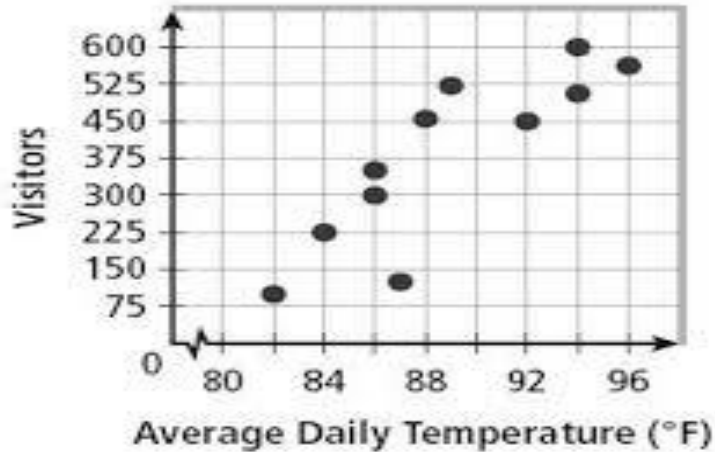
Types of graphs



Bar graphs and **circle graphs** should be used to represent *category data* (comparison, sometimes called “side by side” data).

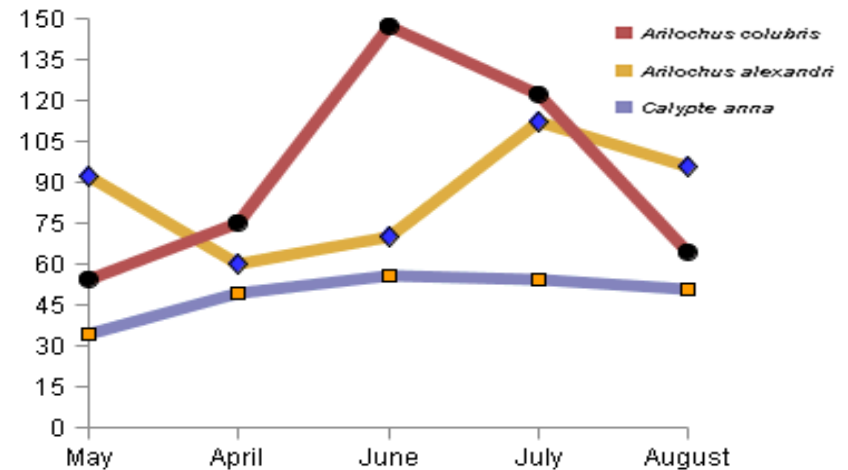
Types of graphs

Cedar Beach visitors



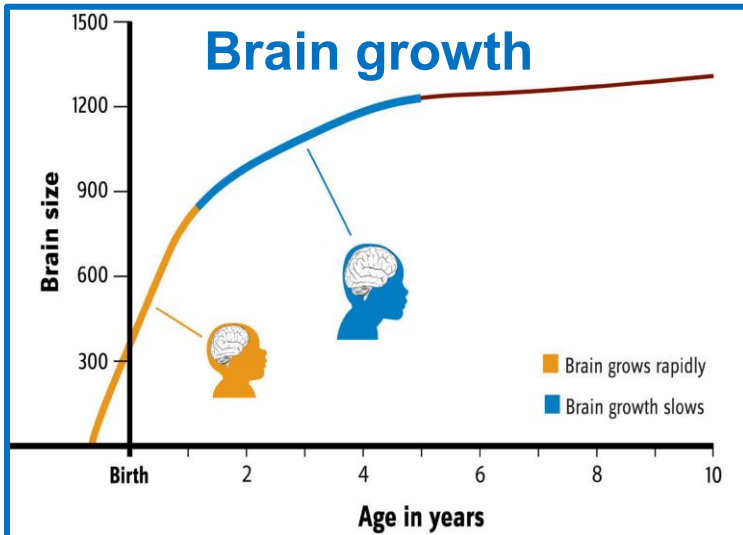
← Scatter plots are used to show *numerical* data.

Hummingbird sightings in Bend, Oregon, 2009



← Line graphs should be used to show *how data changes over time*.

Brain growth



Be sure to make a good graph!

For any type of graph:

- ✓ Generally, you should place your **independent variable** on the **x-axis** of your graph and the **dependent variable** on the **y-axis** (*bar graphs are often an exception*).
- ✓ Make sure to **clearly label** all tables and graphs.
- ✓ Include the **units of measurement** (*volts, inches, grams, etc.*).
- ✓ Be sure to use **proper scale**.
- ✓ If you have more than one set of data, show **each series in a different color or symbol** and include a **legend** with clear labels.

