

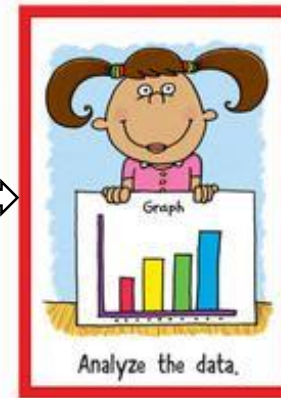
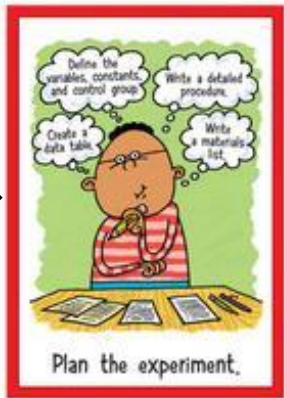
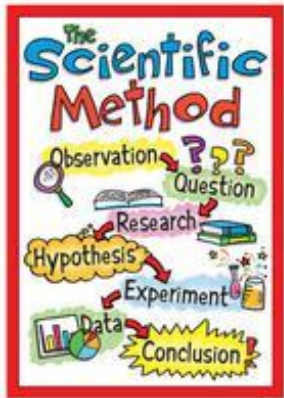
OBSERVATION



WONDER

RESEARCH

HYPOTHESIZE



PLAN

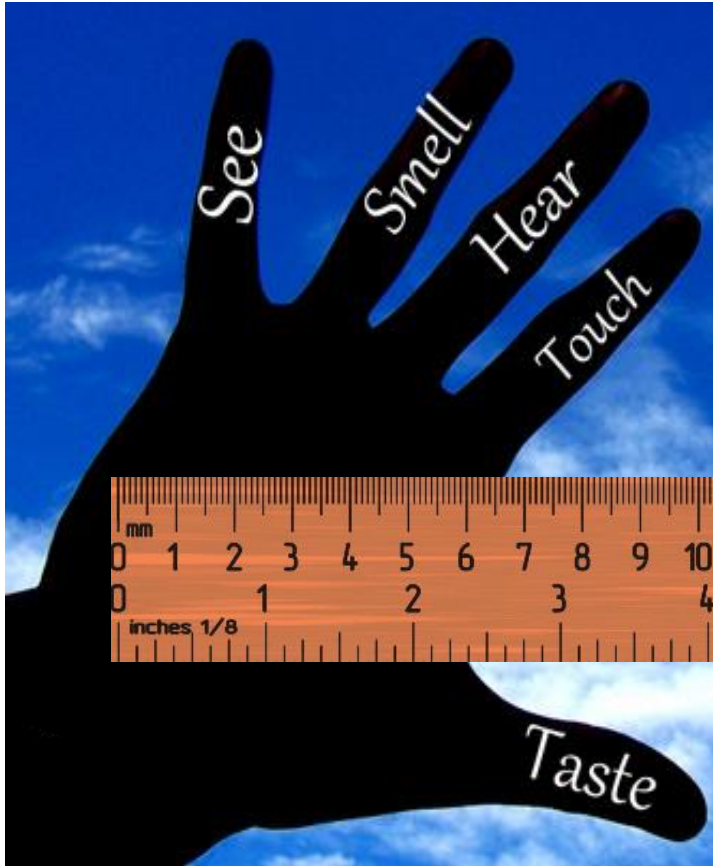
EXPERIMENT

DATA, its
PRESENTATION
and ANALYSIS



CONCLUSION

Observation



- Observation is describing an object or event using your five senses (*what you see, hear, smell, taste, touch*) or measurement (*numbers*).
- Information gathered during an observation is called **data** (sing. *datum*).

Observation **does not include opinion**
(how you *feel* or what you *think*)!

Describe the Baby Elephant



It weighs 480 kilograms.

It has large ears and long trunk.

It has gray wrinkly skin.

~~**It is very cute!**~~

It is young.

It is about 1.5 yards tall.

Qualitative vs Quantitative Data

Qualitative (letters)

- **Descriptions** using **words**.
- Data which can be **observed** but **not measured**.
- What the object is *like*: colors, texture, smell, taste, appearance, etc.
- ***Subjective, relative***

Quantitative (numbers)

- Specific **numbers**.
- Data which can be **measured**.
- Length, height, area, volume, weight, speed, time, temperature, humidity, sound levels, cost, age, etc.
- ***Objective, specific***

Qualitative observations are subjective

That girl is
so short!



No, that
girl is so
tall!



Quantitative observations are **objective**

That girl is
4 feet tall.



Yes, that
girl is 4
feet tall.



DIY: Monarch Butterfly

common morph (form)



rare Hawaiian
white morph



Make one **qualitative** observation about each picture above.

Explain why this is a qualitative observation.

Make one **quantitative** observation about each picture above.

Explain why this is a quantitative observation.

Working with your observations

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

**Table 1. Science and Earth Science
classes enrollment.**

YEAR	EARTH SCIENCE	SCIENCE
2014/2015	15	8
2015/2016	14	13
2016/2017	10	16
2017/2018	12	4
2018/2019	23	22

Famous Table: The Periodic Table of Elements

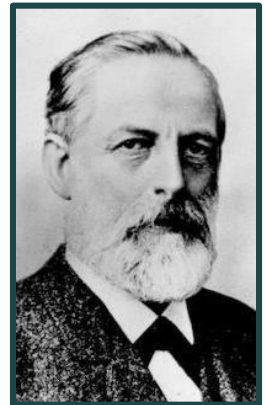
1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 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								

■ hydrogen
■ alkali metals
■ alkali earth metals
■ transition metals
■ poor metals
□ nonmetals
■ noble gases
■ rare earth metals



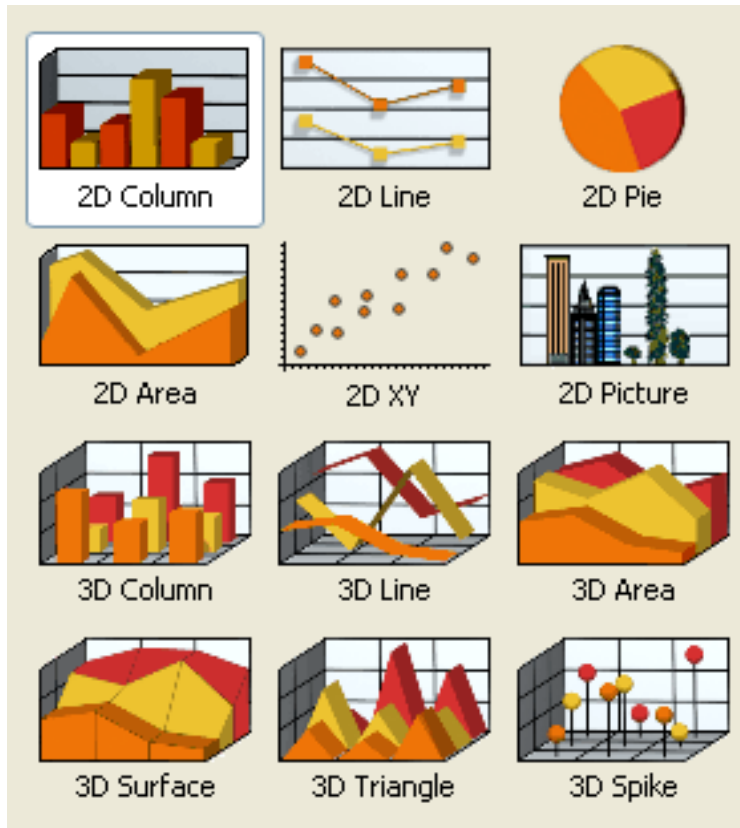
58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Dmitri Mendeleev (1869)
and Julius Lothar Meyer (1870)



Working with your observations

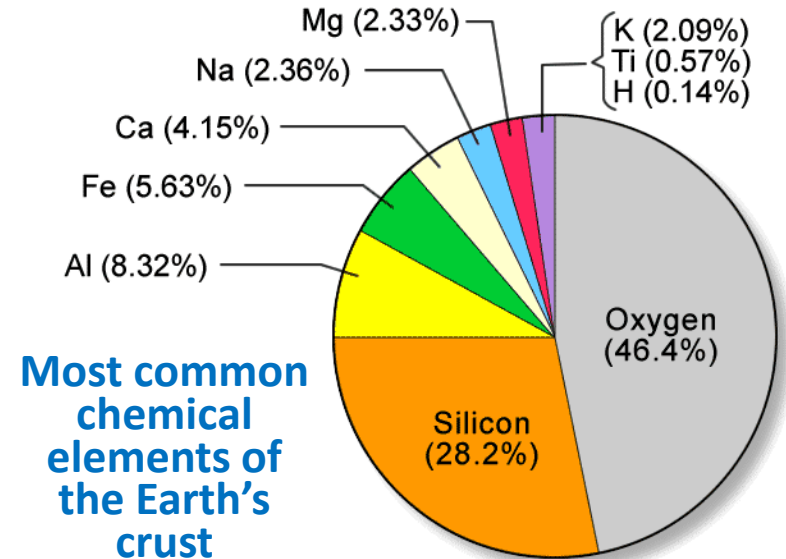
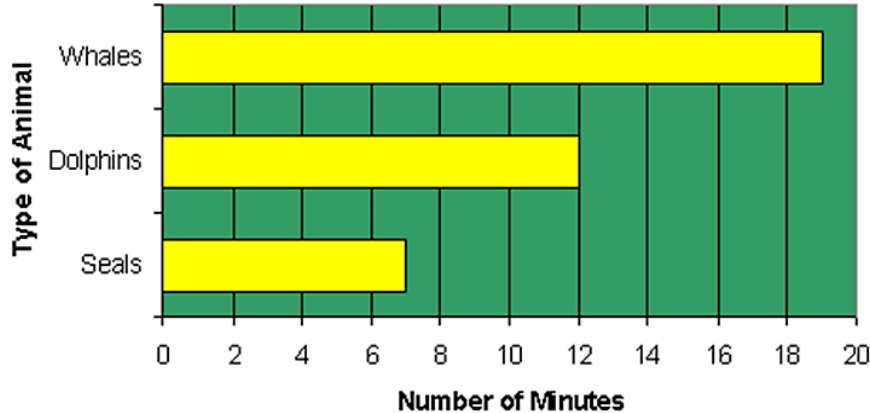
Excellent way to display your data: **a graph.**



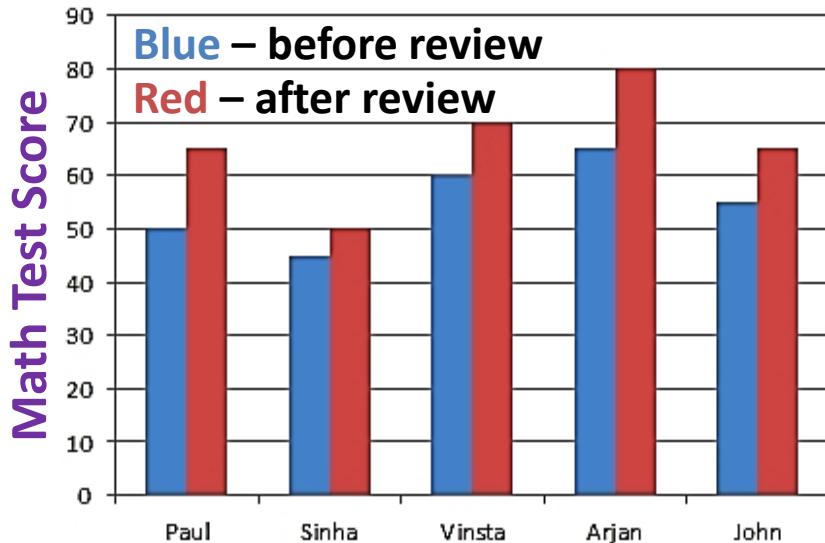
Different types of graphs are appropriate for different experiments!

Types of graphs

How long Animals Can Hold Their Breath

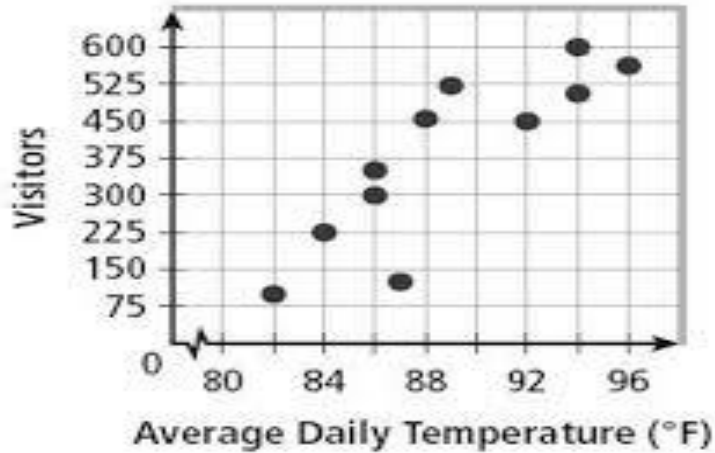


Bar graphs and circle graphs should be used to represent *categorical data* (comparison, sometimes called “side by side” data).



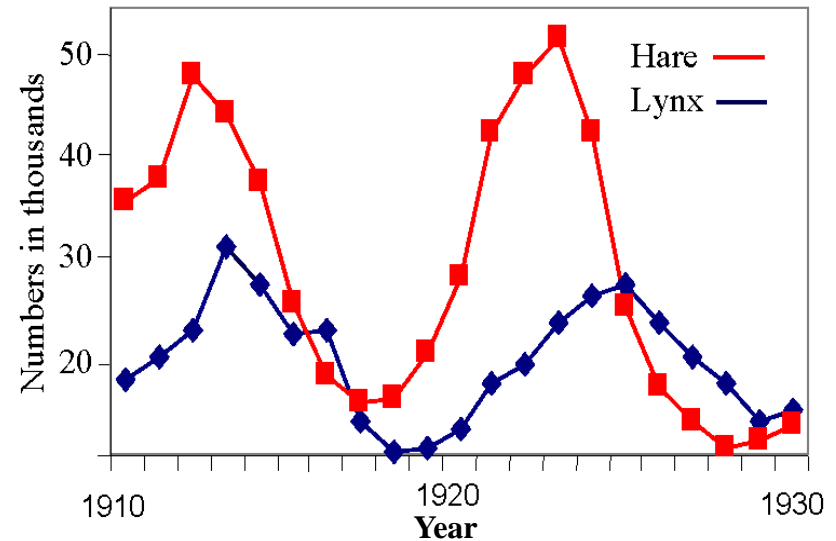
Types of graphs

Cedar Beach visitors



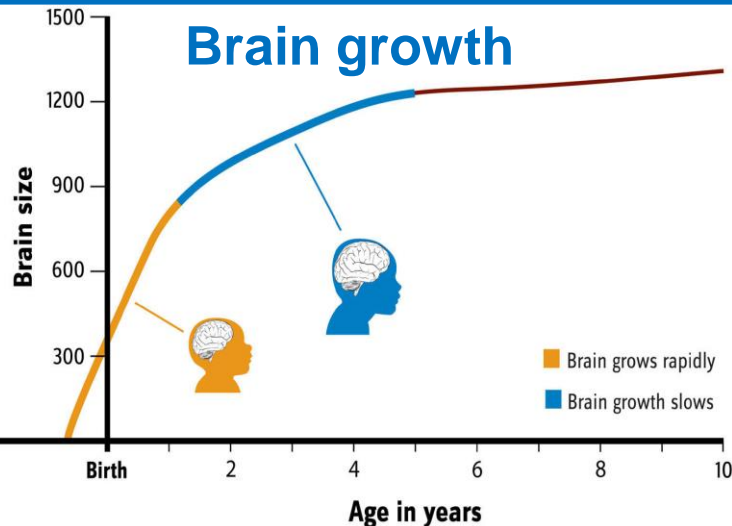
Scatter plots are used to show *numerical* data.

Prey-predator population dynamics



Line graphs are used to show *how data changes over time*.

Brain growth



Most Watched and Debated Graph: Climate Change

