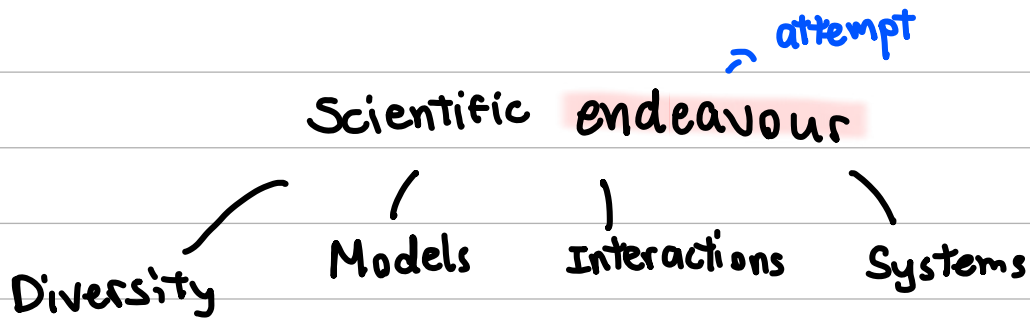


The scientific endeavour

Intro:



1.1 What is science?

↳ Science → study of natural phenomena
→ human endeavour

* phenomena
↳ smth that happens rarely

Compare:

- similarities
- differences

→ how to answer test questions

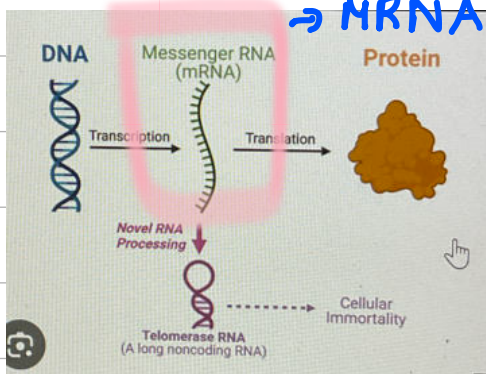
Contrast / differentiate / distinguish:

- give differences ONLY

* Fun Fact !!

↳ Covid-19 vaccine

X weakened virus
✓ MRNA



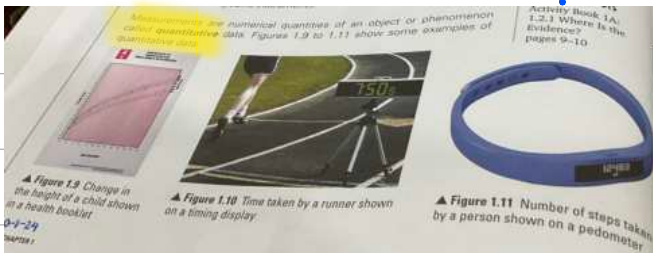
1.2 What is the nature of scientific knowledge?

↳ Science → evidence based

↳ Scientific data :

Qualitative data → quality of object - 5 senses ^{descriptive words + drawings}

Quantitative data → specific numerical values



Sense	Qualitative Data Collected	Observation
sight	colour	green shell
hearing	sound	slush of liquid when the fruit is shaken
touch	texture	hard and smooth
smell	odour	no smell but has a slight fragrance when opened
taste	taste	the liquid and flesh in the fruit taste sweet

Differences between

Qualitative & Quantitative data

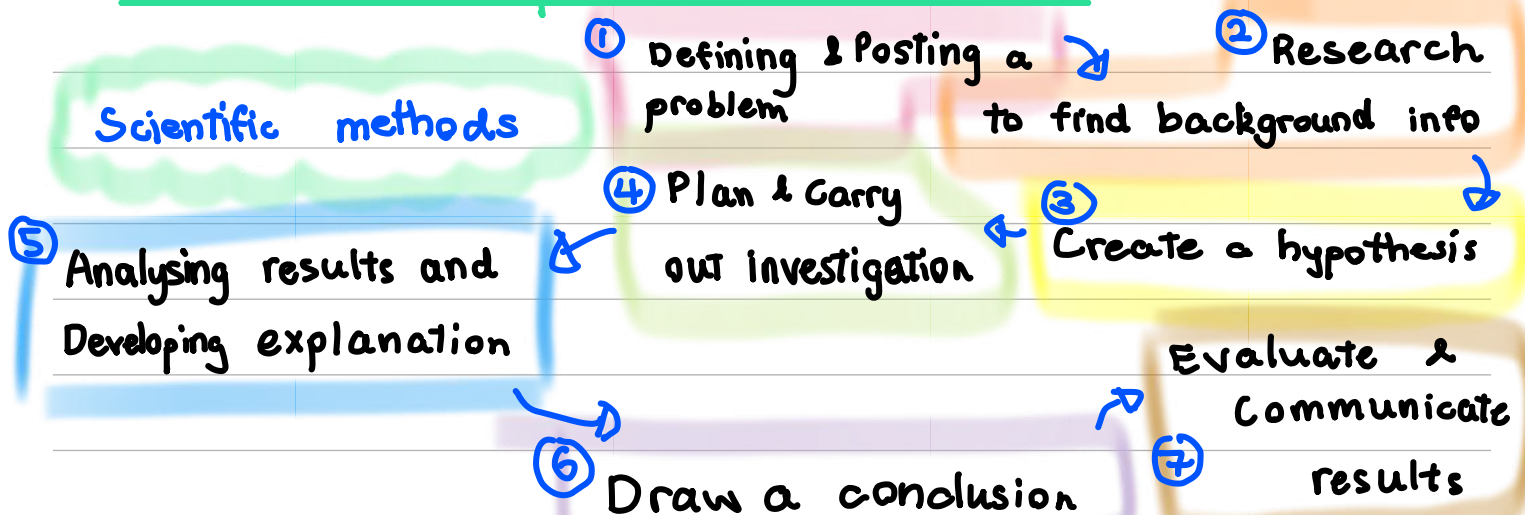
Qualitative Data	Quantitative Data
involves senses	involves senses and measurements taken using instruments
usually descriptive (e.g., heavy, long, fast)	numerical (e.g., 500 g, 2 cm, 50 s)

sight (measuring instrument)

Construction of scientific knowledge

↳ long time ago, scientists thought Earth was the centre of the UNIVERSE

1.3 How do we practise Science?



Variables → 变数

- 操纵性变数 → Independent variable
- 反应性变数 → Dependent variable
- 固定性变数 → Constant variable

* Hypothesis → 假设 → STEP 3

STEP 4

Conducting experiments and testing solutions - Measuring using scientific instruments

Scientific instruments : - Measuring cylinder
- Electronic balance
- Digital stopwatch
- Digital calipers
- Thermometer

Measuring units : Volume : m^3 (cm^3 , mL)

Mass : kg (g)

Time : s (min, h)

Length : m (cm, mm)

Temperature : K ($^{\circ}C$, $^{\circ}F$)

↕
Standard

↕
Commonly used

STEP 4

Conducting Experiments and testing solutions - Accuracy, Precision and errors

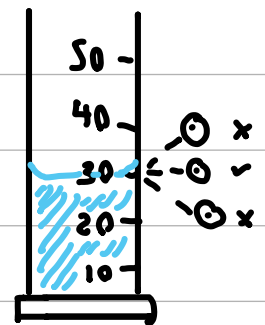
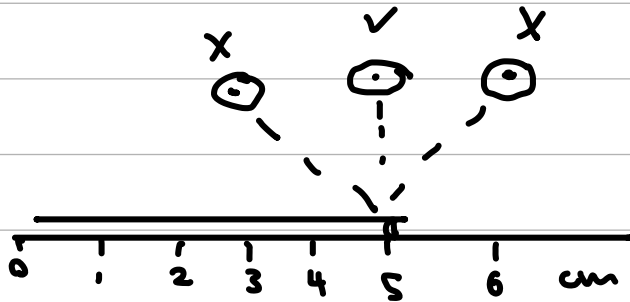
Zero error : x give 0 when nothing is on it

: Ways to resolve: 1. Do the maths yourself
2. Use "tare" function

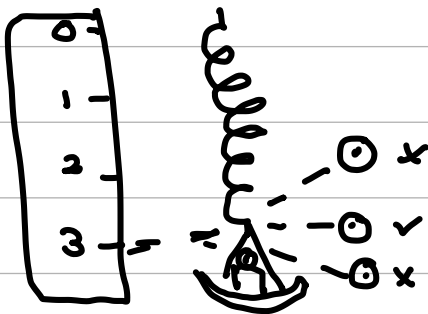
Parallax error : x perpendicular to the measuring instrument

Measuring cylinder:

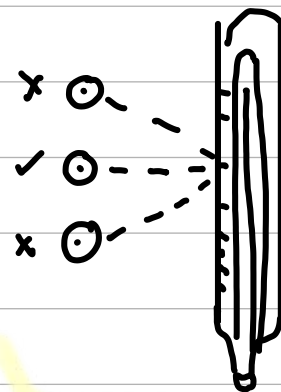
Ruler:



Spring balance:

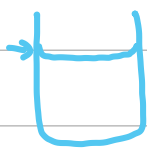


Thermometer:



* Liquids → meniscus 弯月面

Concave meniscus: eye → look at bottom part



only mercury

Convex meniscus: look at top



Precision & Accuracy

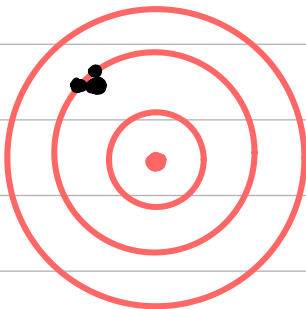
Data : 3 results

Precise

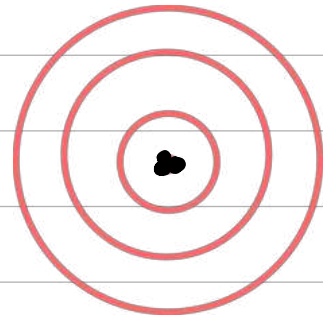
↳ 3 datas → close

Accurate

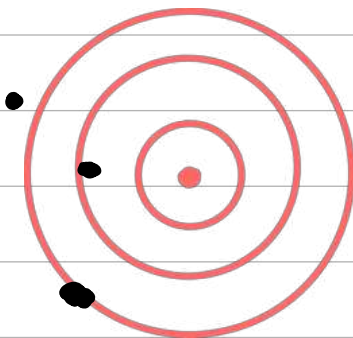
↳ correct



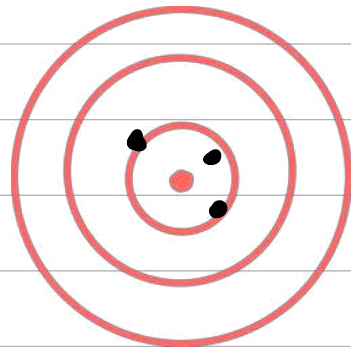
- High precision
- Low accuracy



- High precision
- High accuracy



- Low precision
- Low accuracy



- Low precision
- Relatively high accuracy

Developing explanations and solutions

Easiest way to look at data : - graphs

Evaluating, reasoning and communicating

Communicate through:

- journals
- commercial
- conference

1.4: What influences the way we practise science?

Hazard symbols:



1.5: Why do we learn science?

Science → limited (x solve plastic prob)

Benefits of plastic : → x break easily

→ convenient

→ light

→ cheap

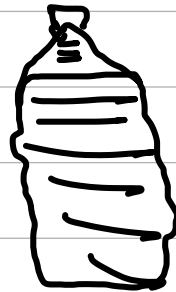
Ethical considerations

↳ personal duties / rights / beliefs

Social considerations

↳ commonly accepted in society

ppl complain if plastic bags charge at 30¢



Solving plastic problem

Economic considerations

↳ cost & benefits of an issue

Environmental considerations

↳ possible effects on living thing & environment

CONCLUSION OF CHAPTER 1:

SCIENTIFIC ENDEAVOUR

Study of Phenomena

Human endeavour

evidence-based

Science: - Moral - limited