



Glossary:

- **Accurate**
Close to the real value.
- **Anomalous**
Something which does not fit the trend or pattern.
- **Control variable**
Variable which is kept the same to ensure a 'fair test'.
- **Correlation**
Relationship between two variables.
- **Decimal places**
number of digits after the decimal point.
- **Dependent variable**
Variable which is monitored or measured.
- **Digit** number.
- **Explanation**
Reason why something happens.
- **Hypothesis**
An idea or explanation which is tested.
- **Independent variable**
Variable which is changed.
- **Line of best fit**
Passes through as many points as possible, roughly equal number of points end up on each side.
- **Mean**
Add them all together and divide by how many values you have.
- **Median**
Put the data in numerical order, then choose the middle one.
- **Mode**
Most frequently occurring value
- **Precise**
Repeats are close together.
- **Prediction**
What you think will happen if the independent variable in an experiment is changed.
- **Repeatable**
Method repeated by the same scientist to produce same results.
- **Reproducible**
Repeated by a different scientist to get the same results.
- **Trend** Pattern in the data.

Activities

- Look at the dartboard below. The shots were precise but not accurate. Explain why.



- A student carried out an experiment to investigate the effect of temperature on the speed of a reaction. They put their data into a results table.

Time seconds	repeat	average	Temperature
130	129	129.5	15°C
196	194	195	10°C
39	37	38	35°C
21	19	20	45°C
7	7	7	60°C
290	289	289.5	5°C

- a) What feedback would you give the student to improve their table?
 - b) Draw a better version of the results table.
 - c) State the trend in the data.
 - d) Plot a graph of the data.
- Look at the following data:
5, 7, 3, 6, 11, 6, 7, 7
 - a) Find the **mean** of the data
 - b) Find the **mode** of the data
 - c) Find the **median** of the data.
- A scientist noticed that tomato plants in the sun produced larger tomatoes than tomato plants grown in the shade.
 - a) Write a prediction for an experiment to investigate the effect of light on the growth of tomatoes.
 - b) Identify the independent and dependent variables.
 - c) What control variables might you need to consider?

QUICK QUESTIONS:

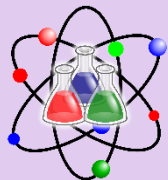
1. What is the difference between repeatable and reproducible?
2. What is the difference between mean, mode and median?
3. What does the term 'anomalous' mean?
4. State the rules for drawing a results table.
5. State the rules for plotting a graph.
6. State the three types of variable.
7. What is an evaluation?

1. What is science?

- Science is about finding explanations for why things happen or what makes things work.
- An **explanation** is not a guess, there has to be some basis for it.
- Careful **observation**, including **measurement** where possible, can suggest what may be happening.
- In some cases it is possible to make a change and observe what happens.

2. Hypothesis and prediction

- A **hypothesis** is a possible **explanation** or reason for why something happens.
- A **prediction** is what a scientist thinks will happen if the **independent variable** in an experiment is changed.



3. Variables

- The **independent variable** is the variable the scientist changes to observe what happens.
- The **dependent variable** is the one which is measured to see if changing the independent variable had an effect.
- The **control variables** are kept constant so that the result can only be the effect of changing the independent variable.

4. Repeats, repeatable and reproducible

- **Repeating** an experiment enables us to calculate an **average** and shows the experiment is **repeatable**. A measurement is **repeatable** if the same scientist uses the same method and gets the same result.
- What people expect to happen can influence what they observe. It is good for the same experiment to be **repeated** by a different person. If they get the same result then the measurement is **reproducible**.



KS3 Spine

Scientific method

5. Recording data

- Data should be recorded during any practical work; this is normally in a table. Tables should have:
 - **Clear headings with units**
 - **Independent variable** in the first column
 - **No units** in the body of the table
 - Consistent number of **decimal places**

6. Graphs

- Data can be displayed in a graph to help identify **trends** or **correlations**.
- Data points should be marked with a **cross**. The plotted points should **fill at least half the paper**.
- **Axes** should be **labelled** with the **variable** and the **unit**.
- The **line of best fit** can ignore **anomalous data** and can form a **curve**, not just a straight line.

7. Averages and decimal places

- Calculating an **average** in science usually involves finding the **mean**, but can also include the **mode** or **median** value.
- When calculating a mean, make sure the answer never has more **decimal places** than any of the data values you used.
- When rounding up, use the **deciding digit** to decide whether to round up or down.

8. Conclusion and evaluation

- A **conclusion** contains a **description** and **explanation** of any **trends** or **patterns** in the data. It also looks back at the **hypothesis** and related **prediction** to see if they were correct.
- An **evaluation** looks at the data to see how **precise** or **accurate** it is. It identifies any **anomalous data** and identifies sources of **error** in the method.