## The Scientific Method

Scientific Method: The process that is used to find out about the world and to answer questions

- we have a problem
- we perform an experiment



- <u>Hypothesis</u>: an idea or explanation that you then test through study and experimentation, in other words...Testable predictions
- Theory: Explanations supported by experiments
- Variable: Something in an experiment that can change

Independent Variable: A variable that is changed, usually graphed on the x axis

Dependent Variable: What is being measured, usually graphed on the y axis

Constants: Variables that stay the same

## Frequency : The number of items occurring in a given category

#### Percent: A proportion multiplied by 100

Percent = <u># of red candies</u> total candies

### The steps of the scientific method:

- Make an Observation
- Ask a <u>Question</u>
- <u>R</u>esearch
- Form a <u>Hypothesis</u>
- Experiment
- Analyze <u>D</u>ata
- Draw a <u>Conclusion</u>
- Share <u>Results</u>

Orange Quiet Ratchet Hippos







#### Identify the problem:

 Observation:
What do you want to know or explain?

 Write a question that addresses the problem or topic



Gather the information:

- Research your topic via multiple sources
- Form a hypothesis (an educated guess)



#### What is a hypothesis?

 It is a prediction based on observations and your knowledge of the topic.



Form a hypothesis:

- What do you think will happen?
- Use prior knowledge
- Predict an answer or outcome

#### Perform an experiment:

- How will you test your hypothesis?
- Develop a reliable experiment and address safety rules
- Follow a step-by-step to perform your experiment



#### What is data?

- Record data and observations!
- It is information gathered during an experiment.



#### Analyze data:

- Is the data reliable?
- Does your data and observation support your hypothesis?
- You can determine if it is reliable by creating a graph that is easy to understand.

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#### If yes – communicate the results:

- Write a conclusion that summarizes the important parts of your experiment and the results
- It is extremely important to share or communicate your results if they are accurate.



If the data is inaccurate:

## Is your data inaccurate or is the experiment flawed?

# Modify the experiment in some way Rewrite your procedure to address the flaws



## Real World Examples:

#### Car Trouble

- -Observation: Car won't start
- -Question: Why?
- -Hypothesis: Battery, no gas, spark plugs dead, alternator
- -Experiment: change spark plugs, test battery, dip stick in gas tank
- -Data: after changing plugs, still won't start, battery has full charge, full tank of gas but gauge says "empty"
- -Conclusion: Bad gauge

# Fleas on Boarded Dogs

- Observation: Majority of dogs boarded at veterinarian have fleas
- -Question: Would a flea collar be beneficial?
- -Hypothesis: The "King's" brand flea collar will rid most boarded dogs of fleas.
- -What do you think would be a good experiment to test this hypothesis?