Logic, Loops, & Conditionals

If you have any corrections or suggestions to make this write up better, please let us know HERE. We want to hear from you!

For more information on digital literacy, or for additional resources, please refer to the session presentation HERE.

Science	Practical & Applied Arts
Grade 1 Science – SE1.1 Grade 5 Science – HB5.5	ROBA26 ROBA28A ROBA65 ROBA66A

Arts Education	Mathematics	Physical Education
Grade 1 Art - CP1.1 Grade 2 Art - CR2.2 Grade 3 Art - CP3.1	Grade 1 Math - P1.1 Grade 2 Math - P2.1 Grade 3 Math - P3.1 Grade 4 Math - P4.2	Grade 1 - PE1.4 PE1.9 Grade 2 - PE2.10 Grade 3 - PE3.8 Grade 4 - PE4.12

Activity in this Package!

Activity 5: Criss Cross Coding: Punnett Squares and Logic

Additional Resources

Inspiring learning through play! https://www.thinkfun.com/teachers/downloadable-games-brainteasers/

Unplugged Coding Websites:

- https://www.csunplugged.org/en/
- https://hourofcode.com/
- https://www.madewithcode.com/projects/

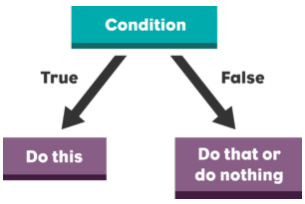
Looking for more ways to use the Let's Go Code! Activity Box? Take a look here for more cool ideas!
Youtube videos:

- If you are needing a little help understanding how to use the Let's Go Code! Activity Box click here

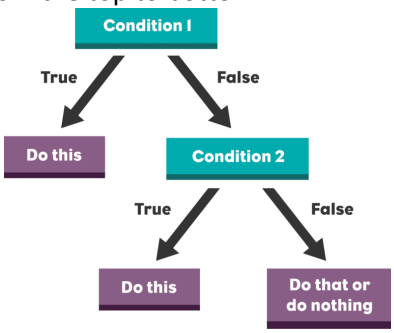
Big Ideas

Conditional Statements

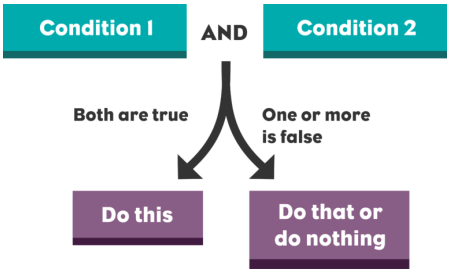
- **If/Else**- the "if" statement tells the computer what to do if the condition is true. The "else" statement tells the computer what to do if the condition is false
    - ex. *If* the number is divisible by 2 it is even, *else* it is odd.



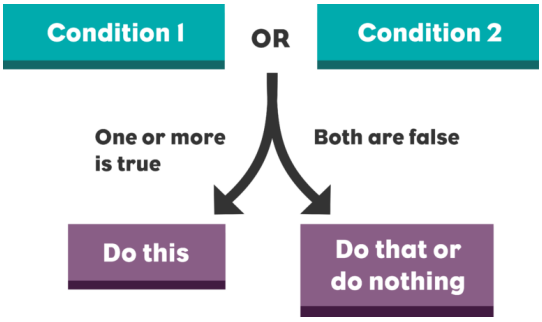
    - Multiple conditions can be added by inputting an additional else if statement between the initial conditions
    - ex. *If* you are free tonight we can meet then, *else if* we can meet tomorrow *else* we can meet on Saturday.
    - conditions are tested from the top to bottom



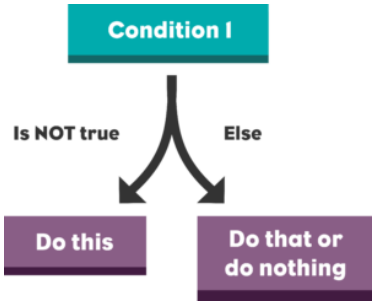
- **Logical Operators:** combine many boolean statements together (Checkpoint: **Boolean statements** are statements that are either true or false)
    - three main operators: and, or, & not.
    - **And:** for an "and" statement to be true, all of its' conditions must be true
        - True and True = True
        - False and True = False
        - True and False = False
        - False and False = False



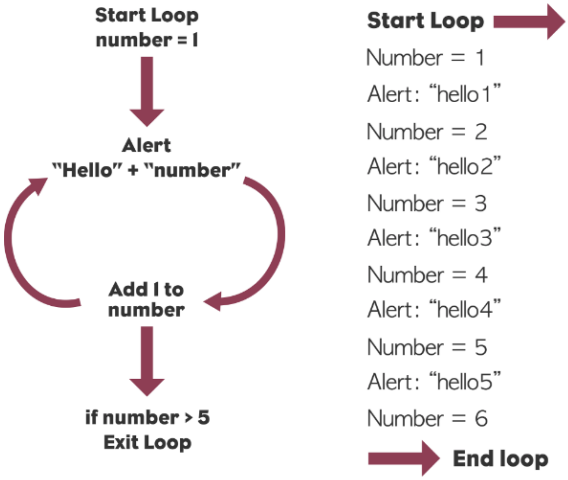
- **Or:** for an "or" statement to be true, at least one of its' conditions must be true
  - true or true = true
  - true or false = true
  - false or true = true
  - false or false = false



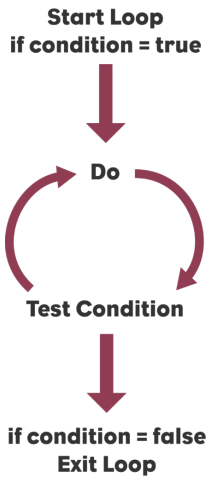
- **Not:** switches the value of the boolean to be the opposite of what it is
  - Not true = false
  - Not false = true



- **For Loops-**repeat a block of code a specified number of times. You determine how long your loops will go *for*
  - often use a variable, defined as counter, inside your loop to count how many times your loop has been run



- **While Loops:** loops that will continue to go until the condition(s) are no longer true
    - ex. **while** (amount of people at a party) > 0, **do** play music.
    - As demonstrated above there are two parts to a while statement: while and do



Quick Reference Terminology

Review of key words:

- Booleans - datatype that can be true or false
- Conditions - something an app evaluates to be true or false
- Conditional Statement - tells the app what to do after evaluating conditions
- AND Operator - evaluates as true if all of the inputs are true

- OR Operator - evaluates as true if one of the inputs is true
- NOT Operator - evaluates as the opposite of the input
- Loop - a repeating block of code
- For Loop - repeats a block of code a certain number of items
- For Each Loop - repeats a block of code for the number of items in a list
- While Loop - repeats a block of code while a condition is true

Real-world Applications: The other meaning of 'Logic'

...afterall, why is teaching logic important??

What is logic?

Understanding the world around us on a deeper level is something we want all of our students to achieve. Whether they are just starting their academic careers, in grade one, or reaching the bring of teenage-dom, all students should be taught the importance of logic.

Logic is the part of science that informs our students about validity and falsity in varying situations. It is the role of logic that helps students to decide what is true or false based on principle facts and inference.

Logic is separate from reasoning because logic forces concrete examples to support or deny the claims presented by specific situations. Our students will experience a myriad of different experiences in their adolescent years. We need to be teaching them how to differentiate between valid and invalid arguments through a solid understanding of logic.

Real-world applications:

As our world grows increasingly dependent on technology, our students are more susceptible than ever to fall prey to fake news, deep fakes, and whatever else the internet comes up with next. **Having the skills and abilities to tell the difference between fake news reports and real ones is crucial for our students now more than ever.**

Peer pressure and the need to fit in is pressing on our students through the increased use of technology. Not only are their friends putting pressure on our students, but so do the phones in their pockets. Thinking logically often helps students to see past the liminal experiences of the present and think critically about the consequences of their actions. Exposed to literally thousands of advertisements, videos, and unrealistic expectations, students must be trained to think logically in order to stay true to themselves and stay away from unhealthy habits promoted through social media.

What are the implications for academic success?

As educators, we all hope for our students to reach their utmost academic potential. One way that we, as educators, can boost our students likelihood of achieving academic success is teaching them

how to think logically. **Simply igniting that critical thinking aspect allows our students to overcome the adversaries that stand in the way of academic progress.**

Reading is more than just words

A student's probability of completing high school can be determined based on their grade three reading abilities. When measuring students' reading sufficiency there is more taken into account than just being able to sound out the words on a page. Comprehension as well as response are equally as important when it comes to reading. If you cannot understand the sentence you have read and respond accordingly there is not much point in having the ability to read the words. What do reading abilities have to do with logic you might ask? **Comprehension and response are learned through logical thinking.** Being able to think deeply about the text at hand will drastically increase a students reading sufficiency.

Library Resources

What is in the RPL "Let's Go Code" class-set box?

Activity 5:

Criss Cross Coding - Punnett Squares & Logic

Project Description

In this activity, we will explore how we can combine to logic of coding to determine the results of allele combinations. In general terms, we will use coding to make punnett squares.

Big Ideas

What is genetics? What are alleles anyways?

Genetics is the study of heredity and the variation of inherited characteristics.
Alleles are one of two or more alternative forms of a gene that arise by mutation and are found at the same place on a chromosome.

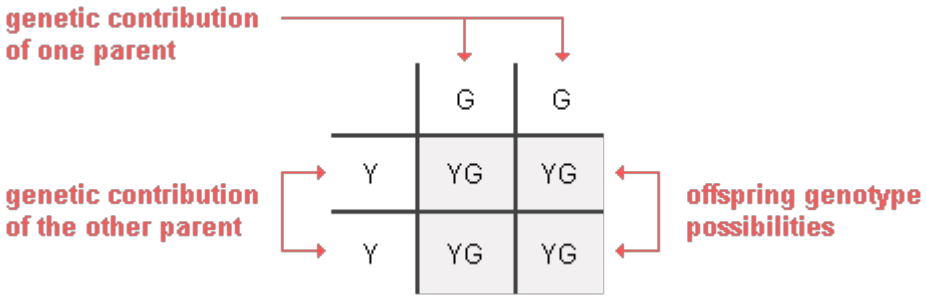
In general, you receive two alleles for each trait - one from the mother and one from the father. The combination of these genes is a **genotype.** How the gene or trait is expressed is known as the **phenotype.** Alleles are either dominant and recessive. Usually, they function in an either/or manner

however, occasionally they are expressed as a hybrid. Generally, dominant alleles are denoted with capital letters and recessive alleles are denoted with lower case letters.

If a genotype has two dominant alleles or two recessive alleles, it is known as **homozygous** (i.e. DD or dd).

If a genotype has one dominant and one recessive allele, it is known as **heterozygous** (i.e. Dd).

A **Punnett Square** combines allele combinations together, to predict the possibilities of offspring.



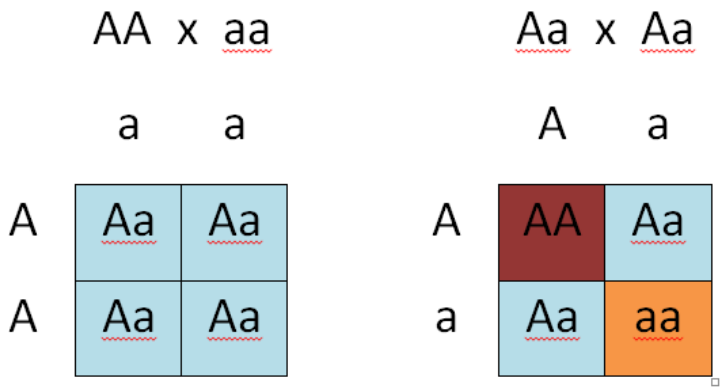
Materials

Paper and pencils for each student.

Procedure

1. Ensure students are familiar with the logical operators, conditionals, and loops explained at the top of this document.
2. Ensure students are familiar with how Punnett Squares work and understand the difference between Homozygous and Heterozygous pairs.
3. Have students make a variety of Punnett Squares for different allele combinations.

For example:



4. Then have students use logic to code and interpret the results of their Punnett Squares. Note: some will be much simpler than others. For example:

For Punnett Square 1 (AA x aa):
If you cross a homozygous dominant genotype with a homozygous recessive genotype, then all offspring with have a heterozygous genotype.

For Punnett Square 2 (Aa X Aa)
If you cross two heterozygous genotypes, then the offspring will have a homozygous recessive genotype OR a homozygous dominant genotype OR a heterozygous genotype.

5. Doing this activity ensures that students understand both concepts.