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Unplugged Algorithm Activity #2: Pizza Recipes

Algorithms can often be linear, that is, they followed a strict series of steps. However, not all algorithms follow a single path. Some algorithms have “branches”, or in other words, more than one possible path. The path that's taken depends on the logic of the algorithm.

In this activity, students first engage in a playful, interactive quiz in which they start to see how logic can be used to design algorithms with multiple paths. Afterwards, they'll demonstrate their understanding by using logic to construct their favourite pizza recipes.

Activity Overview

Estimated Time: 1h

Materials for the teacher:

- Computer or Laptop
- Projector and Screen
- Internet Access (Optional)
- Mobile Device (Optional)
- Speakers (Optional)

Materials for each student:

- Pizza Recipes Student Sheet
- Pencil
- Computer, Laptop, or Mobile Device (Optional)
- Internet Access (Optional)
- Logic Operators Student Sheet (Optional)
- Self-Assessment Student Sheet (Optional)

Preparation:

- Set up the equipment, including the computer or laptop, projector, and screen, to facilitate the quiz.
- If devices and Internet are available to all students, run through the warm-up and test the Kahoot! quiz using a mobile device. Ensure that all 10 questions can be answered.
- If devices and Internet are not available to all students, ensure that you have the Kahoot! quiz in PDF format, which is provided in the warm-up section.
- Print out 1 Pizza Recipes Student Sheet per student.
- Print out 1 Logic Operators Student Sheet per student. (Optional)
- Print out 1 Self-Assessment Student Sheet per student. (Optional)

Note to the teacher: Kahoot! is an online platform that allows users to create and share learning games made up of multiple choice questions. The games are intended to be played in a group setting in which each person chooses his or her answer on a computer, laptop, or mobile device. For more information, please visit the Kahoot! website: https://getkahoot.com/.

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Warm-up: Logic Kahoot! Pizza Edition (10 minutes)

Facilitate a game of Logic Kahoot! Pizza Edition with your class using one of the following options:

Option 1: Students have devices.

1. Using the projector, show the following page: https://play.kahoot.it/#/k/34839be1-8dbb-4961-bcbc-a2aadfa4565d
2. Once the page has loaded, click PLAY.
3. On the next page, click START NOW.
4. On the following page, choose Classic.
5. Once the Game PIN is displayed on the screen, ask students to use their devices to do the following:
    a. Go to kahoot.it.
    b. Enter the Game PIN.
    c. Enter a name.
6. Once everyone has entered their name, click Start to begin the game.

Option 2: Students do not have devices.

Using the projector, display the PDF copy of the Kahoot! quiz. Students may vote for their answers by raising their hands.

During the quiz, ask students to reflect after each question using the following prompts:

- Why did you choose your answer?
- What was easy or difficult about the question?

Activity: Build Your Favourite Pizzas (40 minutes)

Ensure that each student has a pencil and the Pizza Recipes Student Sheet.

Review the Pizza Recipes Student Sheet as a class. Explain that on the sheet, there are 6 steps to building a pizza. Their first task is to help fill in as many blanks as possible by

coming up with more options and toppings that they can add to each step. Give students 10 to 15 minutes to brainstorm individually or in small groups and write down their ideas.

Next, review the examples on the sheet. Explain that they need to use the words AND, OR, and NOT to build their pizzas. Allow students to build their top 3 favourite pizzas.

Reflections: Logic Operators (10 minutes)

Identify the words AND, OR, and NOT as **logic operators.** Explain that even though we all followed the same set of steps or algorithm to build a pizza, that is, we started with the crust, then added the sauce, meat, vegetables, cheese, and finally, the dipping sauce, we were able to use logic operators to change the outcome. Everyone ended up with different pizzas.

Facilitate a class discussion, or alternatively, ask students to reflect individually or in small groups using the following prompts:

- Describe your process for building your pizzas.
- When did you use the NOT operator?
- When did you use the OR operator?
- When did you use the AND operator?
- What was easy or difficult about building your pizzas?
- In what other situations do you use logic operators?
- How might a computer program use logic operators?

Assessment

Criteria	Approaching	Meeting	Exceeding
Student participated in the Kahoot! game by trying to answer one or more questions.			
Student added at least one option or topping to each step in the pizza menu.			
Student incorporated all three logic operators, AND, OR, and NOT in his or her pizza recipes.			
Student shared his or her reflections either individually or in a group discussion.			

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Extensions

Include the XOR operator

The XOR operator is short for **exclusive OR**, which means one or the other, but not both. For example, ham XOR pineapple would mean ham OR pineapple, but NOT (ham AND pineapple).

Replace the words AND, OR, NOT, XOR with symbols

Provide each student with a copy of the Logic Operators Student Sheet. Rather than using the words AND, OR, NOT, and XOR, replace them with their symbols as outlined in the sheet.

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Pizza Recipes Student Sheet

In this activity, you'll help design the pizza menu and use it to build your favourite pizza recipes.

To help design the pizza menu, fill in as many blanks as you can with more options. What other crusts, sauces, and toppings can you add?

Step 1: Choose your crust.

- ❑ Regular Crust
- ❑ Thin Crust
- ❑ _____
- ❑ _____
- ❑ _____
- ❑ _____

Step 2: Choose your sauce.

- ❑ Tomato Sauce
- ❑ BBQ Sauce
- ❑ _____
- ❑ _____
- ❑ _____
- ❑ _____

Step 3: Choose your meat.

- ❑ Pepperoni
- ❑ Ham
- ❑ _____
- ❑ _____
- ❑ _____
- ❑ _____

Step 4: Choose your vegetables.

- ❑ Mushrooms
- ❑ Pineapple
- ❑ _____
- ❑ _____
- ❑ _____
- ❑ _____

Step 5: Choose your cheese.

- ❑ Mozzarella
- ❑ Cheddar
- ❑ _____
- ❑ _____
- ❑ _____
- ❑ _____

Step 6: Choose your dipping sauce.

- ❑ Tomato Dip
- ❑ Ranch Dip
- ❑ _____
- ❑ _____
- ❑ _____
- ❑ _____

Next, using the words AND, OR, and NOT, build your favourite pizzas.

Example 1:
Here's an example of a basic pepperoni pizza:

Regular Crust AND Tomato Sauce AND Pepperoni AND Mozzarella AND Tomato Dip

Example 2:
If there's a topping that you really don't want on your pizza, like mushrooms, then you can use the word NOT:

Regular Crust AND Tomato Sauce AND Pepperoni AND NOT Mushrooms AND Mozzarella AND Tomato Dip

Example 3:
If there's an option where you don't mind having either one thing or the other, for example, maybe you don't mind having regular crust or thin crust, then you can use the word OR:

(Regular Crust OR Thin Crust) AND Tomato Sauce AND Pepperoni AND NOT Mushrooms AND Mozzarella AND Tomato Dip

Use the pizza menu to build your top 3 favourite pizzas. Make sure that you include AND, OR, and NOT in your pizza recipes.

Pizza Recipe 1:

Pizza Recipe 2:

Pizza Recipe 3:

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Logic Operators Student Sheet

Instead of using the words AND, OR, NOT, and XOR, replace them with their symbols as outlined below.

Logic Operator	Symbol
AND	&&
OR	||
NOT	!
XOR	^

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Self-Assessment Student Sheet

Give an example or provide evidence of how you demonstrated or accomplished each of the following statements during this activity. Examples and evidence can include sketches, written descriptions, and references to photos or videos.

Statement	Example or Evidence
During the quiz, I actively participated by answering one or more questions, and/or I supported other students when they shared their answers.	
At the end of the activity, I thought about how I used the logic operators to build my favourite pizza recipes, and how logic operators might be used in other situations.	