

## 6.3 WHAT IS AN ALGORITHM?

**Essential Question(s):** What is an algorithm? How are algorithms being used in our daily lives? How could biased algorithms impact political institutions?

### Overview

Algorithms are quickly replacing human judgment in many aspects of our lives. Algorithms started out as a way of making predictions, decisions and recommendations about products and entertainment by online service providers such as Amazon, Spotify, Google, Netflix and Facebook.

Today, algorithms are being used to predict and determine such life altering assessments as your criminal status, your credit score, your health and even your future success as an employee or student.

Consider the following: Is the algorithm always reliable when it predicts human behavior? Is it ethical to use an algorithm to make a critical decision about another person's life, especially when you can't see or understand the factors being considered?

### Snapshot

#### What Students Will Learn:

In this introductory lesson, students will learn what algorithms are, how they work and how they impact our daily lives.

#### Standard(s):

D2.Civ.10.9-12

D4.5.9-12

**Time:** 50 minutes each



## Objectives

- Explain what an algorithm is and how algorithms impact our lives.
- Explore the costs and benefits of using algorithms.

## Differentiation

If the classroom cannot support student movement, students can complete the activity sitting down and completing the worksheet.

## What's Needed

- Writing utensil and paper or 1:1 technology
- WiFi, internet, computer, screen or projector, speakers
- Signage, see “Classroom Setup” below.
- Make copies of the “[My Algorithmic Map](#),” one for each student.
- Prepare the “[Algorithm Definition](#)” to be projected for whole class viewing.
- “[How Do Algorithms Work?](#)” video clip (2016, 3:20 min.)

## Classroom Setup

Students will be seated and reflecting individually for the majority of the lesson. The “My Algorithm” activity asks students to move and be sorted around the room. Before class begins, create four signs with the numbers 1–4 and hang one sign in each corner of your room. Then post the [candy signage](#)—Starburst, Skittles, Reece’s Peanut Butter Cups, Hershey’s Bar, Snickers and Kit Kat—around the classroom so that all of the signs are spaced apart enough for group gatherings at each sign.

## Direct Teaching

1. As a warm up, have students respond to the following questions on paper:
  - What can you do that a computer program (or artificial intelligence) can’t do?
  - What can adults do in your life that a computer program (or artificial intelligence) can’t do?
2. After providing time to write, call on a few students to share their responses with the class.
3. Explain to students that this lesson will focus on a particular kind of computer program (or artificial intelligence) called an **algorithm**.
4. Ask students to raise a hand if they answer yes to the question, “Who listens to music on Spotify, Pandora or YouTube?”

## Key Vocabulary

algorithm



5. Ask students what artists they're currently listening to and how they create the playlists they're listening to. Ask if any of them use the "Made For You" playlists and the "Daily Mix" playlists. Explain that these playlists are created or curated based off of the artists and songs they listen to frequently.
6. Explain to students that all algorithms—not just music algorithms—make predictions (and tell stories) about them. Algorithms often take seemingly random data—like your musical favorites or even your choices in candy—to make much more important predictions about you.
7. Explain to students that they are now going to participate in a "My Algorithm" activity.
8. Distribute to each student the "My Algorithmic Map." Direct students to gather in the center of the classroom with a pencil and their map.
9. Explain to students that during this activity, you will read several prompts. After listening to each prompt, they should respond by following the next steps you give them. Unless prompted to share or talk, this is a silent activity.
10. Begin the activity as follows:
  - a. State the following prompt. *"I want you to imagine that you're at the local gas station. You haven't eaten all day, so you pick your favorite candy. You have six to choose from: Starburst, Skittles, Reece's Peanut Butter Cups, Hershey's Bar, Snickers or Kit Kat. Take your pick."*
  - b. Direct students to walk to the area of the room associated with their choice of candy, then circle that choice on their map.
  - c. After students gather in their respective area, have them share, for two minutes, with the others in the group why they like that particular candy.
  - d. State, *"Now that you have picked your candy, I'd like to be the first to tell you 'Congratulations,' an algorithm has turned your choice of candy into numerical data to make a prediction about your personality and shopping habits."*
  - e. Explain to students you will tell them where to move to next. Read the following, allowing time for each individual group to move:
 

*"Snickers, you like to shop at The Gap. Move to Sign 1."*

*"Skittles, you like to shop at Target. Move to sign 4."*

*"Starbursts and Kit Kats, you like to shop at Costco. Move to sign 2."*

*Hershey's Bars and Reece's Cups, you like to shop at Levi's Denim. Move to sign 3."*
  - f. State, *"The point of this game is to show you how algorithms make predictions and decisions about you. But often, we don't have access to an algorithm's decision-making process. We call these 'black box' algorithms. The algorithm we are using for this activity is close to a real one. But just like in real life, we aren't going to tell you the category that it is putting you into to make its decisions."*
  - g. Ask students the following question and instruct them to take two minutes and share their thoughts with the others in their group.
 

*"What do you think your choice of candy told the algorithm about your personality or shopping habits?"*

Tell students to write the prediction in the numbered section on their map that corresponds to the numbered sign where they stand and indicate if this prediction is true or not with a check mark.

- h. State, *“Good news! Now that the algorithm has determined your personality and shopping habits, it has also determined your taste in music!”*
- i. Read the following aloud, instructing students where to move to next and to write on their map corresponding to the numbered sign, the prediction you call out for them.
  - “The Gap, you like Lady Gaga. Move to Sign 4.”*
  - “Target, you like Metallica. Move to sign 2.”*
  - “Costco, you like Beyoncé. Move to sign 3.”*
  - Levi’s Denim, you like Taylor Swift. Move to sign 1.”*
- j. Tell students to discuss with their group whether this algorithm accurately predicted their taste in music and to write the prediction in the corresponding numbered section on their map and indicate if this prediction is true or not with a check mark.
- k. State, *“Now that the algorithm has determined your taste in music, let’s take the next algorithmic leap: Using your taste in music to predict your success in college.”*
- l. Read the following aloud, instructing students to write on their map, the prediction you call out for them:
  - “If you are a Lady Gaga fan, you are a pop music fan. An algorithm has predicted your SAT score will be 956. (Or ACT score of 18.)”*
  - “If you are a Metallica fan, you are a hard rock fan. An algorithm has determined your SAT score will be 1130. (Or ACT score of 22.)”*
  - “If you are Beyoncé fan, you are an R&B fan. An algorithm has determined your SAT score will be 990. (Or ACT score of 19.)”*
  - “If you are a Taylor Swift fan, you are a country music fan. An algorithm has determined your SAT score will be 1036 (Or ACT score of 20.)”*

Tell students to indicate on their map if this prediction is true or not with a check mark.

11. Ask students to respond to some of the following questions, either aloud or in writing:
  - What, if any, of these predictions about you were correct? Which predictions were incorrect?
  - How do you think an algorithm could use someone’s taste in music to predict their politics or SAT score? Are there ways that your taste in music could also tell the algorithm about your gender, race, sexuality or religion?
  - Algorithms ultimately tell stories about you. Is it ethical for a politician to use the candy you buy to determine what your personality is or how you might vote? Is it ethical for a school to use your musical taste to predict your SAT score?
12. Have students sit down. Explain that algorithms make predictions and tell stories about them. Project the following algorithm definition on the board/smart board and share with students:
 

An **algorithm** is a sequence of step-by-step instructions designed to transform data into decisions. Algorithms performed by computers allow decisions to be automated and greatly increase their speed and scale. Algorithms now replace human judgement in many professional, legal and social contexts.
13. Play the video, [“How Do Algorithms Work?”](#)

14. On a piece of paper, have students reflect on the following questions and turn in at the end of class:

After learning about algorithms and seeing how some of your preferences in music or candy can be turned into data and then correlated to your personality or educational success, what are the dangers involved in using an algorithm to make predictions or decisions about people? How might this impact voting or other political institutions? What are the benefits?

## Closing

Try to sort the benefits and risks. What are the correlations that you are seeing from students that you can share with them in the next class period? Have students share one or two of the correlations that they are seeing.



# STARBURST



# REECE'S PEANUT BUTTER CUPS





# HERSHEY'S BAR





# SKITTLES



# SNICKERS




# KIT KAT



# MY ALGORITHMIC MAP

Name: \_\_\_\_\_

1	<p><b>Prediction</b></p> <p>I shop at _____</p> <p>A music artist I like is _____</p> <p>My SAT score will be _____</p>	<p><b>True</b></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	<p><b>Not True</b></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>
2	<p><b>Prediction</b></p> <p>I shop at _____</p> <p>A music artist I like is _____</p> <p>My SAT score will be _____</p>	<p><b>True</b></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	<p><b>Not True</b></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>
<p style="color: #0070C0; font-weight: bold; font-size: 1.2em;">START HERE</p> <p style="color: #0070C0; font-weight: bold; font-size: 1.2em;">Circle your candy choice (only one).</p>			
			
3	<p><b>Prediction</b></p> <p>I shop at _____</p> <p>A music artist I like is _____</p> <p>My SAT score will be _____</p>	<p><b>True</b></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	<p><b>Not True</b></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>
4	<p><b>Prediction</b></p> <p>I shop at _____</p> <p>A music artist I like is _____</p> <p>My SAT score will be _____</p>	<p><b>True</b></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>	<p><b>Not True</b></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>



# ALGORITHM DEFINITION

An algorithm is a sequence of step-by-step instructions designed to transform data into decisions. Algorithms performed by computers allow decisions to be automated and greatly increase their speed and scale. Algorithms now replace human judgement in many professional, legal and social contexts.