



## Mary Jackson: Hidden Figure

### Objectives:

By the end of the lesson, students will be able to:

1. Know that Mary Jackson:
  - a) Was a mathematician and aerospace engineer who worked for NASA.
  - b) Was the first African American female engineer to work for NASA.
2. Know that engineers:
  - a) Design and build things to solve specific problems.
  - b) Wants to know how and why things work.

### Materials Needed:

1. Art supplies to make a portrait or photo collage.

### Vocabulary:

- National Advisory Committee for Aeronautics (NACA)
- West Area Computing
- Jim Crow Laws
- Segregated

**Subject Area:** Black History, Social Studies, Women's History, Career Exploration

Bloom Taxonomy	Affective Domain	Gardner's Multiple Intelligences
<ul style="list-style-type: none"> <li>• Knowledge</li> <li>• Understanding</li> <li>• Application</li> <li>• Analysis</li> </ul>	<ul style="list-style-type: none"> <li>• Receiving</li> <li>• Responding</li> <li>• Valuing</li> <li>• Organizing</li> </ul>	<ul style="list-style-type: none"> <li>• Audio</li> <li>• Linguistic</li> <li>• Interpersonal</li> </ul>

### Background on Mary Jackson

- Mary Jackson was born April 9, 1921 in Hampton Virginia and died on February 11, 2005.
- Mary Jackson was a highly intelligent student that graduated high school with honors.
- She attended Hampton Institute (now Hampton University) and graduated with a degree in **mathematics** and **physical science** in 1942.
- After graduating Hampton Institute, she became a math teacher in Maryland. After just one year of teaching, she moved back to Hampton, Virginia, and married Levi Jackson.
- In 1951, Mary started working at NACA (now NASA) as a member of the **West Area Computing**.
- In 1952, Mary left NASA and began working for engineer Kazimierz Czarnecki, conducting experiments in a high-speed wind tunnel. Czarnecki recommended that Mary enter a training program that would help her become an engineer.
- Although schools were segregated in Virginia, Mary received special permission to take courses white students.
- In 1958, Mary completed all the course work and became **NASA's first black female engineer**.
- Despite many attempts, Mary was denied engineering management level jobs. Therefore, she left engineering in 1979 to become a manager of the women's program at NASA. Even though the position was a demotion, Mary was able to **improve job opportunities for women**.
- Mary retired from NASA in 1985.

Source: [Mary Jackson | Biography & Facts | Britannica](#)

### Background on National Advisory Committee for Aeronautics (NACA)

- National Advisory Committee for Aeronautics (NACA) was established in 1915, 43 years before NASA.
- The role of NACA was to conduct aeronautics research, conduct experiments, and perform flight tests and simulations which led to major efforts and contributions in both World War I and World War II.

Source: <https://www.nasa.gov/ames/the-national-advisory-committee-for-aeronautics>

### West Area Computers

- The **West Area Computing unit was a group of Black women who manually performed complex mathematical calculations for the program's engineers.**
- These Black women were known as West Computers. **These women analyzed test data and provided mathematical computations that were extremely necessary for the early U.S. space program.**

Source: <https://www.britannica.com/biography/Katherine-Johnson-mathematician>

### Introduction/Motivation:

#### Part 1:

- Ask students, **“What is your favorite amusement/theme park?”** Entertain various answers such as, Dorney Park, Great Adventure or Disney Parks.
- Ask students, **“What was your favorite ride?”** Have students fully provide details.
- Share with students that, in the U.S. amusement/theme parks **earn over 20 million dollars** every day.
- Ask students why amusement/theme parks, such as Disney Park, earn so much money each year. **What makes the amusement/theme parks special?** Take a poll of student's responses:
  - Type of rides (3D rides, rollercoasters)
  - Good food
  - Games and prizes
  - Family atmosphere
- Most of the responses will be on the **type of rides.**

## Part 2#

### **Activity:** Create your own Amusement Park

- Tell students, “We are going to **turn the classroom into an amusement park**. Each of you will **make a ride** for the amusement park.”
- Show students ride inspiration photos: [Rides | Canada's Wonderland](#)
- If students are online, assign the project for homework.
- Have your students choose the medium they want to work with:
  - Drawing
  - Painting
  - building with LEGO
  - Cardboard rolls
  - Popsicle sticks
  - Plastic/paper cups, recycled containers
  - Paper plates
- Have students choose a theme for their ride (animals, The Avengers, Star Wars).
- Students present their amusement/theme park ride.

## Part 3#

Share with students that:

“An engineer is a person who designs and builds complex products, machines, systems, or structures. Engineers want to know how and why things work. They have scientific training that they use to make practical things. Engineers often specialize in a specific branch of engineering. The field of engineering is divided into branches such as civil, electrical, mechanical, and chemical engineering. Many types of engineering must be performed to design and build a complicated system such as a spacecraft.” (NASA for Kids) Engineers also **solve problems by improving how things work**.

- Say to students, “Today we’re going to learn about a mathematician and an aerospace engineer that worked for NASA. She was also the first African American female engineer to work for NASA. This woman is **Mary Jackson**.”

## For Older Students

### Introduction/Motivation

#### Part 1#

- Use the same introduction on page 3.
- Remind students that for the amusement/theme park to be successful, the **rides must function properly**.
- Ask students, “**Have you ever been on a ride that malfunctioned?**” Have students share their stories.
- Say to students that the rides of an amusement/theme park are created by **engineers**.
- Share with students, “engineers are people who design and build complex products, machines, systems, or structures. Engineers want to know how and why things work”. (NASA).

#### Part 2#

- Share with students a few careers in engineering. [List of Engineering Career Options with Job Descriptions | EducatingEngineers.com](#)
- Show students the video (3:11) and discuss the importance of the position: [Day at Work: Mechanical Engineer - YouTube](#)
- Show students a list of engineering jobs and salaries: [Types of Engineering Jobs: 2021 Engineers and Salaries List \(careerkarma.com\)](#)
- Remind students of the importance of an engineer. Say to students, “Today we’re going to learn about a mathematician and an aerospace engineer that worked for NASA. She was also the first African American female engineer to work for NASA. This woman is **Mary Jackson**.”

### Body

- Show video to introduce students to Mary Jackson 3:03 minutes [Mary Jackson - Educational Video - 5802660 - YouTube](#)
- Review the details of the video.
- Remind students that **engineers solve problems by improving how things work**.
- Mary Jackson’s problem was:
  - What elements on a rocket ship make it go slower when met with powerful winds?
  - To solve the problem, Mary conducted wind tunnel experiments.

- If the lesson is conducted in a classroom, have students pretend that they are in a wind tunnel. Student should pretend that a heavy amount of wind is pushing them.
- Tell students that, “Mary solved the problem and her findings **made it possible for rocket ships to fly better which helped the ships explore space more often.**

#### **Activity: You are an Engineer Today!**

- Students will pretend they are engineers for the day.
- Students will identify a problem at school and create a solution. Students will choose a medium (drawing, painting, poster, PowerPoint).
- Students will present their project.

#### **For older students:**

##### **Body**

- Introduce students to Mary Jackson by showing them the video, 1:30 [NASA names headquarters after Hidden Figure Mary W. Jackson - YouTube](#)
- Remind students that **engineers solve problems by improving how things work.**
- Mary Jackson’s problem was:
  - What elements on a rocket ship make it go slower when met with powerful winds?
  - To solve the problem, Mary conducted wind tunnel experiments.
- Tell students that, “Mary solved the problem and her findings **made it possible for rocket ships to fly better which helped the ships explore space more often.**

##### **Activity**

- Students will identify a problem at school or in their community.
- Students can focus on COVID-19 solutions or another healthcare issue.
- Students create a solution to that problem. Students will choose a medium (Prezi, PowerPoint, or another visual aid).
- Students will present their project.

**Links:**

About Mary Jackson: [Mary Jackson | Biography & Facts | Britannica](#)

Amusement Park stats: [The Secrets Behind Disney's \\$2.2 Billion Theme Park Profits \(forbes.com\)](#)  
[Amusement Park Facts | KidsKonnnect](#)

Creating your own Amusement Park: [Design and build your own ride or amusement park at home - Canada's Wonderland](#)

Engineering Field: [NASA for Kids: Intro to Engineering | National Geographic Society](#)

Types of Engineering jobs and salaries: [Types of Engineering Jobs: 2021 Engineers and Salaries List \(careerkarma.com\)](#)



## Mary Jackson Educational Video

[Mary Jackson - Educational Video - 5802660 - YouTube](#)

3:03 minutes

Have you ever been on an airplane or in a car and thought to yourself, “**Why is it designed like this?**”

I mean... surely there could have been a better or an easier way to shape and create cars and planes.

But what if I was to tell you that over many years’ scientist have discovered that these designs are the best designs.

Actually. These designs were created the same way that they created space crafts and rockets that go supersonic speed.

How do they do all this?

Well, let’s answer that question by going back in time, and looking at a very important scientist called Mary Jackson.

This is Mary Jackson.

Born April 19, 1921 and passed away in February 2005 at the ripe age of 83.

She loved science and getting others involved in science.

Within her 83 years, she did a lot of great thing as a scientist.

She studied hard and got a degree in mathematics and physical science.

She was a math teacher and eventually worked her way up to NASA as an engineer.

Wait! What is an engineer?

Well, the basic answer is an engineer is someone who wants to know how and why things work.

They design and build things to solve specific problems.

[www.iameducationalservices.org](http://www.iameducationalservices.org)



This means that Mary Jackson, as an engineer at NASA, had a problem to solve and wanted to know why and how to fix it and this is where things get interesting.

Mary's problem was understanding how surface and drag on an airplane, in other words... what elements on a rocket ship make it go slower when met with powerful winds.

She conducted her experiments by conducting wind tunnels.

What is a wind tunnel you might ask?

It is simple. A wind tunnel is a tunnel that has fans at one end, which blow to create a wind like form inside a tunnel.

When you place an ordinary object like a rocket inside, you can see how the wind will affect the object.

It's almost like the rocket is flying in space, but it actually is not moving.

But we need to ask an important question. So, what! Why does Mary Jackson's work on wind tunnels affect me?

Her results affected us in two ways.

Firstly, her findings on rocket ships and surface drag have helped other scientists design the best aircrafts that have enabled them to explore more of the galaxy at a better efficiency.

This means that our knowledge of the galaxy has increased significantly and will continue to increase.

Secondly, you remember how we spoke of the designs of airplanes and cars?

Well, Mary's work on rocket ships is simply transferred to these objects.

So, instead of placing a rocket ship inside the wind tunnel, we replace it with a car or a plane and test their surface and drag.

There you have it, a new understand of Mary Jackson.