

**Los Angeles Unified School District  
Division of Instruction  
Secondary Mathematics**

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**Lesson Plan: This lesson is about the movie - Hidden Figures.**

<b>Title:</b>	Hidden Figures Mathematicians
<b>Overview/Annotation:</b>	This lesson is about the movie Hidden Figures. Hidden Figures is a story about a group of black women working at the Langley Memorial Aeronautical Laboratory in Hampton, Virginia who helped America dominate aeronautics, space research, and computer technology, carving out a place for themselves as female mathematicians who were also black, black mathematicians who were also female.

**Associated Standards and Objectives**

<b>Content Standard(s):</b>	<i>*CA Math Standards for Grades 3-12</i>
<b>Learning Objective(s):</b>	Students will demonstrate an understanding of black women mathematicians who shouldered the burden of number crunching, acted as human computers, freeing the engineers of hand calculations in the decades before the digital age.
<b>Mathematics Objective</b>	Students would investigate the mathematics of friction and airflow that lead to differential equations.  This story of female achievement is the efforts contributed by courageous, African-American women. They helped blaze a trail for mathematicians and engineers of all races and genders to follow.

*\* Some CA Mathematics Standards for the grades 3-12 are implicitly addressed*

**Preparation Information**

<b>Lesson Duration:</b>	2-3 hour
<b>Materials and Resources:</b>	Each student will have a notebook/journal, blank storyboards, and handouts (see attached).
<b>Technology Resources:</b>	Classroom computer with Internet access, LCD projector or TV scan converter, computer lab, laptop carts, or one-to-one devices with Internet access, word processing and/or desktop publishing software (optional), and presentation software.
<b>Background/Preparation:</b>	Students should have a working knowledge of computers to include Internet searches, slideshow presentations with transitions, and inserted picture/clip art.

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**Procedures/Activities:**

1. Group the students into heterogeneous groups of four to conduct the research.
2. Introduce the lesson by telling a brief story about the black women working at the Langley Memorial Aeronautical Laboratory in Hampton, Virginia who helped America dominate aeronautics, space research, and computer technology, carving out a place for themselves as female mathematicians who were also black, black mathematicians who were also female that inspired the movie "Hidden Figures." Retell or read the story from a hard copy attached or a website using the computer projector. Spend time discussing the contribution of these women in the aeronautics, space research, and computer technology and the importance of mathematics in everyday life and society.
3. Following this discussion, take the students to the computer lab, or provide laptop carts, or one-to-one devices to research the hidden figures' story and the mathematics that helped NASA dominate the space and launched man to the space and to the moon. Use the information sheet to gather pertinent information (see attachment). Where computer and internet are not available, students could access the story from their school library or community library. They would capture the story and prepare a story book or collage of these women and their story.
4. Students will return to the classroom to use the information gathered to complete one of the following detailing the achievement and contribution of these African-American women in the field of aeronautics, space research, and computer technology and the importance of mathematics in everyday life and society:
  - a. Powerpoint presentation
  - b. Vine, Snapchat, or Tweet and a report on their findings
  - c. Video of the hidden figures as retold by the students
  - d. Journal entry, poster, comic strip, collage or diorama.
5. The teacher will review each groups research findings before they produce the PowerPoint; book report accompanied by Vine, Snapchat, or Tweet; Video; Journal entry accompanied with poster, comic trip, collage or diorama. Provide students with the handout of the requirements for the assignment (see criteria attachment).
6. Each group will compile their findings ready for presentation to the class. The students will have access to library resources about this segregated unit of mathematicians born of desperation during World War II who became the secret to NASA's success as well as research internet websites. The teacher may allow 40 minutes for library or computer lab, laptop carts, or one-to-one devices time for this component, or provide a weekend and assign this portion as homework. Provide help to the students before and/or after school.

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7. It is suggested that teacher takes the time to thoroughly review the parameters and the rubric for the presentation. As well as presentation techniques. The teacher should have the classroom ready for the presentations by having all equipment properly connected and tested prior to the students' arrival. By using a projection device, the class can see the slideshow as it appears on the computer screen.
8. Students will fill in the slideshow storyboard to determine how their presentation will look. By completing a storyboard, the teacher can make suggestions and answer questions prior to the student going to the computer lab, using laptop carts, or one-to-one devices. Allow students groups to share their storyboards with peers for feedback and constructive criticism.
9. Students will share their findings with the class through class discussion, presentations, and a question/answer session. Students are graded using the attached rubric. Allow peers to use rubrics to score student presentations.

**Attachments:**

- Project Rubric.doc
- Criteria
- Powerpoint Storyboard 1.doc
- Hidden Figures Research form.doc

**Assessment**

**Assessment Strategies**     The teacher will use rubrics (see attachment) to assess student knowledge. Students will engage in peer reviews to help each other edit and improve their work prior to teacher's final assessment.

**Resources and References:**

1. The True Story of "Hidden Figures," the Forgotten Women Who Helped Win the Space Race  
<http://www.smithsonianmag.com/history/forgotten-black-women-mathematicians-who-helped-win-wars-and-send-astronauts-space-180960393/>
2. The Hidden Black Women Who Helped Win the Space Race  
<http://nymag.com/thecut/2016/08/dorothy-vaughan-space-race-c-v-r.html>

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3. The True Story of 'Hidden Figures' and the Women Who Crunched the Numbers for NASA

<http://www.popularmechanics.com/space/rockets/a24429/hidden-figures-real-story-nasa-women-computers/>

4. A Mathematical Representation of the March on Washington – Lesson Plan

[http://www.pbs.org/newshour/extra/lessons\\_plans/the-50th-anniversary-of-the-march-on-washington-lesson-plan-a-mathematical-representation-of-the-march/](http://www.pbs.org/newshour/extra/lessons_plans/the-50th-anniversary-of-the-march-on-washington-lesson-plan-a-mathematical-representation-of-the-march/)

### **An excerpt of the Hidden Figures**

The phenomenal true story of the black female mathematicians at NASA at the leading edge of the feminist and civil rights movement, whose calculations helped fuel some of America's greatest achievements in space—a powerful, revelatory contribution that is as essential to our understanding of race, discrimination, and achievement in modern America as *Between the World and Me* and *The Immortal Life of Henrietta Lacks*.

Before John Glenn orbited the earth, or Neil Armstrong walked on the moon, a group of dedicated female mathematicians known as “human computers” used pencils, slide rules and adding machines to calculate the numbers that would launch rockets, and astronauts, into space.

Among these problem-solvers were a group of exceptionally talented African American women, some of the brightest minds of their generation. Originally relegated to teaching math in the South's segregated public schools, they were called into service during the labor shortages of World War II, when America's aeronautics industry was in dire need of anyone who had the right stuff. Suddenly, these overlooked math whizzes had a shot at jobs worthy of their skills, and they answered Uncle Sam's call, moving to Hampton, Virginia and the fascinating, high-energy world of the Langley Memorial Aeronautical Laboratory.

Even as Virginia's Jim Crow laws required them to be segregated from their white counterparts, the women of Langley's all-black “West Computing” group helped America achieve one of the things it desired most: a decisive victory over the Soviet Union in the Cold War, and complete domination of the heavens.

Starting in World War II and moving through to the Cold War, the Civil Rights Movement and the Space Race, *Hidden Figures* follows the interwoven accounts of Dorothy Vaughan, Mary Jackson, Katherine Johnson and Christine Darden, four African American women who participated in some of NASA's greatest successes. It chronicles their careers over nearly three decades they faced challenges, forged alliances and used their intellect to change their own lives, and their country's future.