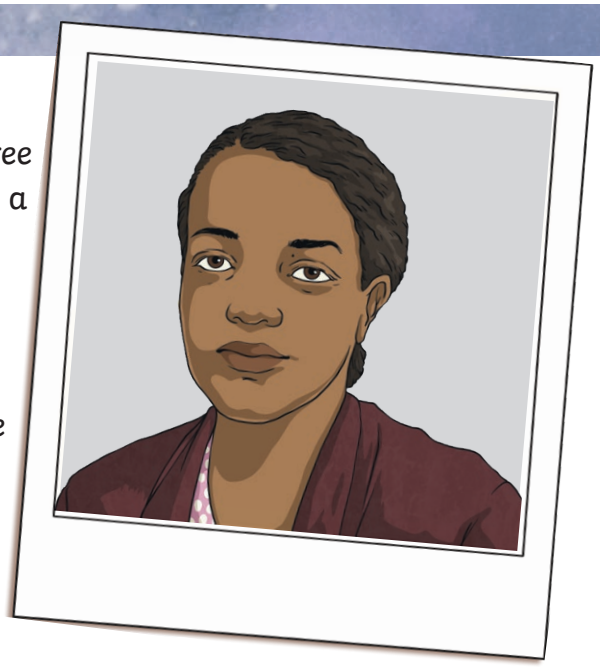
The Women Who Helped Build NASA

When people first started to explore space, lots of complicated calculations needed to be done. Amazingly, these weren't done by an electronic computer. Instead, everything was worked out by a team of talented people who were known as human computers. Read on to discover more about four inspirational women who worked as human computers.

Dorothy Vaughan



Dorothy Vaughan was born on 20th September 1910. In 1929, she gained a degree in mathematics. To begin with, she was as a maths teacher before working at **NACA**.

When Dorothy began working for NACA, there were laws in place that meant that Black workers were **segregated** from White workers. This meant that Dorothy and other Black workers had to work in a separate office. This office was known as the West Area Computing Unit.

In 1949, Dorothy became the manager of the West Area Computing Unit. This meant that she was the first Black manager at NACA.

Katherine Johnson

Born Creola Katherine Coleman on 26th August 1918, Katherine Johnson worked on lots of early space missions.

In 1937, Katherine gained a degree in mathematics and French. In 1953, she started working with Dorothy Vaughan at the West Area Computing Unit.

NACA became **NASA** in 1958 and the offices stopped being segregated. When this happened, Katherine became a member of the Space Task Group. This meant that she was a part of the team who worked out where and when to launch the Apollo 11 rocket so that it could reach the Moon.

In 2016, NASA named a research facility after Katherine and her amazing work.

Mary Jackson

Mary Jackson was born on 9th April 1921. She earnt a degree in mathematics and physical science before joining the West Area Computing Unit.

A few years later, Mary began to work with an engineer at NACA. He was investigating how strong winds affect a rocket ship. Impressed with Mary, he told her that she should train to become an engineer.

At the time, schools in Virginia were still segregated so Mary had to get special permission to study with White students. Mary got the permission to study and became NACA's first Black female engineer in 1958.

Dr Christine Darden

Dr Christine Darden was born on 10th September 1942. She earnt a degree in mathematics and worked at NASA for 40 years.

When she was working at NASA, she noticed that most of the engineers were men and that most of the mathematicians were women. She also wondered why it was only the men who got to complete their own research projects.

Christine asked a manager why there weren't more female engineers. He explained that nobody had thought to ask that question before. As a result, Christine was promoted and began working as an engineer.

After this, Christine started taking part in her own research. She wrote over 50 papers that talked about her results and what she had discovered.

Glossary

NACA: An agency that was founded to undertake aeronautical research. It stands for National Advisory Committee for Aeronautics.

NASA: An agency that encourages the peaceful research of space science. It stands for National Aeronautics and Space Administration.

segregated: Separated or divided along racial, religious or other lines.

Questions

1. In what year did NACA become NASA? Tick one.
   - ○ 1918
   - ○ 1937
   - ○ 1958
   - ○ 2016

2. Number the events from 1-4 to show the order that they happened in.
   - ☐ Mary Jackson became NACA's first Black female engineer.
   - ☐ Dorothy became the manager of the West Area Computing Unit.
   - ☐ Katherine gained a degree in mathematics and French.
   - ☐ NASA named a research facility after Katherine Johnson.

3. **When people first started to explore space, lots of complicated calculations needed to be done.**
   Write another word that means that same as **complicated.**

   _____

4. What was Dorothy Vaughan's job before she worked at NACA?

   _____

5. Fill in the missing words.

   Katherine was part of the team who worked out

   when and _____ to launch the _____ 11 rocket.

6. Summarise what you have learnt about Katherine Johnson using 20 words or fewer.

   _____

   _____

   _____

7. Explain how you think Mary Jackson felt when the engineer that she was working with suggested that she should train to become an engineer.

   _____

   _____

   _____

8. Argue that Dr Christine Darden was right to ask a manager why there weren't more female engineers.

Answers

1. In what year did NACA become NASA? Tick one.
   - ○ 1918
   - ○ 1937
   - ☑ **1958**
   - ○ 2016

2. Number the events from 1-4 to show the order that they happened in.

   3 Mary Jackson became NACA's first Black female engineer.

   2 Dorothy became the manager of the West Area Computing Unit.

   1 Katherine gained a degree in mathematics and French.

   4 NASA named a research facility after Katherine Johnson.

3. **When people first started to explore space, lots of complicated calculations needed to be done.**
   Write another word that means that same as **complicated.**
   Accept any appropriate synonym, such as: difficult; complex; hard; tricky.

4. What was Dorothy Vaughan's job before she worked at NACA?
   Dorothy was a maths teacher before she worked at NACA.

5. Fill in the missing words.

   Katherine was part of the team who worked out
   when and **where** to launch the **Apollo** 11 rocket.

6. Summarise what you have learnt about Katherine Johnson using 20 words or fewer.
   Pupils' own responses, such as: Katherine worked on lots of early space missions and was a part of the Space Task Group.

7. Explain how you think Mary Jackson felt when the engineer that she was working with suggested that she should train to become an engineer.
   Pupils' own responses, such as: I think that Mary Jackson felt really excited when someone told her that she should train to be an engineer. I also think that she would have been worried about where she would train because she wasn't allowed to study with White students.

8. Argue that Dr Christine Darden was right to ask a manager why there weren't more female engineers.
   Pupils' own responses, such as: Dr Christine Darden was right to ask a manager why there weren't more female engineers because, if she hadn't, she might never have become an engineer. She also probably wouldn't have written 50 papers that talked about her discoveries.

The Women Who Helped Build NASA

In the early days of space travel, complicated calculations were not done by electronic computers but by people who were known as human computers. Some of the calculations that these incredible people wrote were as long as several books! Read on to discover more about four inspirational women who worked as human computers at NASA's (originally known as NACA) Langley Research Centre in Virginia, United States.

Dorothy Vaughan

Dorothy Vaughan was born on 20th September 1910. She was an incredible mathematician who helped with lots of different research at the Langley research centre.

When she was younger, Dorothy loved maths. In 1929, she graduated with a degree in mathematics. To begin with, she worked as a maths teacher before starting work at NACA.

When Dorothy began working for NACA, there were laws in place that meant that Black workers were **segregated** from White workers. As a result, Dorothy and other Black workers had to work in separate offices (called the West Area Computing Unit) and eat on a separate table at lunchtime.

In 1949, Dorothy became the supervisor of the West Area Computing Unit. This meant that she was the first Black manager at NACA.

Katherine Johnson

Born Creola Katherine Coleman on 26th August 1918, Katherine Johnson worked on lots of early space missions.

In 1937, Katherine gained a degree in mathematics and French. In 1953, she started working with Dorothy Vaughan at the West Area Computing Unit.

NACA became NASA in 1958 and the offices stopped being segregated. When this happened, Katherine became a member of the Space Task Group. This meant that she was a part of the team who worked out where and when to launch the Apollo 11 rocket so that it could reach the Moon.

In 2016, NASA named a research facility after Katherine and her amazing work.

Mary Jackson

Mary Jackson was born on 9th April 1921. While at university, Mary earnt a degree in mathematics and physical science. She worked as a maths teacher before joining the West Area Computing Unit.

A few years later, Mary began to work with an engineer at NACA who was investigating the effects of strong winds on a rocket ship. The engineer was so impressed with Mary that he suggested that she trained to become an engineer.

At the time, schools in Virginia were still segregated so Mary had to get special permission to allow her to study alongside White students. After receiving the permission, Mary completed the courses and became NACA's first Black female engineer in 1958.

In 2020, NASA announced that they were going to name their headquarters in Washington DC after Mary to commemorate the amazing work that she did for them.

Dr Christine Darden

Dr Christine Darden was born on 10th September 1942. She worked at NASA for 40 years before retiring in 2007.

After earning a degree in mathematics, Christine began working as a human computer for NASA. After several years, she wondered why most of the engineers – who worked on important projects – were men. She also wondered why most of the women worked on the complex calculations but didn't get to conduct their own research.

As a result, Christine asked a manager why there weren't more female engineers. He told Christine that it was because nobody had thought to ask that question before. Within a short space of time, she had been promoted and began working as an engineer.

In total, Christine wrote more than 50 papers that spoke about the research that she had conducted.

Glossary

segregated: Separated or divided along racial, religious or other lines.

Questions

1. Who earned a degree in both mathematics and physical science? Tick one.
   - ○ Dorothy Vaughan
   - ○ Katherine Johnson
   - ○ Mary Jackson
   - ○ Dr Christine Darden

2. Number the events from 1-4 to show the order that they happened in.
   - ☐ NASA named their headquarters after Mary Jackson.
   - ☐ Dr Christine Darden retired from her work at NASA.
   - ☐ NASA named a research facility after Katherine Johnson
   - ☐ Dorothy Vaughan graduated with a degree in mathematics.

3. What did Katherine Johnson do as part of the Space Task Group?

   _____

4. Who was NACA's first Black female engineer?

   _____

5. **Christine wondered why most of the women worked on the complex calculations but didn't get to conduct their own research.**
   Explain what the word **conduct** means in this sentence.

   _____

6. Do you think that people who read this text will be inspired to become mathematicians? Explain your answer.

   _____

   _____

   _____

7. **Some of the calculations that these incredible people wrote were as long as several books!**
   Explain why you think that the author chose to include this sentence.

   _____

   _____

   _____

8. In the future, do you think that NASA will name buildings after Dorothy Vaughan and Dr Christine Darden? Explain your answer.

9. Imagine that you are Dr Christine Darden about to talk to the manager.
Explain how you are feeling.

Answers

1. Who earned a degree in both mathematics and physical science? Tick one.
   - ○ Dorothy Vaughan
   - ○ Katherine Johnson
   - ☑ **Mary Jackson**
   - ○ Dr Christine Darden

2. Number the events from 1-4 to show the order that they happened in.

4	NASA named their headquarters after Mary Jackson.
2	Dr Christine Darden retired from her work at NASA.
3	NASA named a research facility after Katherine Johnson
1	Dorothy Vaughan graduated with a degree in mathematics.

3. What did Katherine Johnson do as part of the Space Task Group?
   Katherine Johnson was a part of the team who calculated where and when to launch the Apollo 11 rocket so that it could reach the Moon.

4. Who was NACA's first Black female engineer?
   Mary Jackson was NACA's first Black female engineer.

5. **Christine wondered why most of the women worked on the complex calculations but didn't get to conduct their own research.**
   Explain what the word **conduct** means in this sentence.
   Accept any appropriate definition, such as: The word conduct means to take part in their own research.

6. Do you think that people who read this text will be inspired to become mathematicians? Explain your answer.
   Pupils' own responses, such as: I think that people will be inspired to become mathematicians because the four people in this text were all amazing and got to work on some really exciting projects like the Apollo 11 Moon landing.

7. **Some of the calculations that these incredible people wrote were as long as several books!**
   Explain why you think that the author chose to include this sentence.
   Pupils' own responses, such as: I think that the author chose to include this sentence so that you could get an idea of how much work the human computers had to do. This is because it is difficult to imagine having to work out complex calculations without using a computer.

8. In the future, do you think that NASA will name buildings after Dorothy Vaughan and Dr Christine Darden? Explain your answer.
   Pupils' own responses, such as: Yes, I think that NASA will name buildings after Dorothy Vaughan and Dr Christine Darden. This is because they have also contributed amazing things to the work of NASA so their hard work will probably be commemorated too.

9. Imagine that you are Dr Christine Darden about to talk to the manager.
   Explain how you are feeling.
   Pupils' own responses, such as: I am feeling really nervous because I don't know what he's going to say. I really want to be an engineer but women don't seem to be so I'm worried that he'll just tell me to go away.

The Women Who Helped Build NASA

In the early days of space travel, important, complex calculations were not completed by electronic computers but by a team of people who were known as human computers. These people spent their days plotting graphs and writing down calculations – some of which were as long as several books! Read on to discover more about four inspirational women who worked as human computers at NASA's (originally known as NACA) Langley Research Centre in Virginia, USA.

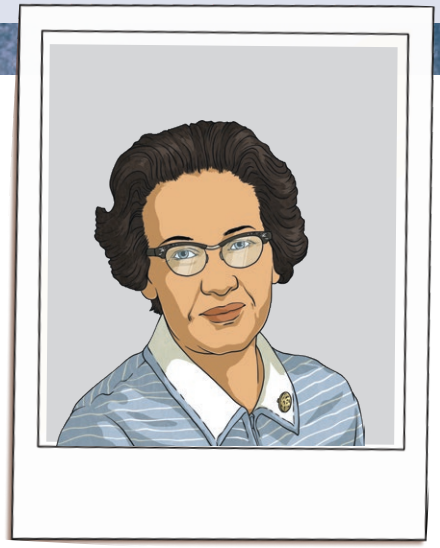
Dorothy Vaughan

Dorothy Vaughan was born on 20th September 1910 in Missouri, USA. She was an incredible mathematician who contributed to a vast amount of research at the Langley Research Centre.

As a young child, Dorothy loved maths. In 1929, she graduated with a degree in mathematics and began working as a maths teacher before joining the team at NACA.

When Dorothy began working for NACA, there were laws in place that meant that Black workers were segregated from White workers. As a result, Dorothy and other Black workers had to work in separate offices (known as the West Area Computing Unit), use separate toilets and eat on a designated table during their lunch breaks.

In 1949, Dorothy became the supervisor of the West Area Computing Unit – this made her the first Black manager at NACA and one of only a few women who had been promoted to a management position.



Katherine Johnson

Born Creola Katherine Coleman on 26th August 1918 in West Virginia, Katherine Johnson was responsible for making important calculations that led to the success of numerous early space missions.

In 1937 – after skipping ahead several years in school – Katherine graduated with a degree in mathematics and French. In 1953, she joined the West Area Computing Unit where she worked under the guidance of Dorothy Vaughan.

When NACA became NASA in 1958, the once segregated facilities were merged together. It was at this point that Katherine became a member of the Space Task Group. Here, she was a part of the team who used their incredible mathematical skills to accurately calculate where and when to launch the Apollo 11 rocket so that it could reach the Moon.

In 2016, NASA celebrated the amazing contribution that Katherine had made to early space travel by naming a research facility after her.

Mary Jackson

Mary Jackson was born on 9th April 1921 in Virginia. During her time working for NASA, Mary worked to ensure that women were given equal opportunities to be scientists, mathematicians and engineers.

While at university, Mary earnt a degree in mathematics and physical science. She worked as a maths teacher before joining the West Area Computing Unit.

A few years later, Mary left the work of the West Area Computing Unit to work with an engineer at NACA who was investigating which parts of a rocket ship made it slow down when it was travelling against a strong wind. The engineer was so impressed with Mary that he suggested that she began training to become an engineer.

At the time, schools in Virginia were still segregated so Mary had to obtain special permission to allow her to study alongside White students. After receiving permission to study, Mary completed the courses and was promoted to become NACA's first Black female engineer in 1958.

In 2020, NASA announced that they were going to name their headquarters in Washington DC after Mary to commemorate the incredible work that she did for them.

Dr Christine Darden

Dr Christine Darden was born in North Carolina on 10th September 1942. She spent 40 years conducting research for NASA before retiring in 2007.

After earning a degree in mathematics, Christine began working as a human computer for NASA. After several years, she began to wonder why the majority of men were engineers who worked on important projects while the majority of the females worked on the complex calculations and didn't undertake research projects of their own.

Wanting to address this, Christine asked a senior member of staff why there weren't more female engineers. He told Christine that it was because nobody had thought to ask that question before. Within a short space of time, she had been promoted and was transferred to the engineering sector.

It was here that Christine spent the rest of her career studying the effects of sonic booms. In total, she published more than 50 papers that outlined her important research.

Questions

1. Who was a member of the Space Task Group? Tick one.
   - ◯ Dorothy Vaughan
   - ◯ Katherine Johnson
   - ◯ Mary Jackson
   - ◯ Dr Christine Darden

2. Number the events from 1-4 to show the order that they happened in.
   - ☐ Katherine joined the West Area Computing Unit.
   - ☐ Dr Christine Darden stopped working at NASA.
   - ☐ Dorothy became NACA's first Black manager.
   - ☐ NACA became NASA.

3. Look at the section about **Mary Jackson.**
   Find and copy one word that means the same as **get.**

   _____

4. When she became an engineer, what did Dr Christine Darden spend the rest of her career studying?

   _____

5. According to the text, what did NASA announce in 2020?

   _____

6. Compare Mary Jackson and Dr Christine Darden.

   _____

   _____

   _____

7. Explain what you think that the senior member of staff meant when he told Christine that **nobody had thought to ask that question before**.

   _____

   _____

   _____

8. How do you think that Mary Jackson was feeling when she started studying to become an engineer?

9. What evidence can you find that shows the author is inspired by these four women?

10. Argue that Dorothy Vaughan should have a building at NASA named after her in the future.

Answers

1. Who was a member of the Space Task Group? Tick one.
   - ○ Dorothy Vaughan
   - ☑ **Katherine Johnson**
   - ○ Mary Jackson
   - ○ Dr Christine Darden

2. Number the events from 1-4 to show the order that they happened in.

2	Katherine joined the West Area Computing Unit.
4	Dr Christine Darden stopped working at NASA.
1	Dorothy became NACA's first Black manager.
3	NACA became NASA.

3. Look at the section about **Mary Jackson.**
   Find and copy one word that means the same as **get.**
   obtained

4. When she became an engineer, what did Dr Christine Darden spend the rest of her career studying?
   Christine spent the rest of her career studying the effects of sonic booms.

5. According to the text, what did NASA announce in 2020?
   In 2020, NASA announced that they were going to name their headquarters in Washington DC after Mary Jackson.

6. Compare Mary Jackson and Dr Christine Darden.
   Pupils' own responses, such as: Both Mary Jackson and Dr Christine Darden worked as human computers after gaining a degree in mathematics. They also both stood up for what they believed in: Mary worked to make sure that women were given equal opportunities and Christine asked a senior member of staff why women weren't being given the same opportunities.

7. Explain what you think that the senior member of staff meant when he told Christine that **nobody had thought to ask that question before.**
   Pupils' own responses, such as: I think that the senior member of staff meant that there weren't more female engineers because nobody had asked about it before. I think he meant that if we don't question things that we disagree with then nothing will change.

8. How do you think that Mary Jackson was feeling when she started studying to become an engineer?
   Pupils' own responses, such as: I think that Mary Jackson was feeling nervous but excited. I think that she was feeling nervous because she had to get special permission to study but excited because she would become NACA's first Black female engineer.

9. What evidence can you find that shows the author is inspired by these four women?
   Pupils' own responses, such as: The author has used lots of positive adjectives to describe these four women, such as inspirational, incredible and amazing. They also describe their work to make it sound impressive by using phrases like 'vast amount of research' and 'the success of numerous space missions'.

10. Argue that Dorothy Vaughan should have a building at NASA named after her in the future.
    Pupils' own responses, such as: Dorothy Vaughan should have a building at NASA named after her in the future because she was the first Black manager at NACA which was an amazing achievement at a time when the offices were segregated. She also contributed to a lot of research and she should be commemorated for that.