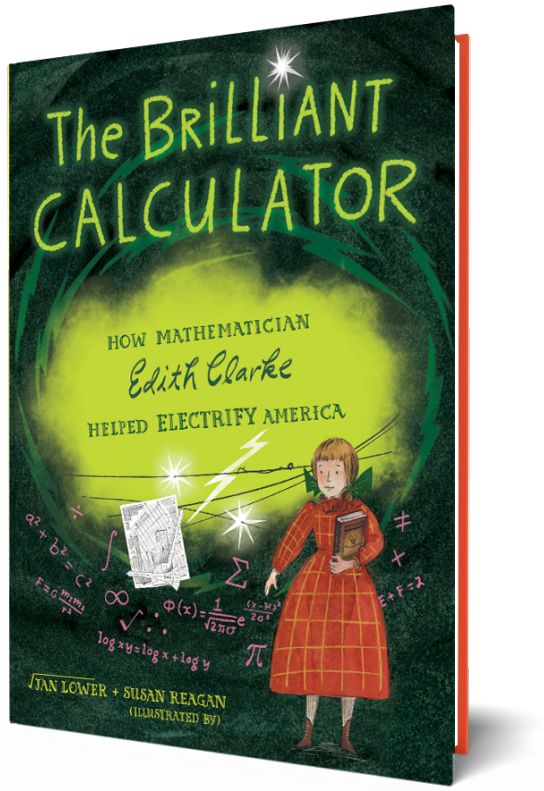
DISCUSSION GUIDE

THE BRILLIANT CALCULATOR: How Mathematician Edith Clarke Helped Electrify America



Written by Jan Lower
Illustrated by Susan Reagan

$18.99 US / $24.99 CAN
ISBN 9781662680069 HC
ISBN 9781662680076 eBook

Grades: 2-5
Ages: 7-10

ABOUT THE BOOK

Edith Clarke devoured numbers, puzzles, and brainteasers, and dreamed of how mathematics could modernize America in the brand-new 20th century. Fascinated by electricity, Edith earned a degree in electrical engineering, but no one would hire a woman.

So—on her own—she tackled a daunting problem: the hundreds of calculations needed to design electrical wires. Edith invented the Clarke Calculator, which solved equations ten times faster than a human. Every engineer working to electrify the country wanted one. Edith Clarke was finally hired as an electrical engineer—the first woman in America!

ASTRA BOOKS FOR YOUNG READERS

CALKINS CREEK

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PRAISE FOR *THE BRILLIANT CALCULATOR*

"The full-color images catch the eye and playfully include mathematical puzzles. Edith's quotes are interspersed throughout, highlighting her love of math and her determination to succeed in a traditionally male field. This one will inspire and validate any readers who love mathematics and calculations, especially anyone who has felt marginalized within STEM fields...Rousing encouragement for readers—especially math-minded ones—to follow their dreams." —***Kirkus Reviews***

"(T)he text tells Clarke's story in terms that are accessible to children and offers more information in the extensive back matter. The attractive illustrations, drawn digitally and brightened with watercolors, do a particularly good job of portraying Clarke as she gradually grows from childhood to maturity. An intriguing introduction to a trailblazing woman in the field of electrical engineering."—***Booklist***

ABOUT THE AUTHOR

Jan Lower has worked with quite a few electrical engineers, but none as remarkable as Edith Clarke. When she's not investigating inventions from her home in Maryland, Jan is searching for fascinating non-fiction stories, like NASA's mission to connect with other life forms in the universe, told in her book *A Song for the Cosmos: Blind Willie Johnson and Voyager's Golden Record*. A former lawyer, Jan holds an MFA in Writing for Children and Young Adults from the Vermont College of Fine Arts. Find out more about Jan at janlower.com.

Susan Reagan has always loved illustration and drawing just as much as Edith Clarke loved mathematics and electricity. Her picture books include *You and Me*, *Lights Out*, and *Revolutionary Prudence Wright*. Susan graduated with a BFA in illustration from the Columbus College of Art and Design. She lives in Tremont, a historical neighborhood of her hometown of Cleveland, Ohio. Learn more about Susan at susanreaganart.com.

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DISCUSSION QUESTIONS

1. Examine the cover of *THE BRILLIANT CALCULATOR*. What—or who—does the word "calculator" refer to? What does the word "electrify" mean?

2. How do the colors on the cover make you feel? What is the writing in pink?

3. What can you understand about Edith Clarke from the cover?

4. What do you think the story is about? Make some predictions. What questions do you have?

5. In the opening quotation of Edith Clarke's words, what does "ideal" mean? Why would girl (and boy) mathematicians enjoy electrical engineering?

6. On the next pages, how do the illustrations show that Edith loved math? Can you solve the picture puzzles?

7. How do you think Edith felt when her father died? When her mother died?

8. Describe what Edith sees when she arrives at boarding school. What does her expression tell you? Why does she feel that way?

9. The author wrote, "Edith finished school as the twentieth century began." What year did the twentieth century begin? What are the unusual details that the illustrator chose for this scene?

10. The author wrote, "Edith saw that modern times needed the numbers she loved. Measures and computations made dreams become reality." What in the illustration of the city street would need to be measured to be built or made?

11. What do you think about Edith's decision to learn about history and literature, to study Latin, and to teach herself ancient Greek? Would you study a subject on your own?

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12. Name some characteristics you think Edith showed in deciding to teach herself, hire a tutor, and to begin college late, "at the age most students graduate."

13. Do you think Edith's decision to become a teacher was "giving up" on her dream of being an engineer, or was it a practical choice? Why did she decide to stop teaching?

14. What are some of the reasons Edith found electricity to be fascinating?

15. Edith worked on her own to simplify the process of building lines that carried electricity over long distances, a problem that stumped many other engineers. What kind of person would work alone on such a challenge?

16. In the illustration where the other engineers are testing her calculator, describe what you imagine they are thinking. Look at Edith's expression and posture. How do you think Edith feels?

17. On the next page, do you recognize any of the famous electrical engineers standing around Edith? Tell what you know about them. They are not mentioned in the story—why do you think the illustrator included them?

18. On the last page, around the quotation, identify some of the things that are illustrated that women engineers can do and have done.

19. Like authors, illustrators do research when they tell historical stories. What details do you notice in the illustrations that help you understand the time and place?

20. Return to the predictions you made earlier. Were you correct? Did you find answers to any of the questions you asked? What would you like to know more about?

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DISCUSSION QUESTIONS: BACK MATTER (AUTHOR'S NOTE, TIMELINE, OTHER INVENTORS, SOURCES)

1. Edith Clarke received a patent from the U.S. government for her Clarke Calculator, which gave her the right to prevent anyone else from using her invention without paying her for it. Yet she immediately gave it away for free by publishing the design in an engineering journal. Why do you think she did?

2. The Author's Note provides more details about Edith Clarke's life. Is there any activity that you have in common with her?

3. Examine the timeline. Why do you think it took so long for homes and farms in rural America to receive electric service?

4. What did families use electric power for when they received it?

5. The timeline notes that Edith retired from her career to her farm in Maryland in 1945. Yet two years later she started working again, at the age of sixty-four. What was her new job? Why did she begin a new job so far from her home in Maryland? Think of as many reasons as you can. What does this tell you about what kind of person she was?

6. Read the brief biographies provided of other women mathematicians, engineers, and inventors. Who would you like to learn more about? Why?

7. In the Selected Bibliography, author Jan Lower provides information about **primary sources** (speeches, official records, newspapers, interviews), **and secondary (or other) sources**, such as books about the era in history, accounts written about Edith Clarke after her death, and information about electric power and its transmission. Which kind of sources are useful for discovering facts? Why? Which kind of sources are useful for discovering what a person was like and what that person thought and felt? Why?

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