■ Science in the Movies: Hidden Figures (2016)

Grade Level: 6–12 | Topics: Mathematics · Engineering · Physics · Equity in STEM

■ Scene Focus

Clip: Katherine Johnson calculates the re-entry trajectory for John Glenn’s orbital flight.
Timestamp: 01:45:00–01:48:00
Focus: Precision in mathematics, teamwork, and representation in STEM.

■ Before You Watch

1. Why is precision so important in space flight?
2. How might mathematics be used to ensure an astronaut’s safety?
3. What challenges do you think women and people of color faced at NASA during the 1960s?

> Prediction Time! How might Katherine Johnson’s mathematical skills help NASA overcome a challenge in this scene?

■ A. Science Connections

1. What mathematical problem is Katherine Johnson solving for NASA?

2. Why is calculating an orbital trajectory so critical for a safe re-entry?

3. How do engineering and mathematics work together in this scene?

4. What does this clip reveal about teamwork and respect for scientific expertise?

■ B. Data & Analysis

1. The spacecraft travels at approximately 17,500 miles per hour. Estimate how far it travels in 10 minutes. Show your math.

2. Engineers must align the angle of re-entry precisely to avoid burning up in the atmosphere. If the safe range is between 5.3° and 5.7°, what could happen if it were 4° or 7° instead?

3. Why does even a small error in data or calculation become dangerous in engineering?

■ C. Real-World Connection

1. Who were the “human computers,” and what was their role at NASA?

2. How did Katherine Johnson, Dorothy Vaughan, and Mary Jackson break barriers in STEM?

3. Research one modern-day example of a woman or person of color making significant contributions to science or technology.

4. How does the story of Hidden Figures connect to equity and inclusion in today’s STEM fields?

■ D. Reflection

• What does Hidden Figures teach us about the importance of accuracy, perseverance, and collaboration in science?

• In what ways does scientific discovery depend not only on intelligence, but also on courage and opportunity?

• Complete this sentence: □ “Katherine Johnson proved that…”

■ Did You Know?

Katherine Johnson’s work involved solving the orbital re-entry equation that ensured John Glenn’s safe return to Earth. This simplified equation shows the relationship between velocity, gravity, and re-entry angle:

$$R = v^2 / [\, g \times (1 - \cos \theta) \,]$$

- R = re-entry radius (distance to Earth’s center)
- v = velocity
- g = gravitational acceleration
- θ = re-entry angle

■ Extension (Optional)

Design a 'STEM Barrier Breaker' poster highlighting a historical or modern scientist from an underrepresented group. Include their name, field, contribution, quote, and a creative illustration or symbol that represents perseverance in science.