## Activity 1: HeLa Cells (*10 minutes*)

| **Instructional Routine:** Collect and Display (MLR2) | |
|---|---|
| **Addressing:** NC.M1.A-CED.2; NC.M1.F-LE.5; NC.M1.F-IF.7; NC.M1.A-SSE.1a | **Building Towards:** NC.M1.F-BF.1a |

The context for this activity, cells taken from Henrietta Lacks for diagnosis and treatment that are still used today for research, will be elaborated on in Unit 6, Lessons 9 & 10, Station D. This activity prompts students to build expressions of the form $a \cdot b^x$ to encapsulate a type of pattern they have encountered several times so far, and to consider what $a$ and $b$ mean in the context of cell growth. They do so by writing numerical expressions that make explicit the key feature of exponential change, the repeated multiplication by the same factor, and then making a generalization of their repeated reasoning (MP8) using exponential notation. Since students are finally representing this pattern using an exponent, a quantity following this type of pattern is described as *changing exponentially*. The term "growth factor" is given to the multiplier or $b$ in an expression of the form $a \cdot b^x$, where $b > 1$.

### Step 1

- Ask students to read their task statement.
- If needed, provide an example (e.g., write the expressi
first day as $500 \cdot 2$ and evaluate in the third column).

### Step 2

- As students are working, use the *Collect and Display* r
Listen for and collect vocabulary and phrases students
describe patterns in the table for the growth of bacteria
words and phrases such as "multiplier," "exponentially,"
"doubling," for all students to see.
- Remind students to suggest additions and to borrow la
from the display as needed. This will help students rea
mathematical language during their partner and whole-

***Advancing Student Thinking***: For the first question, some students
bacteria after one hour. Both are mathematically correct, but $2 \cdot 500$
an expression for the number of bacteria after $t$ hours. If they strugg
row of the table and ask them if there is a different expression they c

In the last row, students may write something like $500 \cdot 2 \cdot 2 \cdot ...2$ wi
they might be able to write this expression more concisely.



### Station D: The Legacy of Henrietta Lacks (*20 minutes*)

In Unit 6, Lesson 5, Activity 1, students were introduced to HeLa cells without the full context. HeLa cells have been, and continue to be, invaluable for medical research since 1951. For decades after her death in 1951, the family of Henrietta Lacks, was not informed about the significant use of HeLa cells, despite the fact that her name and medical records were shared with media and throughout the medical community. Even though the medical discoveries made possible by these cells contribute to continued profits for companies that produce medications and treatments, the family of Henrietta Lacks has not been compensated. This activity provides students with an opportunity to consider the magnitude of even a small offering of compensation, and to reflect on the potential impact of compensation for Lacks' descendants. Teachers doing Station D should consider if they want to make the station a whole-class activity, reserve class time to process the activity, or enlist another adult to monitor the station.

Students are asked to take 10 minutes to learn more about Henrietta Lacks and HeLa cells. A few options to learn more include:

- "Henrietta Lacks: Her Impact and Our Outreach" video: https://bit.ly/HonoringHenrietta
- "Henrietta Lacks: science must right a historical wrong" editorial: https://go.nature.com/3k0vhlm

**Station D**

In Unit 6, Lesson 5, Activity 1, you were introduced to HeLa cells, with a unique characteristic of doubling about every 24 hours, used for medical research. Take 10 minutes to learn more about Henrietta Lacks and HeLa cells, and then answer the following questions:

1. Suppose the family of Henrietta Lacks was given $1,000 as compensation for using HeLa cells for research once it was discovered how valuable they were in 1951. Use the question and prompts below to determine the amount this compensation would be worth to the family today if it accrued interest at a rate of 10% per year.
   a. If an amount of money grows 10% per year, what is the annual growth factor?
   b. Create an exponential equation for a function representing the value of compensation as a function of the number of years since 1951, with an initial value of $1,000, and the growth factor from part a.
   c. Calculate the value of $1,000 today, using the number of years since 1951.
2. Do you believe the family of Henrietta Lacks deserves compensation for the contributions she unknowingly made to modern medicine? If so, how much do you think is owed to the family? Share your reasoning.
3. Do you think requiring consent for research should be required, meaning an individual or family has the right to agree or refuse permission to use samples taken during treatment? Describe why you believe consent is a good or bad requirement for medical research.

**Student Task Statement**

1. In a medical research lab, 500 HeLa cells double approximat
   a. In the middle column, the expression to show how to find the number of HeLa cells after each day has been started for you. Complete each expression in the middle column.
   b. Evaluate your expression in the third column.
   c. Write an equation relating $n$, the number of cells, to $t$, the number of days.
   d. Use your equation to find $n$ when $t$ is 0. What does this value of $n$ mean in this situation?

| Day | Expression to determine the number of HeLa cells | Number of HeLa cells (evaluate your expression in the middle column) |
|---|---|---|
| 0 | 500 | |
| 1 | $500 \cdot$ | |
| 2 | $500 \cdot$ | |
| 3 | $500 \cdot$ | |
| 6 | $500 \cdot$ | |
| $t$ | $500 \cdot$ | |