The David and Shanna activity begins with students or PLCs considering their intuitive responses to a comparison of exponential growth and decay effects on equal initial amounts. The participants then calculate and show their reasoning, in comparison to their intuitive reasoning. Following the initial activity, we suggest asking the group to consider the following questions (The first is for students or PLCs, the second just for PLCs - we show responses we have observed below the questions. See the document David and Shanna Representations for a follow-up activity.):

1. Do the task and unpack the mathematics:
   1. What mathematical ideas did you use and how did you use them?
   2. What procedures did you use and why did you use these procedures?
   3. What SMP did you use and how did you use them (choose at most 2 and thoroughly explain rather than listing)?
2. Imagine giving this to a class of Algebra 1 students and consider the task from a teaching point of view
   1. How will you launch the task to get all students engaged in it?
   2. What tools would you make available to students? Why?
   3. What prior knowledge would you expect students to bring to this task and how does their work on this task deepen and refine their understandings? What questions can you do to support this deepening and refining?
3. Without calculating, who withdrew their money sooner? Explain your reasoning.

We saw groups make an argument for David in that he would be earning more (or faster) than Shanna was losing since he would earn 5% of a higher amount each year whereas she would lose 5% of a smaller amount each year. There was an argument for Shanna in that she only needed to lose half of the amount whereas David needed to earn twice as much as she lost. Another argued that it seemed .95x would get to .5 before 1.05x got to 2, so he reasoned abstractly. Most participants thought David would withdraw his money first, so in that way, the answer was surprising.

1. Calculate and show and explain your reasoning. Is the answer different from what you expected? If so, reconsider your reasoning above.

We saw participants use several strategies:

1. For example, one participant chose $1000 as a starting amount for each and found that David needed more years of earning 5% simple interest to reach $2000, while Shanna needed fewer years of losing 5% simple interest to reach $500. For those who use compounding, discuss why they assumed the earnings or losses would be compounded – they may say it says the investments earned or lost 5% per year and seems to imply that the 5% is 5% of the amount in the account the previous year.)
2. Several participants chose an amount of money that each started with (same amounts), then created tables showing the amounts in each account for several years, until David’s doubled and Shanna’s halved. Some of them took the whole number year as the answer, whereas those who used logarithms settled on exact days (e.g.13 years and 188 days) or fractions of years (e.g. 13 ½ years). This should be discussed.
3. While almost all participants chose the same starting value for David and Shanna, after a discussion, they decided that it wasn’t necessary and that the answers would be the same. For example, participants who used p for the starting value noticed the p’s were eliminated from each equation before comparing Shanna’s and David’s amounts.
4. Many participants stopped when they found answers of David: x=14.2067 and Shanna: x=13.5134, and did not put their numbers back into context and interpret (SMP2).
5. Some participants used logarithms to solve for the numbers shown in #4. No one used graphs.