Interpreting Rates of Change Task

NOTE: This task plays with the different modes of engagement. This activity is open-ended with the intent of letting students explore different interpretations of collected data and the various ways in which it can be represented. Their graphs might look different from the provided example and each other. Encourage these differences and use them to spark discussion amongst groups. Have students use the different modes of engagement (doing, justifying, explaining, teaching, & creating) where applicable while working through this task.

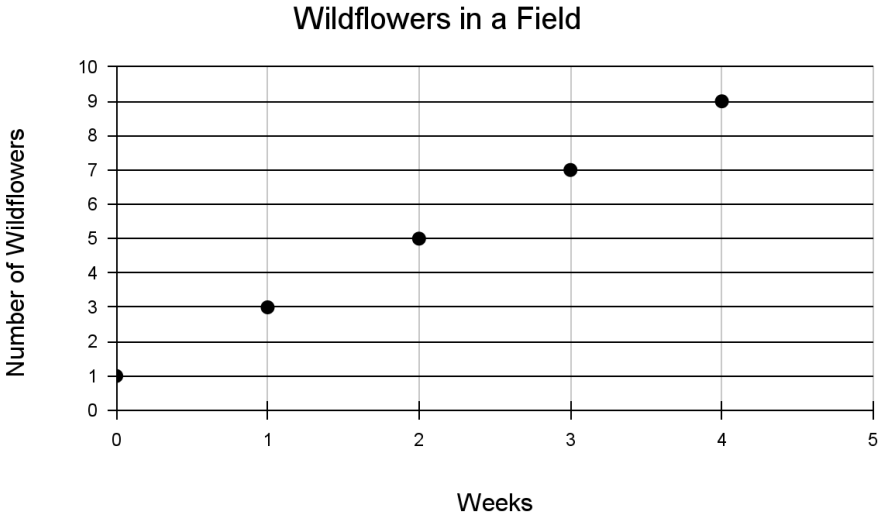
Scripted Intro: (student responses shown in bold)

Keisha is tracking the number of wildflowers that she sees growing in a field over the course of one month. On average, how many weeks are there in 1 month? [***4 weeks***] Okay, awesome! So, she notes that she sees an increase of 2 flowers every week over the course of that month that she observed the flowers. Keisha is very visual, so she wants to find a way to display her data that allows her to see the rate of change visually, but she needs help figuring out what that should look like. In your groups, I want you to figure out the best way for Keisha to represent her data in a visual way. [start task]

Task:

Part 1

1) Example representations for above scenario:



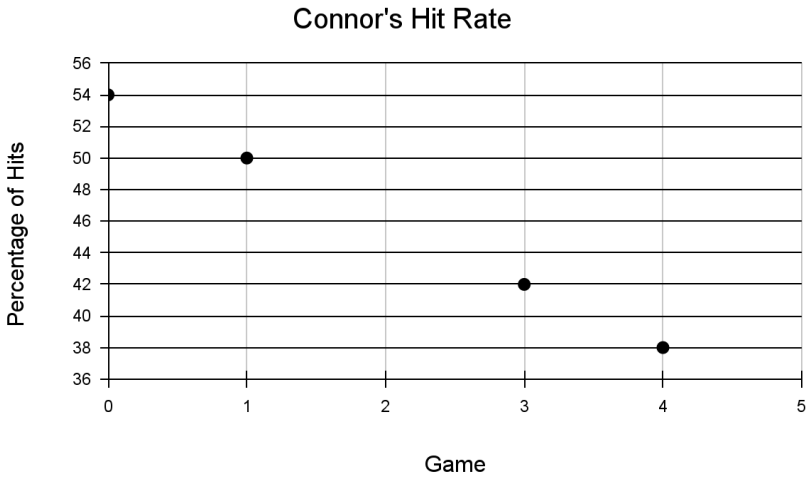
Week	Number of Wildflowers
0	1
1	3
2	5
3	7
4	9

2) Questions for group under “Explaining” mode of engagement:
   a) Let’s say I didn’t know anything about Keisha’s observations. Walk me through your graph. What is it that your graph is showing me?
      i) The goal here is to guide students to explain the following:
         (A) What their axes represent [***x-axis: the weeks in which she took her observation*** and ***y-axis: the number of wildflowers counted in any week*** or something similar matching their particular graph]
         (B) What the y-intercept represents [***the starting point for Keisha’s observations*** or similar]
         (C) What the slope represents [***the increase in wildflowers each week*** or similar]
3) “Teaching” mode of engagement:
   a) If two groups are coming up with different ways of representing the data (e.g. graph vs. table), engage those groups with defending why they feel that their group has produced the better representation for the situation. Encourage other groups that might be stuck to weigh in on their interpretation of the two types. This is where the discussion piece can come in more heavily.
   b) If most groups are representing data in a similar way, you can play the devil’s advocate and create your own representation and have groups defend against your representation. Students love to “teach” the teacher!
   c) When going through this mode of engagement, place an emphasis on the following:
      i) Which representation most clearly depicts the y-intercept [example response: ***on a graph, it’s easier to see the y-intercept as the starting point for the data, whereas in a table, it just looks like another point like all the others***]
      ii) Which representation most clearly models the rate of change (slope) [example response: ***when the data is in a table, you can see the rate of change better because you can see the patterns with the numbers, but in a graph, you have to actually count out all the movements***]

Part 2

1) Francis collected data on hits from his brother Connor’s first few baseball games. In order to help the coach analyze the data on Connor’s performance, Francis wants to organize his data in a way that will be easy for the coach to understand. During the last practice before the first big game, Connor hit 54% of appropriate pitches. At the first game, Connor was nervous so he hit only 50% of appropriate pitches, and threw out his shoulder. Coach had him sit out the second game to recover from his injury. At the third game, his shoulder was still giving him trouble, so he could only hit 42% of appropriate pitches. By game four, Connor was so out of practice from his recovery time that he hit 38% of appropriate pitches. How can Francis organize all of Connor’s data so that the coach can help Connor get his game back on track?

2) Example representation for above scenario:



Game	% of Hits
0	54
1	50
3	42
4	38

3) Follow the same methodology as you did with the "Explain" and "Teaching" modes of engagement from the previous scenario.
   a) **<u>Built-in Extension</u>:** If you have a group that whizzed through both scenarios, add a bonus question for them to "Justify" and "Explain": At this rate, if the coach doesn't intervene, how many more games would it take for Connor to not hit any pitches at all? [***14 games, because at 13.5 games Connor would reach 0 hits, but you can't have half a game, so it'd have to be 14 games***]
      i) Have students discuss that "0.5" of a game if it comes up organically, or with groups you feel like could run with the *extra* extra extension. Great way to discuss appropriate domain values in a real-world context.

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Extension

1) For any group that completes two of the scenarios with ease (to include the scenario from Part 1 and one scenario from Part 2), move them to the "Creating" mode of engagement:
   a) Have the group create their own scenario by writing out the scenario in word form on their VNPS and displaying their data in what they deem to be the clearest representation. They will get to display their created scenario during consolidation and have other students see if they can figure out the y-intercept, slope, and the interpretations for each.

Consolidate

For consolidation, have all groups leave their work on their VNPS and do a gallery walk where students from other groups detail what the y-intercept and slope are for the shown representation, and what each mean in terms of the context. For any groups that are showing the same scenarios but maybe different representations of the data, mention how the y-intercept and slope are the same, regardless of the representation the data is displayed, and how their interpretations are still the same.