**Notes to Instructor**

Please read the activity descriptions in the Cover Page for specifics about measurables and expectations for students before you use this activity.

The activity is formatted so that you, as the instructor, have the freedom to arrange or include things as you wish; this also means that you will need to manually input the spacing you desire, as any rearrangement will necessarily modify any out-of-the-box spacing.

**Additional Information and Common Pitfalls**

1. Instructors will need to be on the lookout, as with any group setting, for the students who want to do the entire task on their own as well as for the students who refuse to do any work at all. The students should be prepared for an individual presentation, but where the instructor will ask each student a specific question about a step. Ideally, there are the same number of students as particular steps for that problem (maybe three, one for the function type and equation, one for the graph, and one for solving). It’s important that the students not know which part they are presenting as they prepare. This will make sure they are more flexible in the problems. This method also allows the class to ask questions of their peers, leaving the instructor to moderate.
2. In both activities, the instructor should enforce their typical expectations of what it means to “sketch a graph.” This might include any of the following:
   1. Labeling axes with units
   2. Drawing and labeling reasonable tick marks on each axis.
   3. Plotting specific points with given or findable data.
   4. Filling in a reasonable curve (Note that on these, there is no correct answer, so there are plenty of reasonable responses).
3. In the first activity, because the inventory is depleted then replenished cyclically, the idea is that students might choose sine or cosine as the function type. Choosing either of these would require thinking of graphical transformations (sine needs to be shifted horizontally, and cosine needs to be reflected vertically OR shifted horizontally, both need to be shifted vertically and include a vertical stretch to address amplitude of the inventory). It would be more challenging to choose polynomial or piecewise, but these answers would be alright as well. Since the function would show how many skeins are in the inventory at a given time of year, their answer is not a simple output and need not rely on the function at all, though it is still part of their instructions to include it. This allows the instructor to ask follow-up questions about the context. Some suggested follow-ups:
   1. When is the yarn inventory decreasing the fastest?
   2. When the yarn is increasing, does this mean that no yarn is being sold?
4. In the first activity, due to the ill-structured problem statement, there may be some questions that come up when working with students on it. Here are some questions you might prepare for:
   1. Are we assuming the numbers are essentially constant - fall 400 and spring 50 - so adding 350 by the fall, not 400?
   2. Are sales generally only from mid-Fall to mid-Spring so the sales would occur starting in mid-Fall so the .5 years is from mid-Spring to mid-Fall of the first year?
5. In the second activity, the lake level goes up, then down, then slightly up, then down again. It’s not quite cyclic, but because the numbers don’t vary by much, students might want to force a sine or cosine onto it. The most appropriate function type, though, would be polynomial. They have quite a few things to break down in this one. First, they need to turn the data into usable data points, inputs of days since April 25 and outputs of height above the threshold of 1039.8, then estimate the algebraic representation using possible zeros and multiplicities as well as an extra point for the leading coefficient. These will be estimations on their part. Anything reasonably estimated from the given data is not wrong. When it comes to answering the given question, they should identify that this is an inequality, though they might not see it as such. Where is their function greater than 0? Once they have the intervals for this, these numbers have to be turned back into the dates for their “boss”.
6. The data in the second activity is not real, but inspired by data available here: <https://waterdata.usgs.gov/monitoring-location/07229900/>
   1. Only the most recent months of data are available here, but an alternative activity could ask students to look at specific dates on the actual website. The instructor would need to determine new dates each semester they run this activity to make it most meaningful. Doing this, you could force the best solution to be based on something quadratic/absolute value, sinusoidal, polynomial, or piecewise. Of course this also depends on what the actual data shows.