

Instructional mathematics tasks are accessible to all learners because they invite students to wrestle with a problem. Students share their ideas, ask questions of one another, use and apply multiple representations, and collaborate to develop various solution pathways. Then, teachers use students' solutions to make the math visible, connect prior learning, and forecast new mathematical learning.

**Directions:** Launch the tasks in a whole group to provide opportunities for students to discuss their understanding of the task and suggest strategies to solve. Organize the students in pairs or groups of four to encourage participation. Provide manipulatives, chart paper, and markers.

Build and interpret logistic models to solve real-world problems.

Jasmine has a vitamin deficiency. Her bloodwork indicates that she typically starts her day with approximately 30 micrograms of the vitamin in her system. Her doctor has prescribed 15 milligrams of the vitamin per day to increase her levels. Due to the absorption rates of the vitamin in the body, only about 85% of the total amount will remain in her system at the end of each day. Explore the effects of the prescription on Jasmine's vitamin deficiency throughout the first month.

Facilitate Prompt groups to use recursive reasoning and a graphical representation to

explore the effects of the vitamin in her system throughout the first 30 days.



Topic

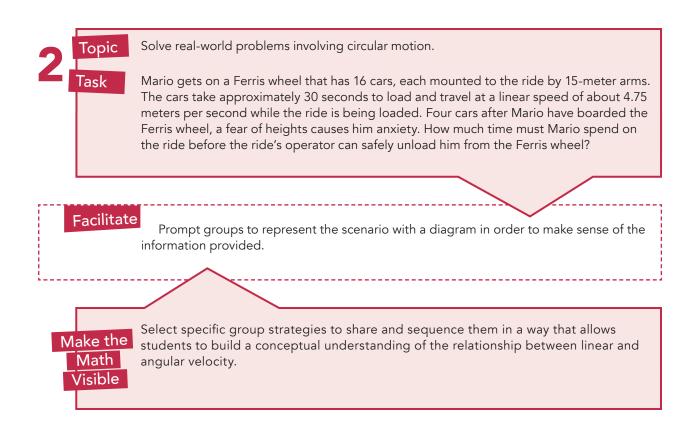
Task

Select student-generated representations to analyze the behavior of the function as a class. Compare and contrast the scenario and corresponding representations with an exponential model to introduce logistic growth and how it is similar to and different from exponential growth. Discuss the meaning of the carrying capacity and why it would matter in this and other real-world situations.





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Use conic sections to model real-world scenarios.

The Ellipse in Washington, D.C., is a 52-acre park located to the south of the White House. It is bounded by a pedestrian walkway that has a major axis of approximately 350 yards and a minor axis of approximately 300 yards. If the President of the United States were to go on a jog around the perimeter of the walkway and a Secret Service Agent were to be placed in the center of the Ellipse for additional security, how far would the President be from the Agent during his jog?

## Facilitate

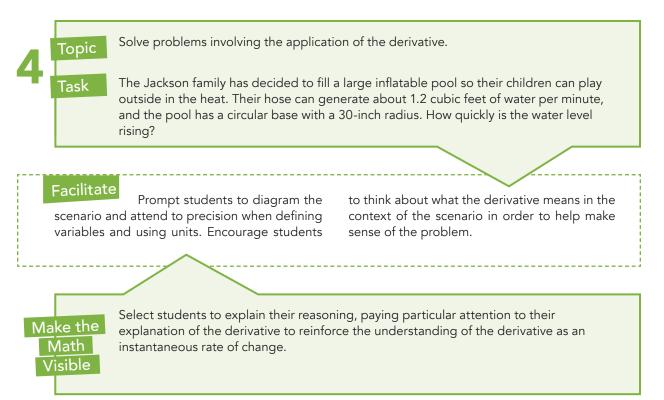
Topic

a graphical representation of the scenario to make sense of the problem, a symbolic representation to determine precise distances, and a tabular representation to organize their work.

Make the Math Visible Discuss how the problem may be solved using the rectangular, polar, and/or parametric form of the equation for the ellipse.







Understand an accumulation function as the area under the curve of a derivative graph.

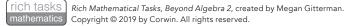
A local manufacturing company must monitor a tank that holds the excess condensation produced by their machines. The tank is filling with  $H_2O$  at a rate of  $r(t) = \frac{1}{4}t^3 + 3$  gallons per day, where t is the number of days that the machines have been operating. How much condensation will the tank accumulate throughout the first 5 days of operation? How much will the tank accumulate on the sixth day of operation? If the tank has an 80-gallon capacity, when must the company empty the tank to avoid overflow?

Facilitate

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Prompt groups to use a graphical representation and their understanding of the meaning of an integral in order to make sense of the problem.

Make the Math Visible Discuss the graphical representation of the various accumulations addressed in the problem to strengthen the conceptual understanding of the integral.





## Adapt-a-Mathematical TASK Tool Do you have a task that is not quite right? Use this guide to adapt the task to meet your needs!

