

## Jump!

Watch the video showing the commercial where a car is launched straight up into the air after being jump started. You will probably need to watch it several times as you work to develop a graph of the height of the car as a function of the total vertical distance the car travels. Certainly, you will have to either make up a scale for each axis or use qualitative benchmarks for each axis. The following questions are designed to promote your thinking about your thinking concerning this situation.

1. On your whiteboard, create a graph of the car’s distance from the ground as a function of the total vertical distance the car travels.

2. This graph is to appear as part of an article or report and you are given the task of writing the caption for this graph. Write a concise caption that communicates the information that the graph provides.

3. Choose a particular point on the graph. Describe the meaning of this point.

4. It is possible that, while explaining the meaning of the particular point chosen in #3, you pointed to the graph you created. If not, suppose that you did. When pointing to the graph, what might be the purpose? Specifically, what aspect of the graph do you hope your audience envision as you describe the meaning of the point in #3 by pointing to it?

5. Imagine that a student was presented with the graph that you created. How would they interpret what you created? What would they say?

6. Think about your thinking as you worked to create the graph in this situation. What strategies were helpful? How could students be prepared to successfully create a graph of this situation? The strategy, “I will show them how to do it and then have them practice over and over again” is not a valid strategy.

7. What issues or misconceptions need to be addressed in preparing students to create a graph such as the graph from this situation?

8. A student indicates that the graph should be “steeper at the beginning and at the end” of the event since that is when the car must be traveling at the fastest speed. How are students thinking if they make such a comment? What might you say or do to help students with this issue?

The Jump Commercial Situation - Teacher Notes

**Materials**

We use a [video of the commercial for Dodge vehicles](http://www.youtube.com/watch?v=lKL8ijvolD4) where a “lesser” car is jump started. In the process, the more powerful Dodge engine causes the car to blast off into the air.

**Item Analysis**

1. On your whiteboard, create a graph of the car’s distance from the ground as a function of the total vertical distance the car travels.

*Because we are tracking distance from ground as a function of total distance (elapsed time is NOT the independent variable), covariational reasoning becomes very necessary. Students might find it helpful to make sense of the quantities by examining the video one frame at a time.*

2. This graph is to appear as part of an article or report and you are given the task of writing the caption for this graph. Write a concise caption that communicates the information that the graph provides.

*Participants will be forced to describe the quantities and how they covary. They may tend to features of the graph such as how the graph increases, concavity, rate of change. They may also choose specific points on the graph and explain what they mean in the context of the situation.*

3. Choose a particular point on the graph. Describe the meaning of this point.

*If this hasn’t come up naturally in #2, the issue is explicitly brought up here.*

4. It is possible that, while explaining the meaning of the particular point chosen in #3, you pointed to the graph you created. If not, suppose that you did. When pointing to the graph, what might be the purpose? Specifically, what aspect of the graph do you hope your audience envision as you describe the meaning of the point in #3 by pointing to it?

*This presents another opportunity to deal with the following issues: Do the participants see a point on the graph as just a blip on the paper? Or, do they see the point as representing a horizontal distance and vertical distance from the origin? Here, we begin to push the idea of how to envision the graph that will be helpful for later work.*

5. Imagine that a student was presented with the graph that you created. How would they interpret what you created? What would they say?

*We want to force teachers to think about student thinking.*

6. Think about your thinking as you worked to create the graph in this situation. What strategies were helpful? How could students be prepared to successfully create a graph of this situation? The strategy, “I will show them how to do it and then have them practice over and over again” is not a valid strategy.

*Continuing the theme of thinking about student thinking, we want teachers to try to think about how students might be helped in thinking about graphing dynamic situations. Out of such a discussion, the Coordinating Quantities Tool (finger tool) may emerge as a strategy/tool for developing covariational reasoning.*

7. What issues or misconceptions need to be addressed in preparing students to create a graph such as the graph from this situation?

*Here, we continue the theme of thinking about student thinking.*

8. A student indicates that the graph should be “steeper at the beginning and at the end” of the event since that is when the car must be traveling at the fastest speed. How are students thinking if they make such a comment? What might you say or do to help students with this issue?

*We explicitly deal with the issue of “shape thinking”. When the independent variable is time, then it is the case the “steeper means faster”. But, this type of shape thinking can break down in other situations and does not promote covariational reasoning.*