

## Running Downhill

**CER:** Explain how Newton's Laws describe changes in an object's motion.

**Essential Question** How does Newton's first law affect human motion?



A student has begun training for tryouts for lacrosse by running a two mile loop through her neighborhood every evening. Part of the run is a very steep hill. One evening, the student is running down the hill at a very quick pace when she notices a dog lying in the middle of her path. To avoid hitting the dog, she tries to stop but has difficulty. With effort, she is able to stop right before running into to the dog.

Explain why it was so difficult for the student to stop. In your response, be sure to include:

- the role of Newton's first law in making it difficult for the student to stop.
- the correct use of the term inertia.
- why some objects in motion have more inertia than others.

Be sure to consider the completeness of your response, supporting details, and accurate use of terms. (claim, evidence, reasoning)

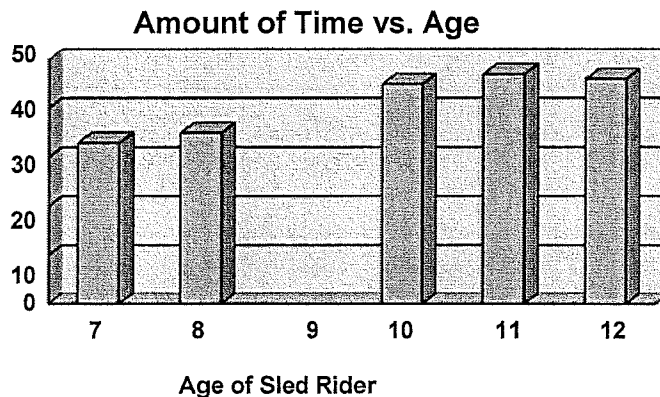
## SLEDDING

**CER:** Analyze and explain how Newton's Laws describe changes in an object's motion.

**Essential Question** How does Newton's second law affect the motion of an object?



Amount of Time  
to Top of Hill



A student comes up with an idea to make some extra money during a snow day. All the neighborhood kids are outside sledding. The student offers to pull the students to the top of the hill for one dollar per ride. The student notices that it was taking more time to pull some student to the top than it was other students even though he was pulling with the same force. He decides to start timing how long it takes to pull each kid and see if there was a pattern based on their age.

Explain why some kids took longer to pull to the top of the hill than other kids despite pulling with the same force. In your response, be sure to include:

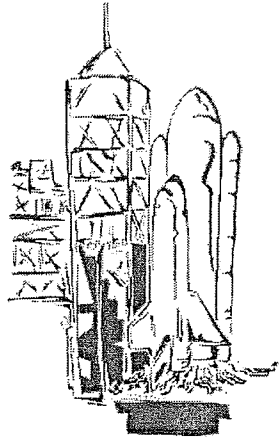
- the pattern of the data including any exceptions to the trend.
- the role of Newton's second law in it taking longer to pull some kids.
- a prediction of how long it would take to pull the ten and twelve year olds if they were on the same sled.

Be sure to consider the completeness of your response, supporting details, and accurate use of terms. (claim, evidence, reasoning)

## Space Shuttle Launch

**CER:** Analyze and explain how Newton's Laws describe changes in an object's motion.

**Essential Question** How does Newton's third law affect the motion of an object?



The motion of space shuttles is caused differently than that of most modes of transportation. As the fuel is burned, the hot gasses produced rush out of the bottom of the craft. This causes the space shuttle to launch into the air.

Describe how hot gasses rushing out of the bottom of a space shuttle cause it to launch. In your response, be sure to include:

- The forces acting on the space shuttle using appropriate terms.
- How Newton's third law allows the space shuttle to launch.
- Why there is a delay between when the fuel starts to burn and when the space shuttle launches.

Be sure to consider the completeness of your response, supporting details, and accurate use of terms. (claim, evidence, reasoning)