


Short Performance Assessment: 4-PS3-3 & 4-PS3-1

Grade Level: **Fourth Grade**

Adapted from [SNAP](#)¹

Title	Crash Course		
Designed by	Cheryl Aldrich & Beth Swierski Sweet Home Central School District, Amherst, NY	Course(s)	Grade 4
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Performance Expectation	<p>4-PS3-1: Use evidence to construct an explanation relating the speed of an object to the energy of that object.</p> <p>Clarification Statement: none Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.</p> <p>4-PS3-3: Ask questions and predict outcomes about the changes in energy that occur when objects collide.</p> <p>Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact. Assessment Boundary: Assessment does not include quantitative measurements of energy.</p>
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Science and Engineering Practice	<p>Constructing Explanations (4-PS3-1)</p> <ul style="list-style-type: none"> Use evidence (e.g., measurements, observations, patterns) to construct an explanation. <p>Asking Questions (4-PS3-3)</p> <ul style="list-style-type: none"> Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.
Disciplinary Core Ideas	<p>PS3.A: Definitions of Energy (4-PS3-1 & 4-PS3-3)</p> <ul style="list-style-type: none"> Energy can be moved from place to place by moving objects or through sound, light, or electric currents. <p>PS3.B: Conservation of Energy and Energy Transfer (4-PS3-3)</p> <ul style="list-style-type: none"> Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. <p>PS3.C: Relationship Between Energy and Forces (4-PS3-3)</p> <ul style="list-style-type: none"> When objects collide, the contact forces transfer energy so as to change the object's' motions.
Crosscutting Concept	<p>Energy and Matter (4-PS3-1 & 4-PS3-3)</p> <ul style="list-style-type: none"> Energy can be transferred in various ways and between objects.

Student Performance	<p>4-PS3-1 - 1. Articulating the explanation of phenomenon 2. Evidence 3. Reasoning</p> <p>4-PS3-3 - 1. Addressing phenomena of the natural world 2. Identifying the scientific nature of the question</p>
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¹ The Short Performance Assessment (SPA) and the Assessment Rubric adapted from the Stanford NGSS Assessment Project <http://snapgse.stanford.edu/>



Name _____

Crash Course!

A group of friends are going sledding! There are 2 hills at the park. One is called the Bunny Hill. The other hill is called Adventure Hill!

Leo has a habit of crashing into his friends. There is a lot of energy moving in this system. Think about the collisions in this system and how energy is moving.

What questions do you have about this system that would help you understand how the energy causes different actions on the two hills?

Change the models on the next page to:

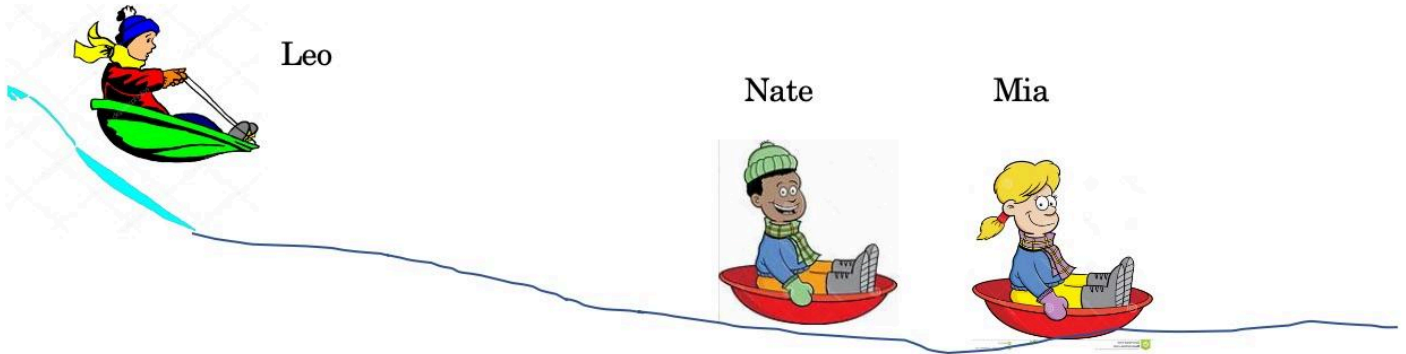
- Show what will happen to Nate and Mia when Leo collides with them. Do this for each hill.
- Add labels to show how energy is transferred during the collision.

Use the lines below to explain **why Nate and Mia's sleds moved differently** after the collision on the Bunny Hill and on Adventure Hill.

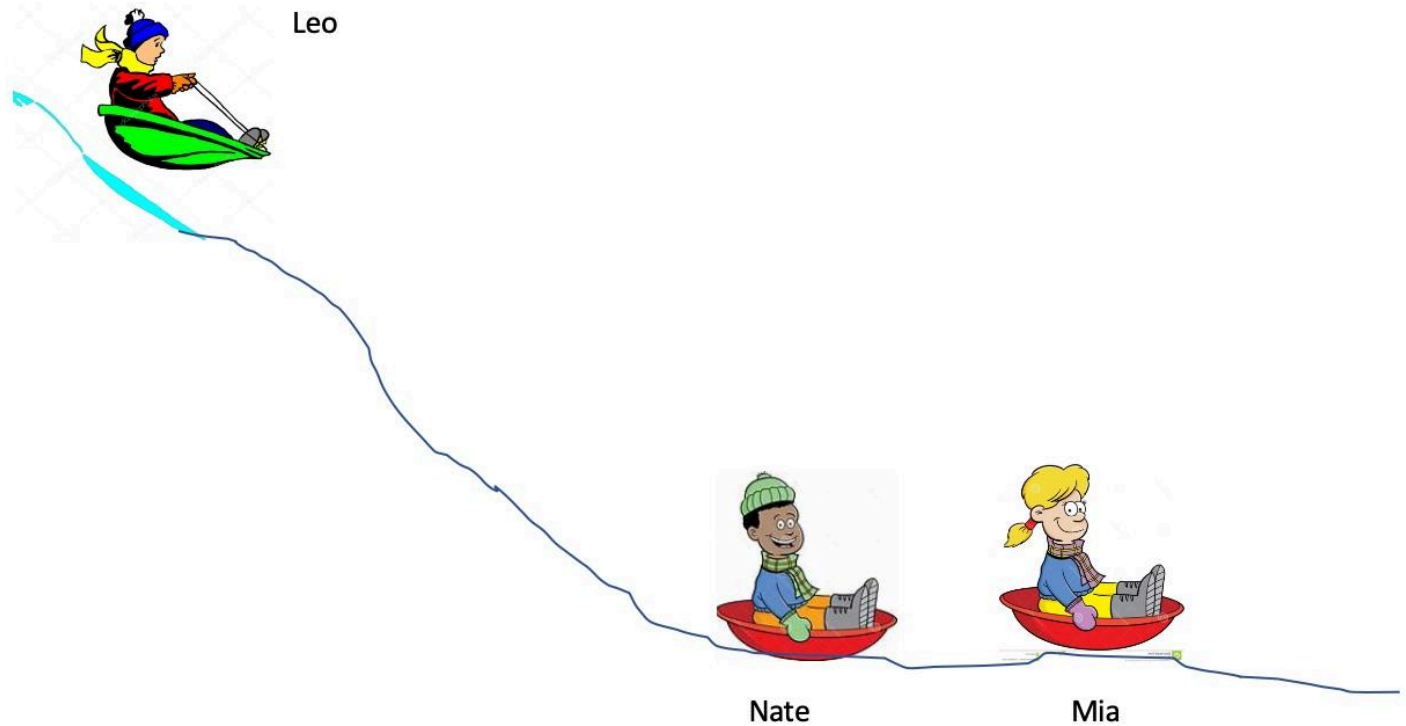


Name _____

Bunny Hill



Adventure Hill



Task 1: Write question(s) that elicit more information about the system parts, forces or energy.

4-PS3-3: Ask questions and predict outcomes about the changes in energy that occur when objects collide.			
Science & Engineering Practices <ul style="list-style-type: none"> · Ask questions to predict outcomes based on patterns. · Develop and use models to explain phenomena 	Disciplinary Core Ideas <ul style="list-style-type: none"> · Objects have more energy when they are moving faster. · When objects collide, the contact forces transfer energy, so as to change the object's direction. 		Cross Cutting Concepts <ul style="list-style-type: none"> · Cause & effect relationships are identified and used to explain change. · Energy can be transferred in various ways & between objects.
4- Exceeding/ Distinguished	3- Secure/ Meeting	2- Developing/Progressing	1- Beginning/ Not yet demonstrating
Student: <ul style="list-style-type: none"> · Demonstrates an understanding that energy can be transferred when objects collide that is more sophisticated with high level scientific vocabulary, and detailed cause & effect relationships explained. 	Student: <ul style="list-style-type: none"> · Asks questions that demonstrate an understanding of energy transfer. · The cause and effect relationships are evident in question, not requiring inference by teacher. 	Student: <ul style="list-style-type: none"> · Asks questions that do not connect to energy directly, teacher can infer that intent. · Cause & effect relationships are not evident. May required inference by teacher. 	Student: <ul style="list-style-type: none"> · No questions written · Asks questions that are unrelated to relationship of energy transfer. · Is unable to explain the cause and effect relationships between energy and hill size, or the connection to the motion of sleds at bottom.

Task 2: Use models and written explanation to show what happened when Leo collides with Nate and Mia showing the transfers of energy that occur. Explanations should connect energy to speed and why the sleds acted differently on the 2 hills.

4-PS3-1: Use evidence to construct and explanation relating the speed of an object to the energy of that object.			
Science & Engineering Practices <ul style="list-style-type: none"> · Ask questions to predict outcomes based on patterns. · Develop and use models to explain phenomena 	Disciplinary Core Ideas <ul style="list-style-type: none"> · Objects have more energy when they are moving faster. · When objects collide, the contact forces transfer energy, so as to change the object's direction. 		Cross Cutting Concepts <ul style="list-style-type: none"> · Cause & effect relationships are identified and used to explain change. · Energy can be transferred in various ways & between objects.
4- Exceeding/ Distinguished	3- Secure/ Meeting	2- Developing/Progressing	1- Beginning/ Not yet demonstrating



<p>Student:</p> <ul style="list-style-type: none"> · Demonstrates an understanding that energy can be transferred when objects collide that is more sophisticated with high level scientific vocabulary, and detailed cause & effect relationships explained. 	<p>Student:</p> <ul style="list-style-type: none"> · Demonstrates an understanding that energy can be transferred when object collide. · The cause and effect relationships are clearly explained, not requiring inference by teacher. · Models clearly show correct movement of energy and change of position of the sleds. 	<p>Student:</p> <ul style="list-style-type: none"> · Demonstrates a partial understanding of energy transfer during collisions. Focus is more on force than energy. · Cause & effect relationships are not clearly explained. May required inference by teacher. (Ex. States size of hill matters but does not detail in what way.) · Models may be incomplete, and/or partially inaccurate in showing energy and position changes. 	<p>Student:</p> <ul style="list-style-type: none"> · Is not connecting energy to movement in collisions. · Is unable to explain the cause and effect relationships between energy and hill size, or the connection to the motion of sleds at bottom. · Models are incomplete or inaccurate. Energy is excluded from model. · More work on vocabulary is needed.
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