Maryland Integrated Science Assessment (MISA)

2018 Public Release

Grade 8

Unit 1

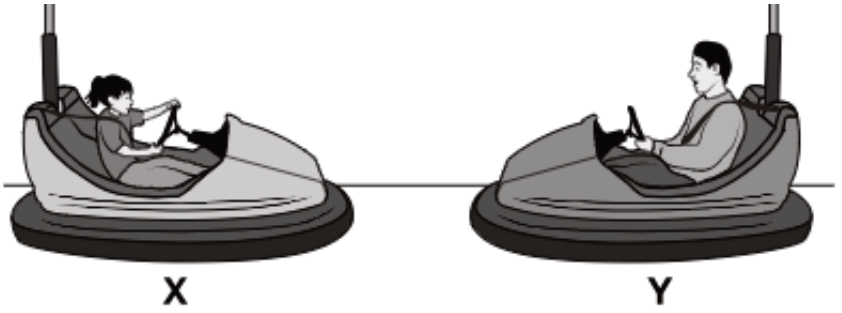
Unit 1

Read all of the information. Use the information to answer the questions.

As part of a design project involving Newton's laws of motion, students watched a video of bumper cars colliding. During the discussion after the video, the students recorded the following observations about bumper cars.

- **The cars have big bumpers.**
- **The cars' interiors and steering wheels are padded.**
- **The cars have seat belts.**
- **The floor the cars travel on is very smooth.**
- **The car that was not moving before the collision moved after the collision.**

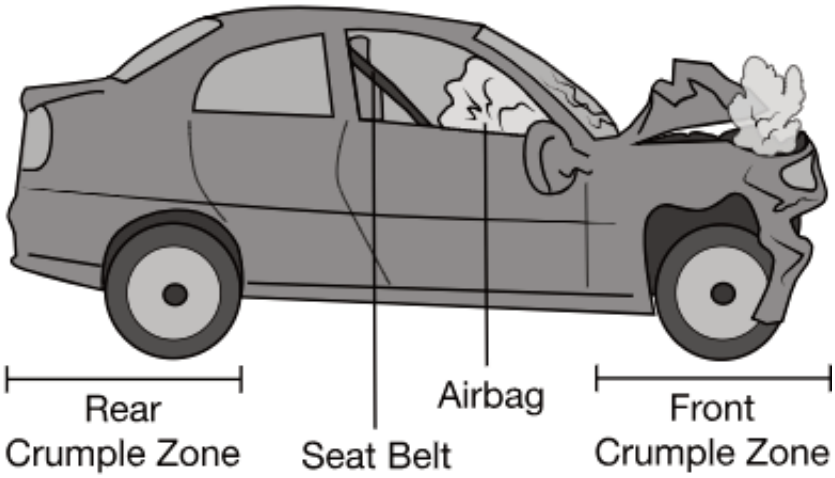
A diagram of the bumper cars is shown below.



A person riding in a bumper car is able to stay relatively safe because the car has a bumper that wraps around the entire vehicle. The bumper helps reduce the force of a collision with another car, but colliding cars undergo changes in motion. Since collisions occur on bumper-car rides, riders wear seat belts to help ensure their safety while in the bumper cars.

Unit 1

As part of their design project, the students researched collisions of automobiles. The research indicated that safety in automobiles is a primary concern; therefore, research is done to determine the best ways to keep passengers safe while riding in vehicles. The diagram below illustrates safety features found in some cars.



Crumple zones are important safety features for vehicles. The zones reduce the impact during a collision, which results in less force being transmitted to the passengers. Airbags are another safety feature designed to absorb energy and reduce the movement of passengers during the collision.

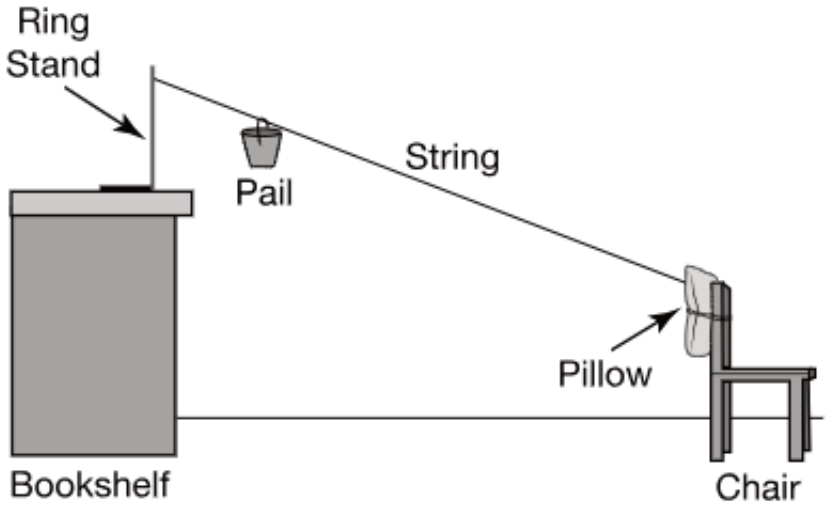
Unit 1

The students applied their research about collisions in automobiles and bumper cars to a design project. The purpose of the project was to design a device that would minimize the force of the collision between two objects.

The Students' Setup:

- **Secure a ring stand to the top of a bookshelf to elevate the ring stand.**
- **Attach one end of a piece of thick string to a chair and the other end of the string to the secured ring stand.**
- **Secure a thick pillow to the back of the chair.**
- **Hang a pail containing an egg from the top of the string.**
- **Release the pail.**
- **The pail travels down the string and collides with the pillow on the back of the chair.**

A diagram of the students' investigation setup is shown below.



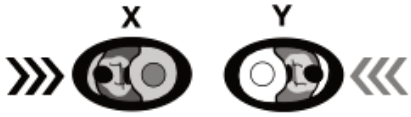
Unit 1

1 **To better understand collisions, the students modeled a bumper car collision. In the model, the mass of the driver of bumper car X is 65 kilograms (kg) and the mass of the driver of bumper car Y is 85 kg. The students predicted the direction each car would move after the collision.**

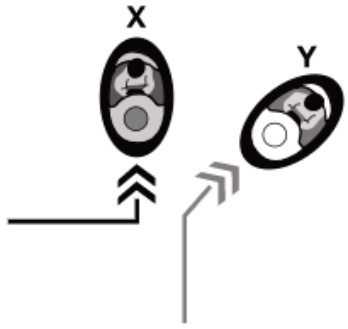
Which diagram best illustrates the movement of bumper car X and bumper car Y after the front bumpers collide?

○ **A**

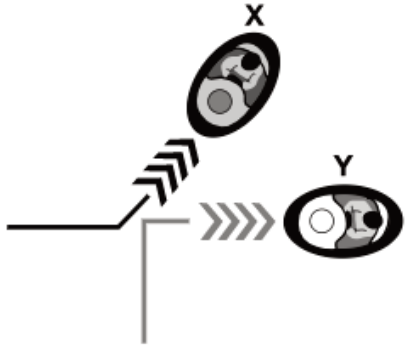
○ **B**



○ **C**



○ **D**



2 **The students reviewed the safety features of a bumper car and evaluated the features based on the most likely actions and reactions of the features during a collision.**

Write the function of each safety feature in the table.

Provides cushion during a collision

Restricts motion during a collision

Reduces amount of force transmitted in a collision

Safety Feature	Function
Bumper around entire car	
Padded steering wheel	
Seat belt	

3 **The students determined that crumple zones and bumpers of modern automobiles could be incorporated into their design.**

The purpose of the bumper is to ✓ Choose... reflect absorb transmit **energy during a collision.**

The purpose of the crumple zones is to ✓ Choose... absorb increase reflect **the force transferred to the vehicle during the collision.**

4 **In order to design a device that minimizes the effects of the collision between the pillow and the pail, the students identified the forces that would occur during the collision.**

When the pail collides with the pillow,

- ○ **A** the pillow exerts a frictional force on the pail
- ○ **B** the pail exerts an unequal force on the pillow
- ○ **C** the pail exerts a gravitational force on the pillow
- ○ **D** the pillow exerts an equal and opposite force on the pail

5 **The students defined the constraints of their design solution to minimize the effect of the collision on the pail.**

The students knew that when the mass of the pail was increased, the force exerted on the pillow would be ✓ Choose... greater less the same **. The force exerted on the pail by the pillow would direct the pail** ✓ Choose... away from toward below **the pillow.**

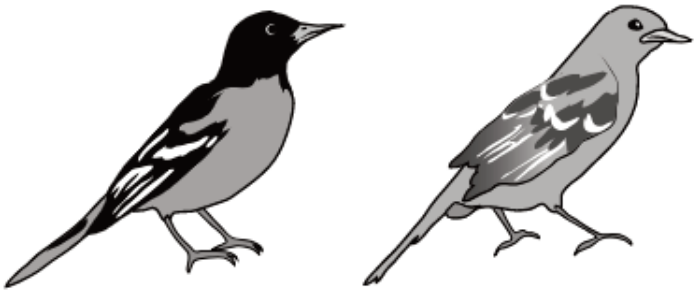
6 **Use evidence to explain how the device combines the features of an airbag and a bumper. In your explanation, be sure to include the type and direction of the forces present during a collision.**

Unit 2

Unit 2

Read all of the information. Use the information to answer the questions.

While researching animals for a project in a science class, a student chose to research the state bird of Maryland, the Baltimore oriole (*Icterus galbula*). Some of the information contained in the student's research states that Baltimore orioles are medium-size songbirds that are easily recognized by their colors. Male orioles have black heads and wings and bright orange backs and chests. Female orioles have gray heads, backs, and wings and yellow chests. Both male and female orioles have white bars on their wings.



Male Female

Unit 2

Baltimore orioles are migratory birds. They generally spend the winter months in Central and South America and the summer months in the eastern and central United States and Canada, where they nest, mate, lay eggs, and raise their young. Orioles build a unique type of nest that is woven like a basket and hangs from a tree branch. In eastern North America, orioles prefer to stay high up in deciduous trees in open woodlands, forest edges, and small groves.

Unit 2

The diet of orioles changes with the seasons. In the summer, when they are breeding and feeding their young, orioles prefer protein-rich insects, such as the checkerspot butterfly. In spring and fall, they tend to prefer fruits and nectar.

When it is time to mate, a male oriole attracts a female oriole by hopping, bowing, and spreading his wings. The female oriole responds by fanning her tail and lowering her wings. The female chooses the nest site and builds the nest, while the male oriole defends the territory around the nest.

Backyard bird enthusiasts in Maryland can attract Baltimore orioles to their yards by hanging ripe fruits such as sliced oranges from tree branches. They can also put out special bird feeders that offer sugar water or nectar. Planting fruits such as raspberry and blueberry bushes or crabapple trees may also attract orioles.

The student organized the research data about Baltimore orioles into the table shown below.

BALTIMORE ORIOLE DATA

Oriole Facts	Descriptions
Body length	17–19 centimeters (cm)
Wingspan	23–30 cm
Mass	20–40 grams (g)
Summer breeding locations	Eastern United States, central United States, Canada
Winter location	Central America, South America, Florida
Spring migration months	March–May
Fall migration months	July–September
Number of matings per year	1
Number of offspring produced	3–7 eggs
Incubation period	11–14 days
Nesting period	11–14 days
Global population size	12 million

Unit 2

1 **The student found evidence of a recent decrease in the population of Baltimore orioles in Maryland.**

Identify the <u>most likely</u> reasons for this population decrease.

Select all that apply.

- ○ **A** an increase in the number of elm trees
- ○ **B** an increase in the number of predators
- ○ **C** an increase in the caterpillar population
- ○ **D** a need to adapt to a changing environment
- ○ **E** a lack of access to an adequate food supply

2 **The evidence in the student's research identified many different factors that affect the growth of Baltimore orioles.**

If part of the forest where orioles live were destroyed, the orioles that live in the forest would <u>most likely</u> experience an increase

in ✓ Choose... mating parasitism competition **, which would** ✓ Choose... negatively affect positively affect not affect **the growth of the orioles.**

3 **After researching oriole characteristics, the student claimed that specific Baltimore oriole behaviors increase the likelihood of successfully reproducing during a breeding season.**

Identify the evidence from the research that supports this claim.

Select all that apply.

- ○ **A** Orioles are songbirds.
- ○ **B** Female orioles lay 3–7 eggs after mating.
- ○ **C** Male orioles defend territory around the nest.
- ○ **D** Orioles prefer to eat fruit and nectar in the spring and fall.
- ○ **E** Female orioles fan their tail feathers and lower their wings when responding to a mate.

4 **The student planned to present an argument to the science class addressing how human actions can help or harm Baltimore orioles.**

Write each action in the appropriate box to identify which human actions increase or decrease the orioles' chances of reproduction and growth.

cutting down deciduous trees	planting a butterfly garden	spraying insecticides	planting fruit trees

Increases Chances of Reproduction and Growth	Decreases Chances of Reproduction and Growth

5 **The evidence in the student's research claimed that Baltimore orioles prefer to nest in tall, large-leafed trees such as elm trees.**

Use this evidence to determine which outcomes a local oriole population would most likely experience if Dutch elm disease destroyed the elm trees in the oriole population's area.

Select all that apply.

- ○ **A** a decrease in nesting space
- ○ **B** an increase in cover from predators
- ○ **C** an increase in competition for territory
- ○ **D** a decrease in the types of flowering plants
- ○ **E** an increase in the number of potential mates

6 **The student claimed that orioles engage in specific behaviors to ensure survival and successful reproduction.**

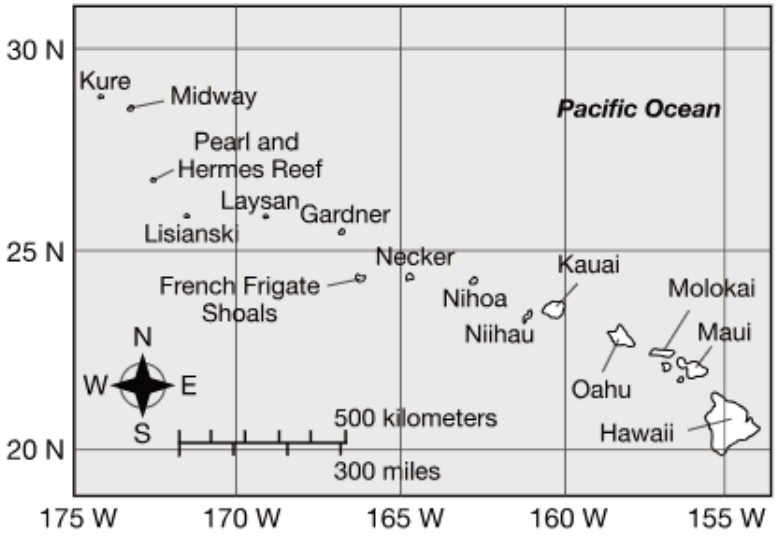
Use evidence from the research to support this claim.

Unit 3

Unit 3

Read all of the information. Use the information to answer the questions.

While studying surface features of Earth, a student researched the geoscience of the Hawaiian Islands to determine how the islands formed. The student research data indicated that the Hawaiian Islands are a long chain of islands located in the Pacific Ocean. The Hawaiian Islands, the Aleutian Islands, and the Galápagos Islands are all island arcs. Each island in such a chain was formed by at least one volcano; however, some of the Hawaiian Islands consist of multiple volcanoes. Hawaiian volcanoes are called shield volcanoes because they are produced by slow-moving lava flows that form mountains over time. There are many volcanoes in the Hawaiian Island chain, but most of the volcanoes are inactive or extinct; very few of the volcanoes are currently considered active.

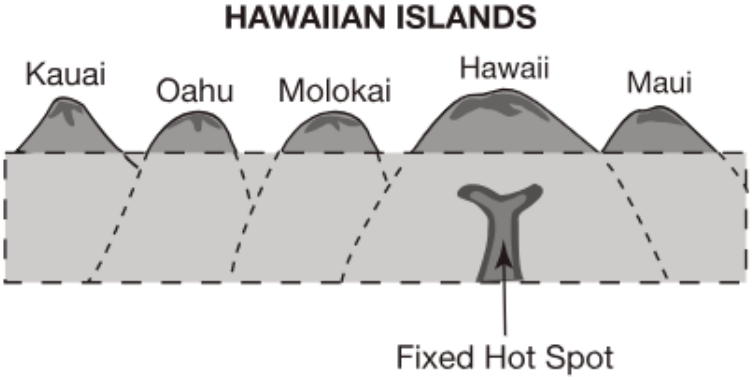


The student's research indicated that the Hawaiian Islands currently have three clearly active volcanoes: Kilauea, Mauna Loa, and Loihi. These volcanoes are located over a hot spot that formed the island of Hawaii, the most recently formed and largest island in the chain. Scientists have estimated the ages of volcanoes in the Pacific Ocean and have measured their distances from Kilauea, one of the active Hawaiian volcanoes. The table below includes data about some of these Pacific volcanoes.

VOLCANOES OF THE HAWAIIAN ISLANDS

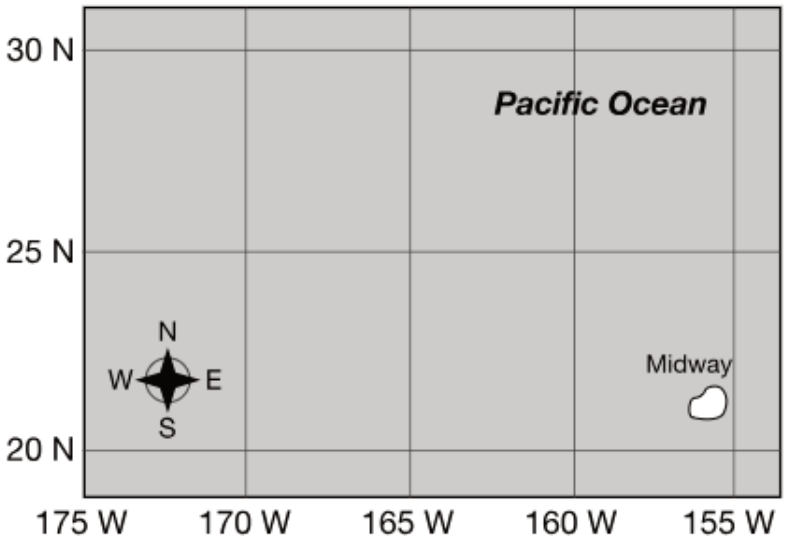
Volcano	Volcano Distance from Kilauea (kilometers)	Estimated Age (millions of years)	Location	Area of Location (square kilometers)
Kilauea	0	0.00–0.40	Hawaii	10,433.55
Mauna Kea	54	0.37		
Kohala	100	0.43		
Kahoolawe	185	1.03	Kahoolawe	115.5
Haleakala	182	0.75	Maui	1,999.45
West Maui	221	1.32		
Lanai	226	1.28	Lanai	365.36
East Molokai	256	1.76	Molokai	674.58
West Molokai	280	1.90		
Koolau	339	2.60	Oahu	1,547.88
Waianae	374	3.70		
Kauai	519	5.10	Kauai	1,430.59
Niihau	565	4.89	Niihau	175.09
Necker	1,058	10.30	Necker	0.18
Gardner	1,435	12.30	Gardner	0.02
Laysan	1,818	19.90	Laysan	4.11
Midway	2,432	27.70	Midway	6.21

The student's research indicated that all volcanoes in the Hawaiian Islands were formed at one hot spot, a fixed location on the floor of the Pacific Ocean that spews hot lava from Earth's mantle. As the Pacific Ocean floor moves slowly over the hot spot, the old volcanic islands are moved away from the hot spot and become inactive. New volcanic islands then form over the hot spot. The older islands erode away over time and are generally smaller than the newer islands because the new islands are above the hot spot and have an active volcanic lava flow.

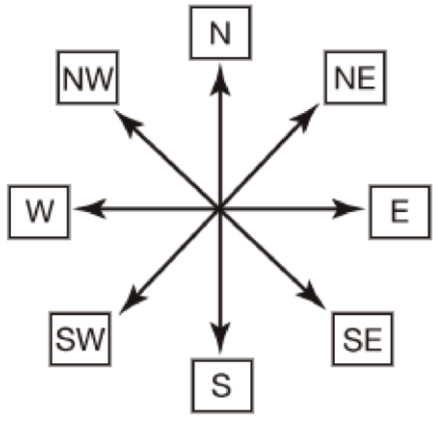


Unit 3

1 **The map below shows the location of the Hawaiian Islands as the location appeared 20 million years ago.**



Select the direction that the ocean floor beneath the Hawaiian Islands has moved for the past 20 million years to result in their current location.



2 **The student's research included evidence that over the next few million years, scientists expect the size of Midway Island to** ✓ Choose... decrease increase stay the same **and move** ✓ Choose... closer to farther from **the hot spot.**

3 **After researching, the student predicted how the Hawaiian Islands would appear in 100,000 years.**

The best prediction about the islands 100,000 years from now is

- ○ **A** the number of active volcanoes will increase
- ○ **B** Hawaii will be located slightly closer to Maui
- ○ **C** new islands will have formed over the hot spot
- ○ **D** the smaller islands will have a slight increase in height

4 **The student researched the changes that occurred over time to the island of Oahu. A diagram of Oahu is shown below.**

OAHU

Write the events in the order they would most likely have occurred to produce the current geological appearance of Oahu.

Lava cooled and formed volcanic rock.

Water eroded the land around the extinct volcano.

Lava erupted from the ocean floor.

The ocean floor moves away from the hotspot.

Occurred First	
↓	
↓	
Occurred Last	

5 **The student analyzed the data from the research on volcanoes to identify relationships between the formation of islands and the volcanoes.**

The younger volcanoes are ✓ Choose... / more than / less than **a million years old and have a** ✓ Choose... / smaller / larger **surface area because they have experienced** ✓ Choose... / a smaller amount of erosion than / a greater amount of weathering than / the same amount of deposition as **the older volcanoes.**

6 **According to the student's research, the current appearance of the Hawaiian Islands is due to a combination of short-term and long-term geoscience processes.**

Use evidence from the research to explain how short-term and long-term geoscience processes have contributed to the Hawaiian Islands' current appearance.