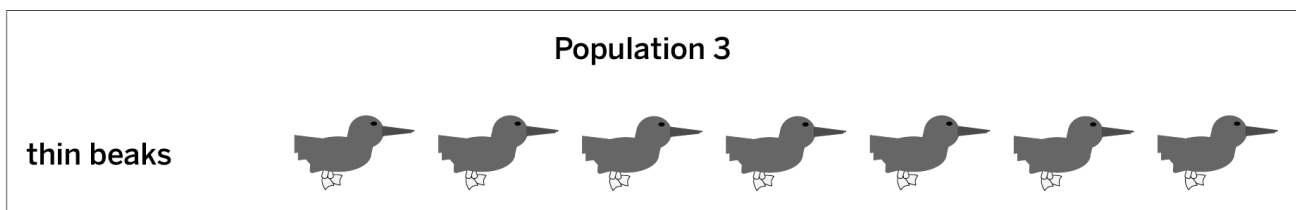
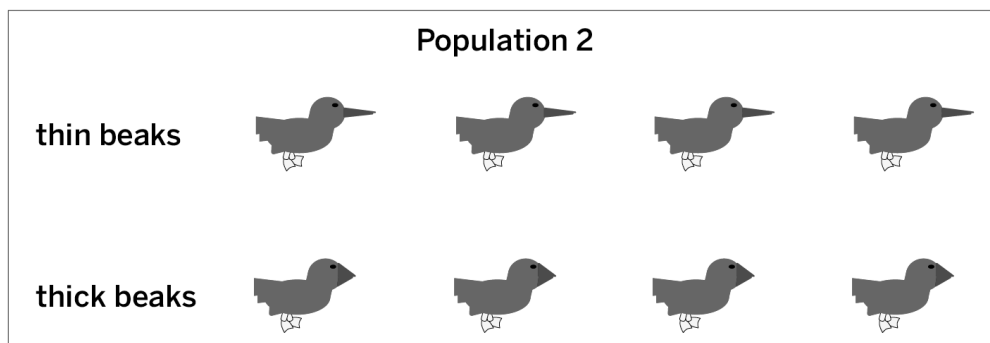
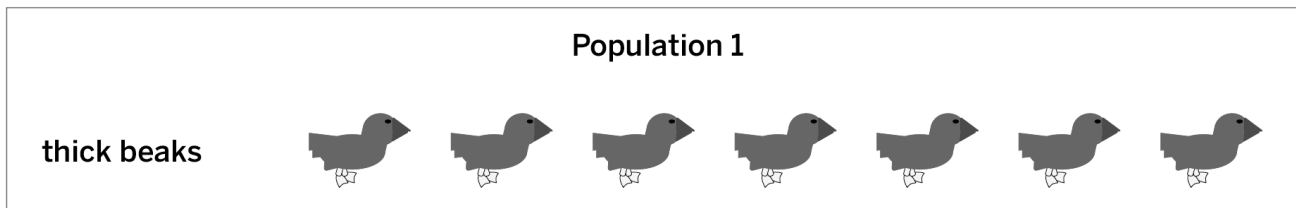


Multiple-Choice Questions

1. Blue jays are birds that live in the forest. They can have beaks of different thicknesses.

Blue jays use their beaks to get to the seeds they eat. Blue jays with thinner beaks can easily reach and eat the seeds inside pinecones. Blue jays with thicker beaks can easily open and eat seeds with hard shells.

The diagrams below show three possible blue jay populations.



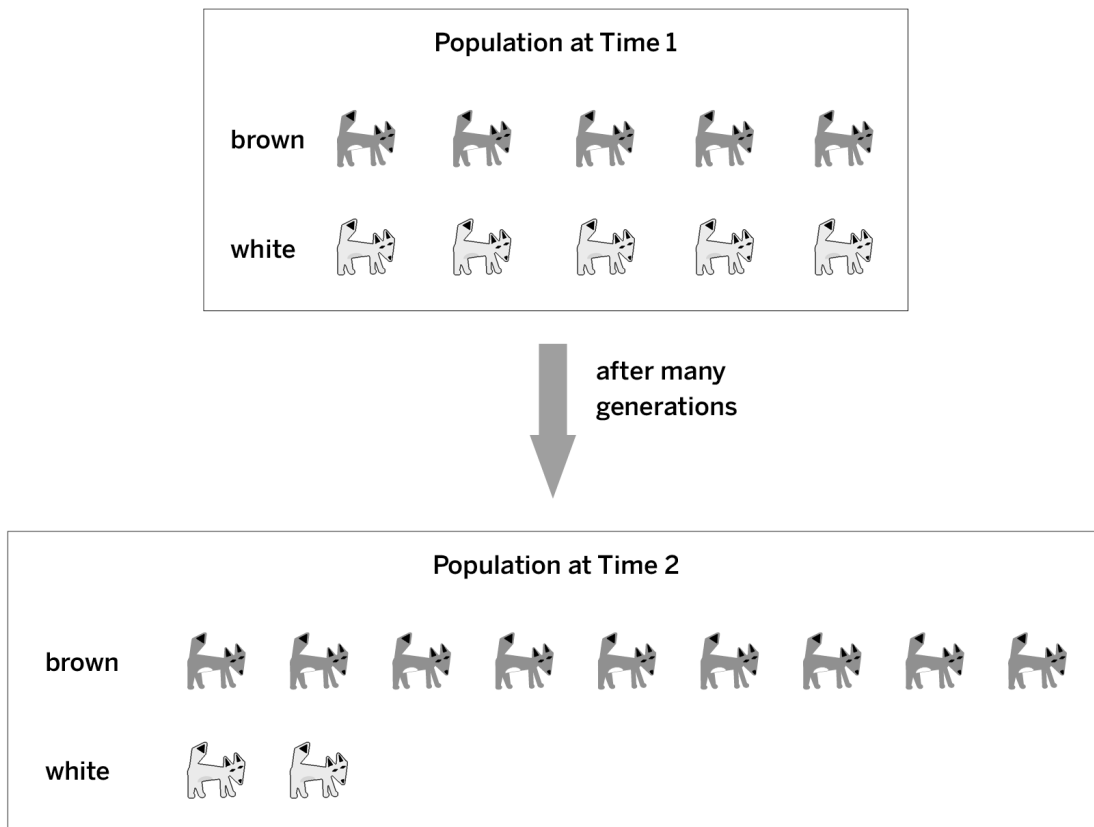
If their environment changes to have only seeds in pinecones, which of the following blue jay populations will most likely survive?

- (a) Populations 1 and 2 will most likely survive.
- (b) Populations 2 and 3 will most likely survive.
- (c) Only Population 2 will survive because it is the only population with variation.
- (d) All the populations will survive because the blue jays will change the thickness of their beaks if they need to.

2. Northern foxes can have different fur colors.

The foxes hunt squirrels for food. Foxes that have fur the same color as their environment are better at getting closer to squirrels and catching them.

The diagram below shows a population of foxes that live in one area. At time 1, the population had the same number of brown and white foxes. At time 2, after many generations, there were many more brown foxes and fewer white foxes in the population.

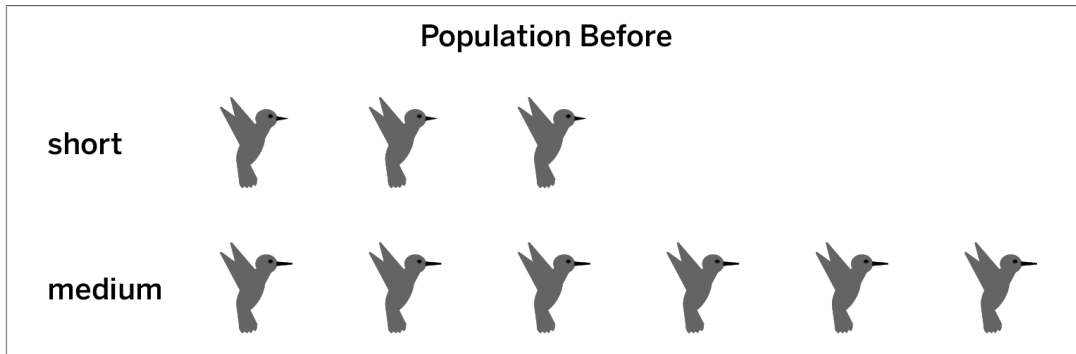


How did the environment change between time 1 and time 2? How did the population change?

- (a) You cannot tell how the environment changed. With each generation, more foxes passed on the gene for brown fur to their offspring.
- (b) The environment became brown. Brown foxes are more likely to survive, so the white foxes changed to have brown fur.
- (c) The environment became brown. Brown foxes are more likely to survive, so both kinds of foxes passed on the gene for brown fur to their offspring.
- (d) The environment became brown. With each generation, more brown foxes survived long enough to pass on the gene for brown fur to their offspring.

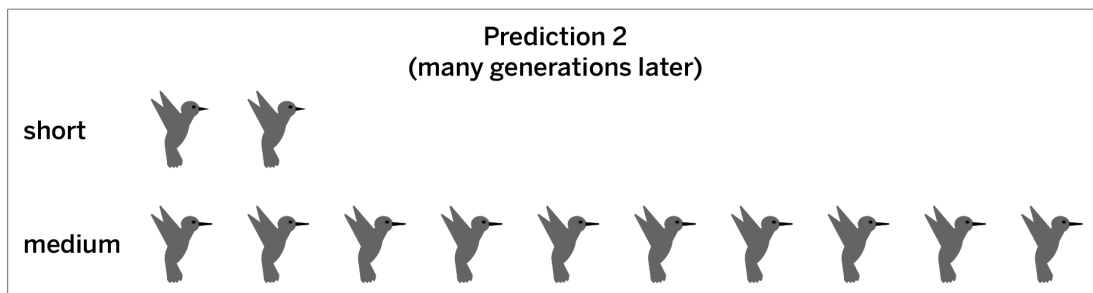
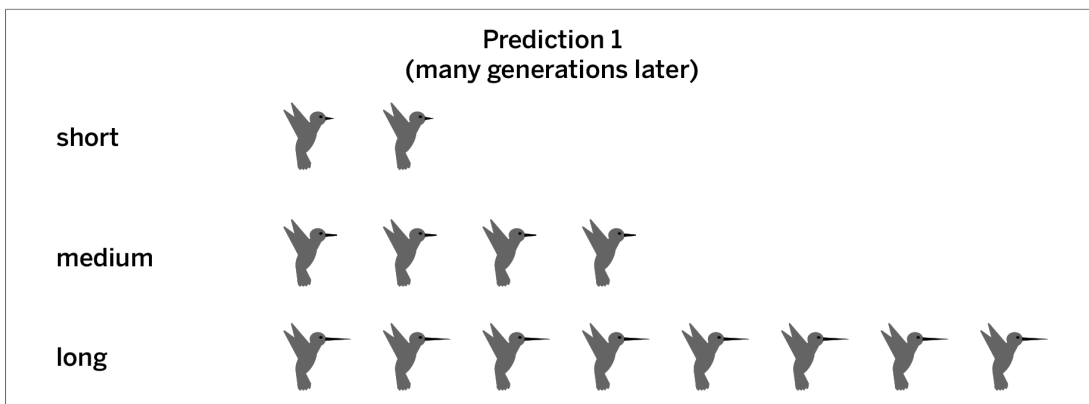
3. Hummingbirds can have beaks of different lengths.

They use their beaks to reach to the nectar (their food) at the bottom of flowers. Hummingbirds with longer beaks can get food from long flowers. Hummingbirds with shorter beaks cannot reach the nectar in long flowers. If a hummingbird can't easily reach its food, it will die.



A population of hummingbirds once lived in an environment where there were very few long or medium flowers. The image above shows what the population looked like then. The environment changed so that mostly long and medium flowers now grow there.

The diagrams below show two predictions for what the population could be like after many generations.



question continued →

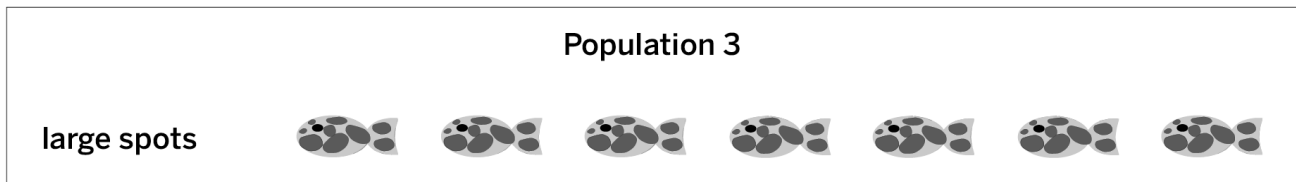
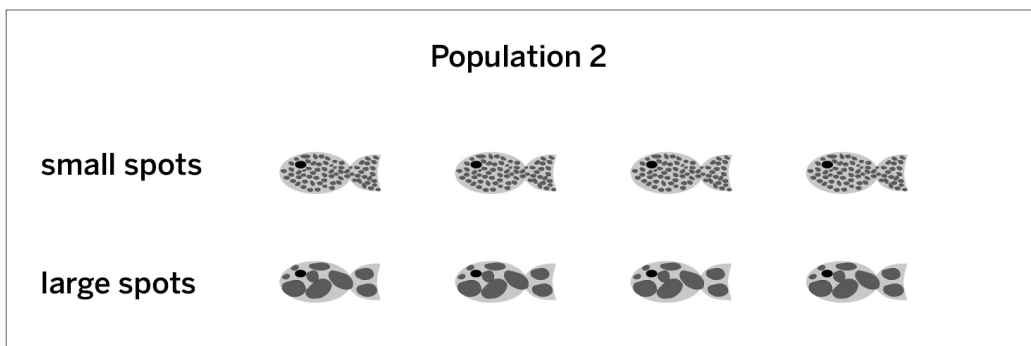
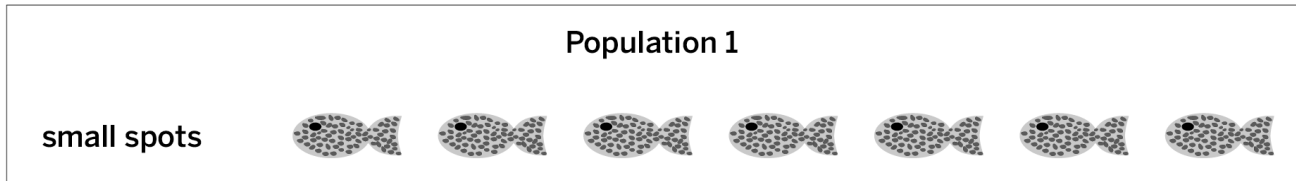
3. Which prediction best shows what the population could look like after many generations? What caused it to change?

- (a) Prediction 1 is best. Two hummingbirds with short or medium beaks had a baby with a mutation in its genes for the long-beak trait. Because long-beak hummingbirds are more likely to survive, that baby survived long enough to pass on its mutation, so the long-beak trait became more common over generations.
 - (b) Prediction 1 is best. Hummingbirds with long beaks are more likely to survive, so hummingbirds with short and medium beaks began to have offspring with a mutation in its genes for the long-beak trait so that their offspring would have a better chance to survive.
 - (c) Prediction 2 is best. A hummingbird could have been born with a mutation in its genes for the long-beak trait and lived for a little while. Because long-break hummingbirds are more likely to die, it would have been more likely to die before it had any offspring, so the final population will only have medium or short beak hummingbirds.
 - (d) Prediction 2 is best. A hummingbird could have been born with a mutation in its genes for the long-beak trait, but having a mutation in its genes would have caused it to die when it was born, so the final population will only have medium or short beak hummingbirds.
-

4. Guppies are small fish that live in South American rivers. They can have different-sized spots on their bodies.

The river bottoms are covered in rocks. Guppies with spots that are the same size as the rocks on the bottom are harder for bigger fish to see and catch.

The diagrams below show three possible guppy populations.



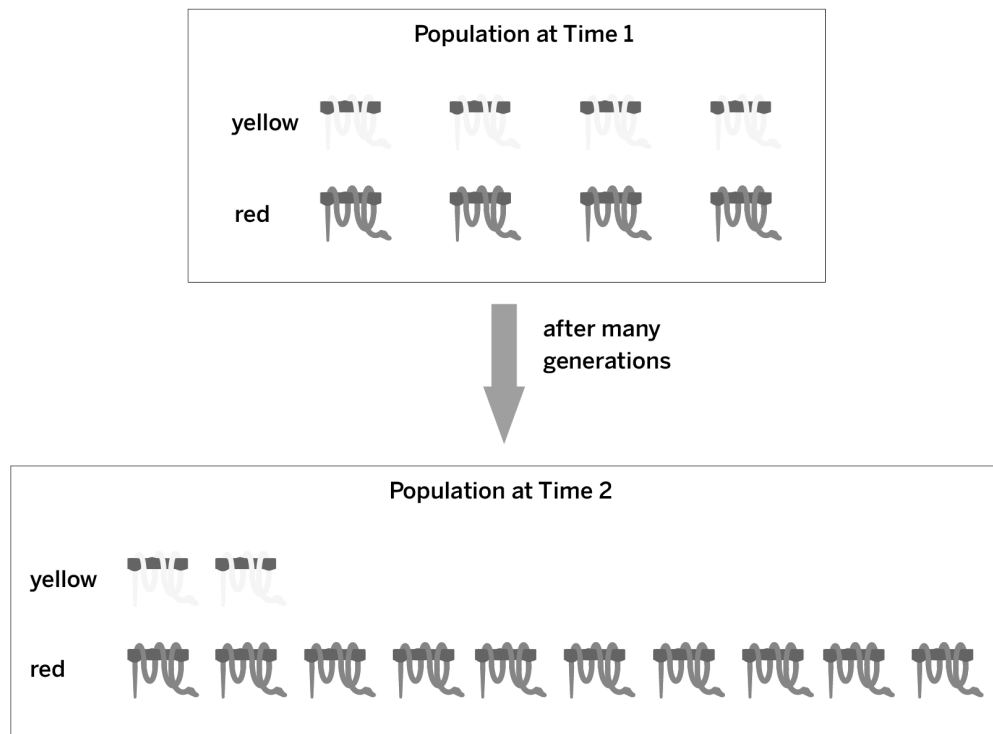
If their environment changes to have only large rocks, which of the following guppy populations will most likely survive?

- (a) Only Population 2 will survive because it is the only population with variation.
- (b) All the populations will survive because the guppies will change the size of their spots if they need to.
- (c) Populations 1 and 2 will most likely survive.
- (d) Populations 2 and 3 will most likely survive.

5. There is a kind of snake that can be born with red or yellow skin. Eagles hunt these snakes, but snakes that are the same color as their environment are harder for the eagles to see and catch.

The diagram below shows a population of snakes that live in an environment where there was yellow sand and red dirt. At time 1, the population had the same number of yellow and red snakes. At time 2, after many generations, there were many more red snakes and fewer yellow snakes in the population.

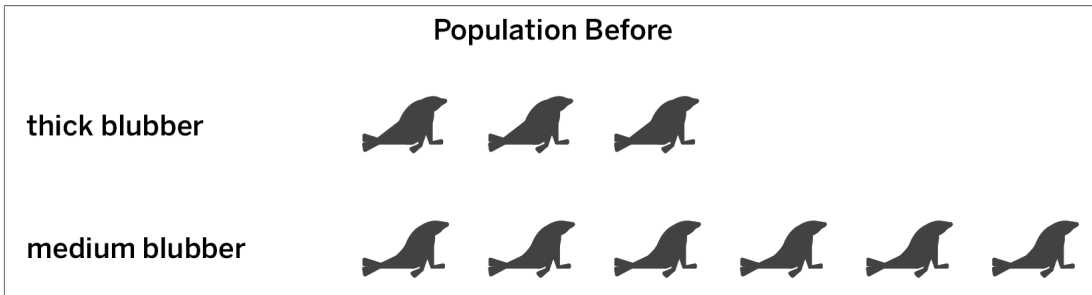
How did the environment change between time 1 and time 2? How did the population change?



- (a) You cannot tell how the environment changed. With each generation, more snakes passed on the gene for red skin to their offspring.
- (b) There was more red dirt in the environment. With each generation, more red snakes survived long enough to pass on the gene for red skin to their offspring.
- (c) There was more red dirt in the environment. Red snakes are more likely to survive, so the yellow snakes changed to have red skin.
- (d) There was more red dirt in the environment. Red snakes are more likely to survive, so both kinds of snakes passed on the gene for red skin to their offspring.

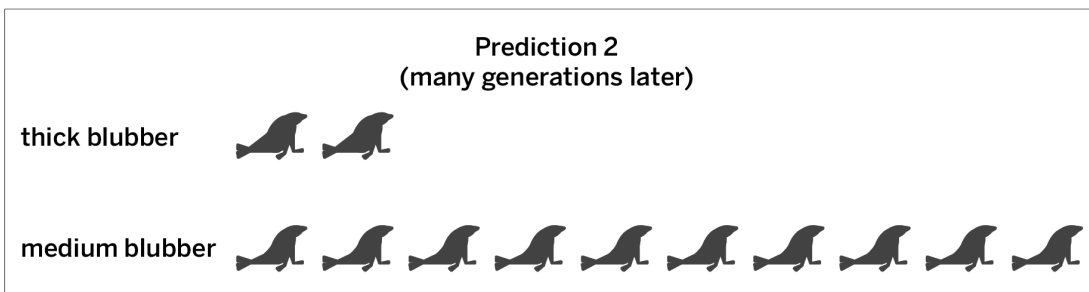
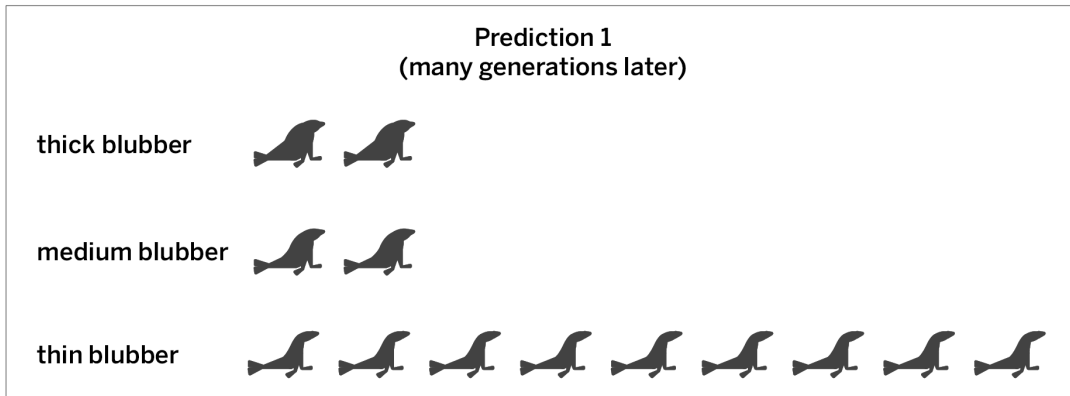
6. Harbor seals live in northern oceans and have a layer of blubber (fat) that keeps them warm. Seals can have blubber of different thicknesses.

Seals with thicker blubber are more likely to stay warm and survive in cold ocean waters. But, in warm ocean waters, thicker blubber can make the seals overheat and die.



A population of seals once lived in an environment where the water was cold. The image above shows what the population looked like then. The environment changed and now the water is very warm.

The diagrams below show two predictions for what the population could be like after many generations.



question continued →

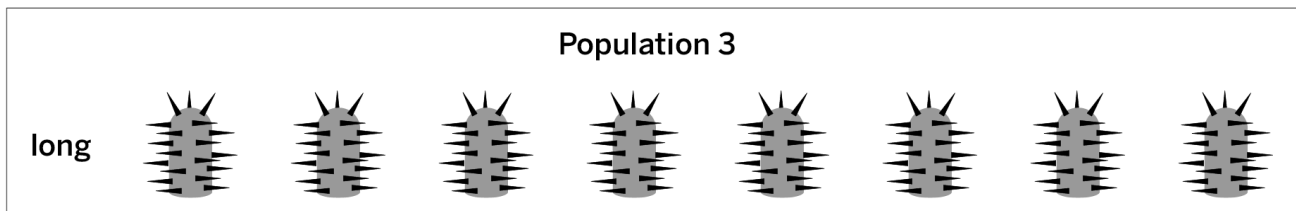
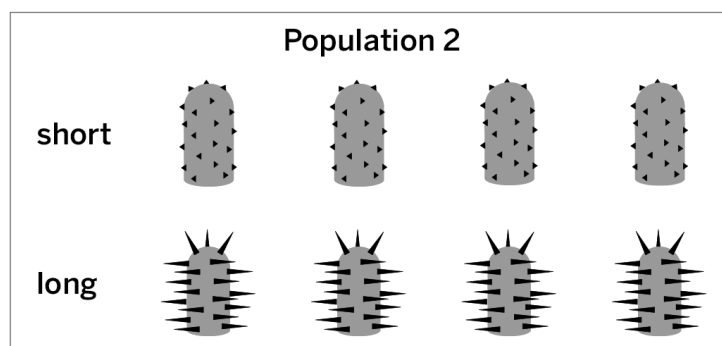
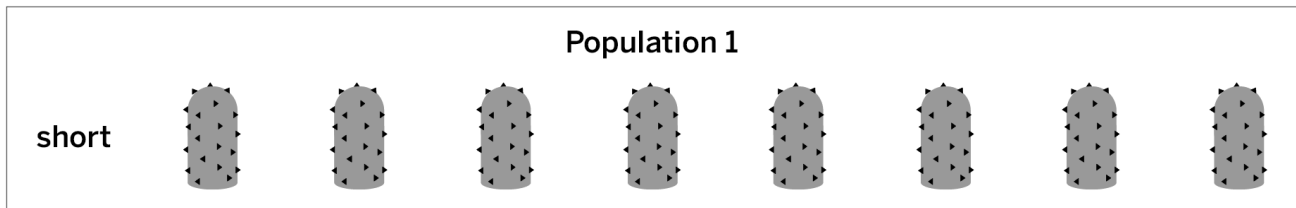
6. Which prediction best shows what the population could look like after many generations? What caused it to change?

- (a) Prediction 1 is best. Two seals with thick or medium blubber had a baby with a mutation in its genes for the thin trait. Because thin seals are more likely to survive, that baby survived long enough to pass on its mutation, so the thin trait became more common over generations.
 - (b) Prediction 1 is best. Seals with thin blubber are more likely to survive, so seals with thick and medium blubber began to have offspring with a mutation in its genes for the thin trait, so that their offspring would have a better chance to survive.
 - (c) Prediction 2 is best. A seal could have been born with a mutation in its genes for the thin trait and lived for a little while, but it would have been more likely to die before it had any offspring, so the final population will only have seals with thick or medium blubber.
 - (d) Prediction 2 is best. A seal could have been born with a mutation in its genes for the thin trait, but having a mutation in its genes would have caused it to die when it was born, so the final population will only have seals with thick or medium blubber.
-

7. Barrel cactuses live in the Mexican desert. They are covered in sharp spines. Cactuses can have spines of different lengths.

Their sharp spines help protect them from being eaten by bighorn sheep. Cactuses with longer spines are less likely to be eaten by the sheep.

The diagrams below show three possible cactus populations.



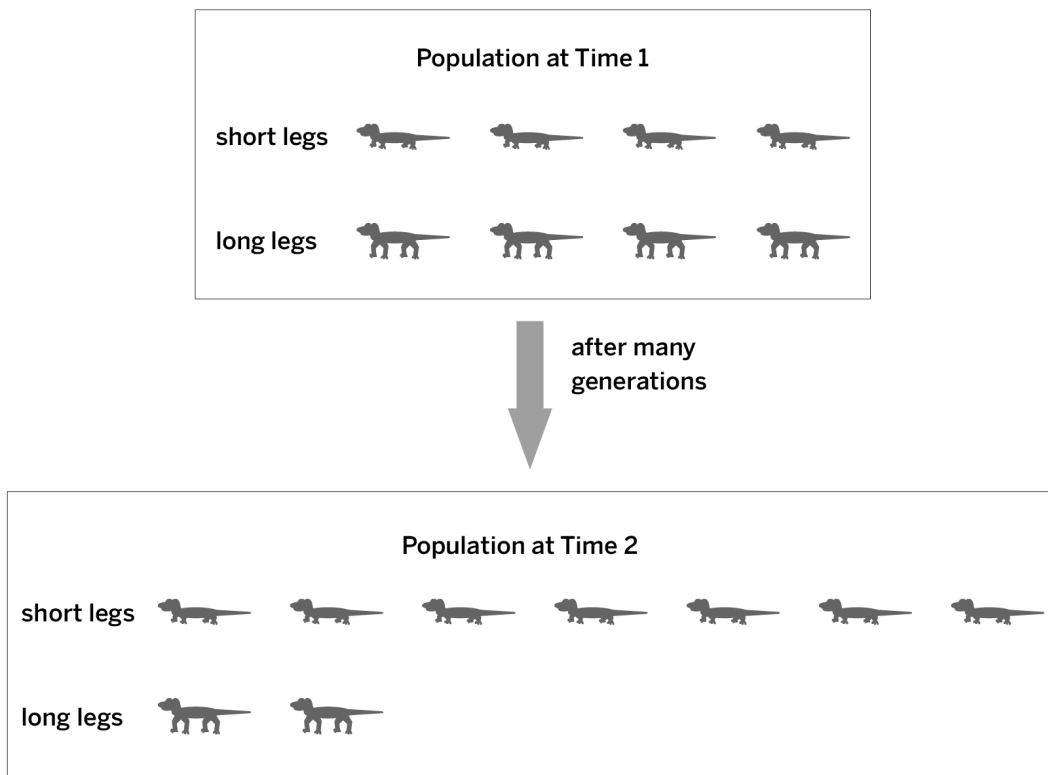
If their environment changes to have many bighorn sheep, which of the following cactus populations will most likely survive?

- (a) Populations 1 and 2 will most likely survive.
- (b) Populations 2 and 3 will most likely survive.
- (c) Only Population 2 will survive because it is the only population with variation.
- (d) All the populations will survive because the cactuses will change the length of their spines if they need to.

8. Brown anoles are lizards that live on islands in the Bahamas. They can have legs of different lengths.

Lizards with shorter legs are better at climbing trees than lizards with longer legs. This makes lizards with shorter legs better at escaping from the floods that sometimes cover the islands.

The diagram below shows a population of lizards that live on an island. At time 1, the population had the same number of lizards with short legs and lizards with long legs. At time 2, after many generations, many more lizards had short legs and fewer lizards had long legs.

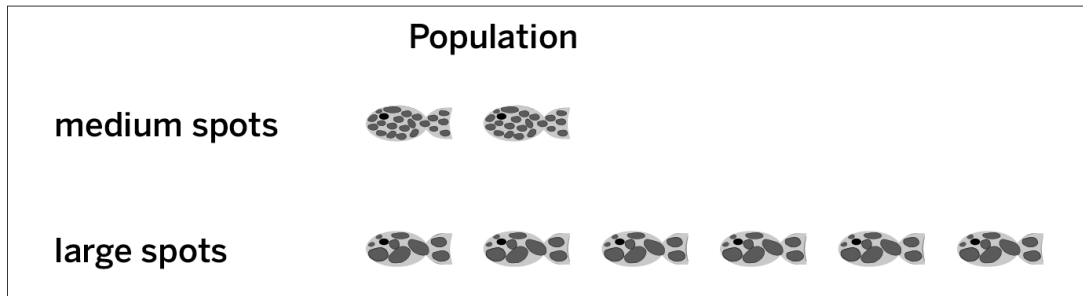


How did the environment change between time 1 and time 2? How did the population change?

- (a) You cannot tell how the environment changed. With each generation, more lizards passed on the gene for short legs to their offspring.
- (b) There were more floods. Lizards with short legs are more likely to survive, so the lizards with long legs changed to have short legs.
- (c) There were more floods. Lizards with short legs are more likely to survive, so both kinds of lizards passed on the gene for short legs to their offspring.
- (d) There were more floods. With each generation, more lizards with short legs survived long enough to pass on the gene for short legs to their offspring.

9. Guppies are small fish that live in South American rivers. They can have large spots, medium spots, or small spots.

The river bottoms are covered in rocks. Guppies with spots that are the same size as the rocks on the bottom are harder for bigger fish to see and catch.



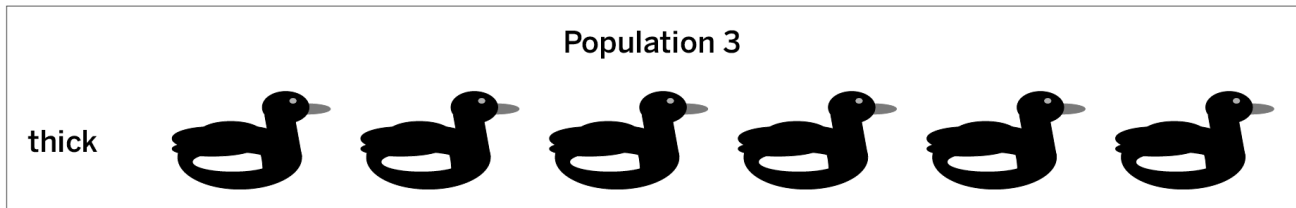
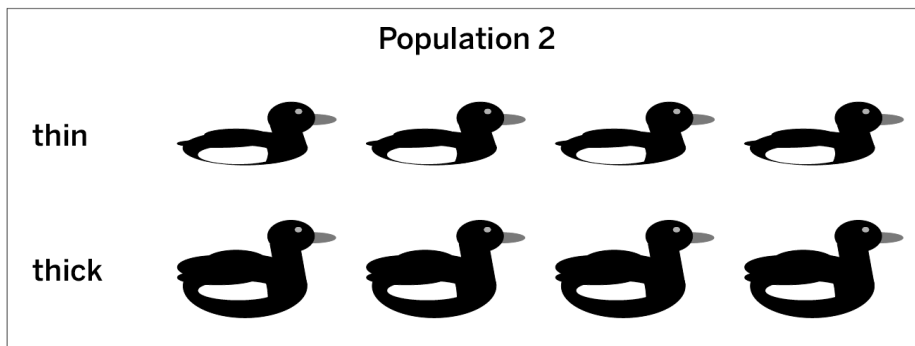
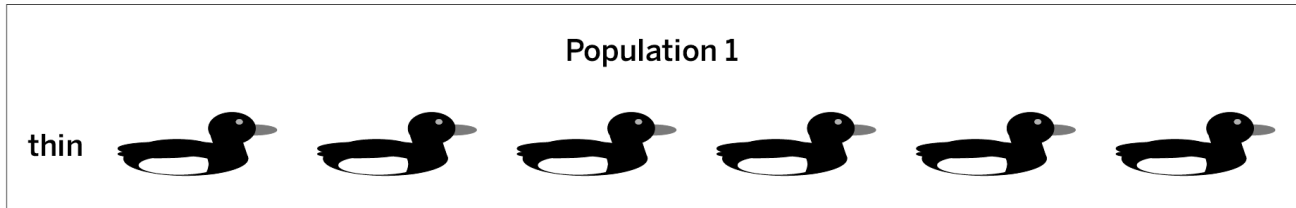
The population of guppies shown above lives in an environment that has always had large rocks. Could there ever have been guppies with small spots in this population?

- (a) No guppies could have been born with the small-spot trait because none of the adult guppies had that trait to pass down.
 - (b) No guppies could have been born with the small-spot trait in the past, but some with that trait could be born in the future if the environment changes to have small rocks.
 - (c) A baby guppy could have been born with genes for the mutant small-spot trait and lived for a little while, but it would have died before it had any offspring.
 - (d) A baby guppy could have been born with genes for the mutant small-spot trait, but its mutant trait would have caused it to die when it was born.
-

10. Eider ducks live in the ocean and have a layer of warm feathers underneath their regular feathers. They can have feathers of different thicknesses.

These feathers help the ducks stay warm in cold water. Ducks with thicker feathers are more likely to stay warm and survive in cold water. But, in warm water, thicker feathers can make the ducks overheat and die.

The diagrams below show three possible duck populations.



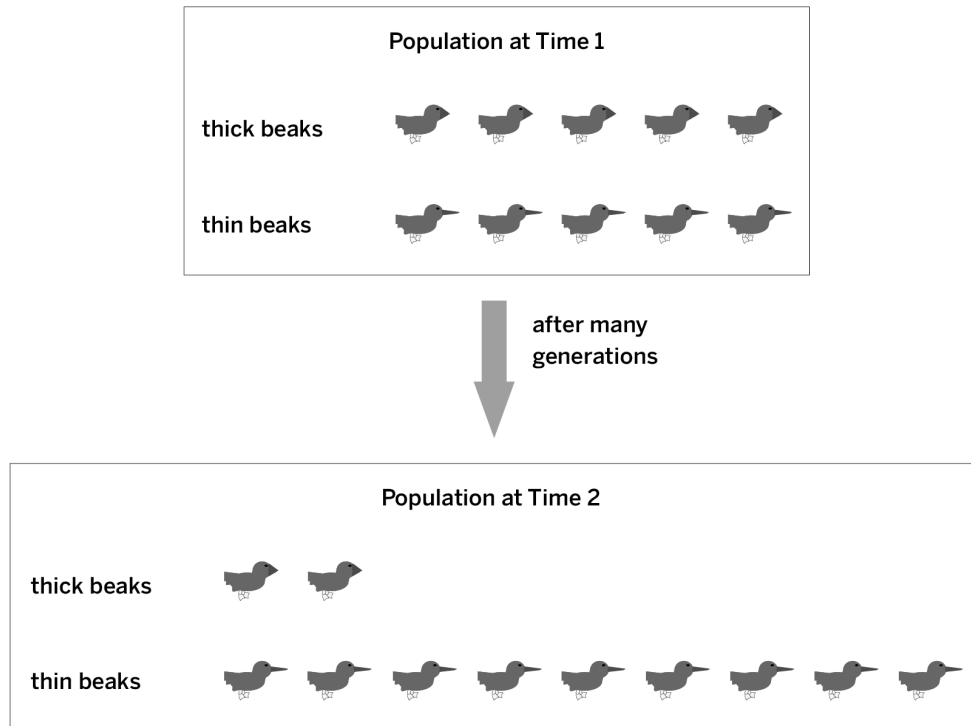
If their environment changes to have very cold water, which of the following duck populations will most likely survive?

- (a) Populations 1 and 2 will most likely survive.
- (b) Populations 2 and 3 will most likely survive.
- (c) Only Population 2 will survive because it is the only population with variation.
- (d) All the populations will survive because the ducks will change their feather thickness if they need to.

11. Blue jays are birds that live in the forest. They can have beaks of different thicknesses.

Blue jays use their beaks to get to the seeds they eat. Blue jays with thinner beaks can easily reach and eat the seeds inside pinecones. Blue jays with thicker beaks can easily open and eat seeds with hard shells.

The diagram below shows a population of blue jays that live in a forest. At time 1, the population had the same number of blue jays with thick beaks and blue jays with thin beaks. At time 2, after many generations, there were many more blue jays with thin beaks and fewer jays with thick beaks in the population.

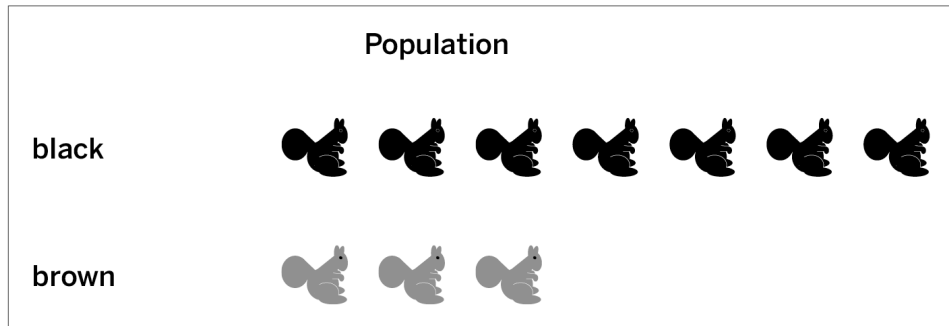


How did the environment change between time 1 and time 2? How did the population change?

- (a) There were more trees that had pinecones with seeds. With each generation, more blue jays with thin beaks survived long enough to pass on the gene for thin beaks to their offspring.
- (b) There were more trees that had pinecones with seeds. Blue jays with thin beaks are more likely to survive, so the blue jays with thick beaks changed to have thin beaks.
- (c) There were more trees that had pinecones with seeds. Blue jays with thin beaks are more likely to survive, so both kinds of blue jays passed on the gene for thin beaks to their offspring.
- (d) You cannot tell how the environment changed. With each generation, more blue jays passed on the gene for thin beaks to their offspring.

12. Tree squirrels can have different fur colors. They can be black, brown, or gray.

Squirrels live in forests where foxes also live. Foxes hunt squirrels for food. Squirrels that have fur the same color as the trees are harder for the foxes to see and catch.



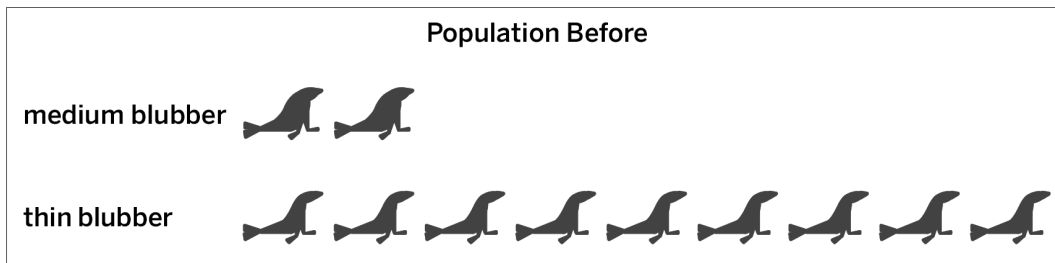
The population of squirrels shown above lives in an environment that has always had black trees. Could there ever have been squirrels with gray fur in this population?

- (a) No squirrels could have been born with the gray trait because none of the adult squirrels had that trait to pass down.
- (b) No squirrels could have been born with the gray trait in the past, but some with that trait could be born in the future if the environment changes to have gray trees.
- (c) A squirrel could have been born with a mutation in its genes for the gray trait and lived for a little while, but it would have been more likely to die before it had any offspring.
- (d) A squirrel could have been born with a mutation in its genes for the gray trait, but having a mutation in its genes would have caused it to die when it was born.

Written-Response Question #1

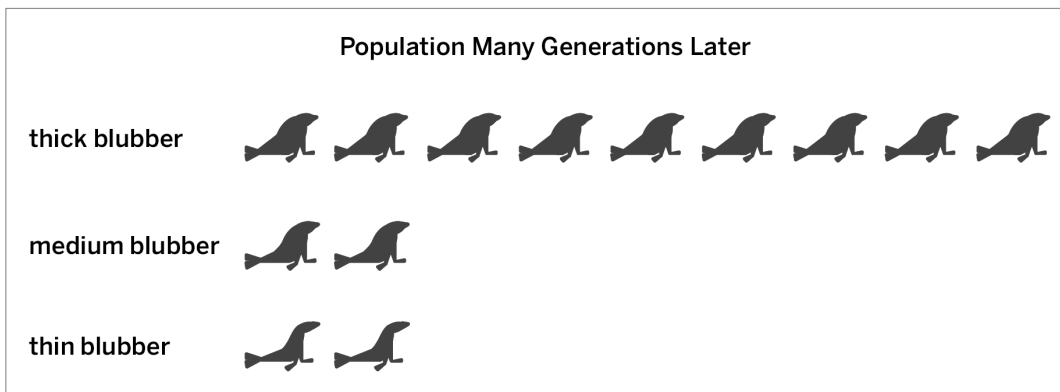
Harbor seals live in northern oceans and have a layer of blubber (fat) that keeps them warm. Seals can have blubber of different thicknesses.

Seals with thicker blubber are more likely to stay warm and survive in cold ocean waters. But, in warm ocean waters, thicker blubber can make the seals overheat and die.



The diagram above shows a population of seals that lived in an area of ocean. Scientists had previously only seen seals with medium or thin blubber in this area of ocean; they had never seen seals with thick blubber.

The diagram below shows how the population changed after many generations.



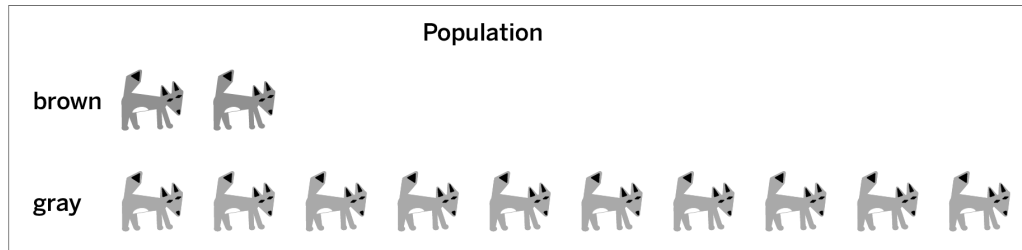
- Edin says the change in the seal population was caused by a change in the environment.
- Vada says the change was caused by a mutation.
- Miko thinks both Edin and Vada are correct.

Who do you think is right? Explain what happened to the seals over many generations.

Written-Response Question #2

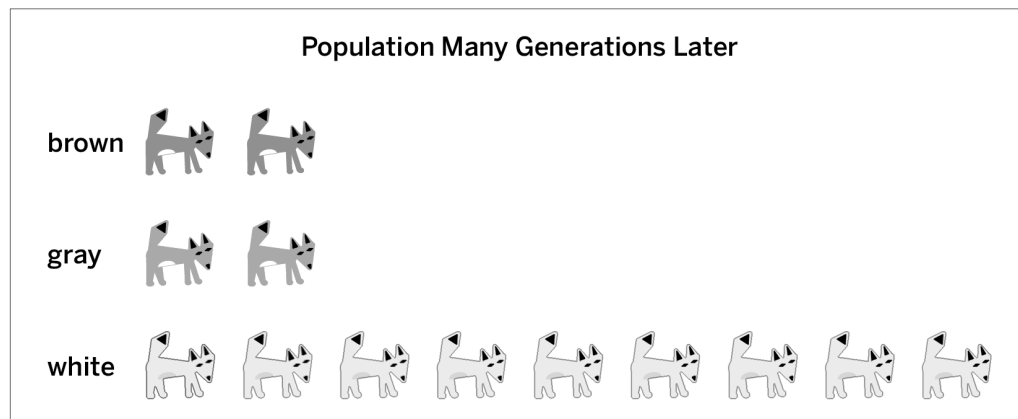
Northern foxes can have different fur colors. They can be white, brown, or gray.

The foxes hunt squirrels for food. Foxes that have fur the same color as their environment are better at getting closer to squirrels and catching them.



The diagram above shows a population of foxes that once lived in a forest. Scientists had only seen brown and gray foxes in this forest and had never seen foxes of any other color.

The diagram below shows how the population changed after many generations.



How did the color of the foxes' environment change? Explain what happened to the foxes over many generations.

question continued →

