

Mountain Lion Populations 5E

How can we figure out where the Connecticut Cat came from?

Performance Expectations
HS-LS3-2

Investigative Phenomenon
A male mountain lion was killed by a car on a parkway in Connecticut. Students need to figure out where it came from, how it got there, and why it would roam so far from its original home.

Time
5 days

Mountain lions used to have a large range across North, Central, and South America. As humans have built roads, farmlands, and cities in their range, mountain lions are more restricted to smaller areas. This causes a problem for genetic diversity, since it limits the mates in a reachable area for each animal. Male mountain lions typically roam far from their immediate families in search of mates, but now they may have to travel very far to find a female who is not closely related. Relationships between mountain lions can be determined by looking at genetic data and determining allele frequency.

Engage	How can we figure out where the Connecticut Cat came from?	Connecting to their earlier questions, students develop and share their initial ideas about how they can determine where the mountain lion hit by a car in Connecticut came from. Students develop a table that lists the evidence that would support each of their ideas .
Explore	How can we use genetic data to determine where the Connecticut Cat came from?	Students analyze patterns in genetic variation data from five different populations of North American mountain lions (California, Mexico, South Dakota, Texas, Florida) in order to figure out where the Connecticut cat may have originated.
Explain	Why would a mountain lion roam so far from his home territory?	Students incorporate descriptions of mountain lion behavior with their analysis of genetic data to make and defend a claim on the cause behind the Connecticut Cat's movements.
Elaborate	How can we apply what we've learned about mountain lions to another kind of big cat?	Students apply what they learned about mountain lions in North America to analyze data about cheetah populations in Africa, in order to make and defend a claim on the relationship between genetic variability and survival .
Evaluate	How do changes in populations relate to genetic variation among individuals?	Students develop a model, based on evidence , to represent the cause behind the migration of the Connecticut cat at different scales .

Science & Engineering Practices

Disciplinary Core Ideas

Crosscutting Concepts

Engage

How can we figure out where the Connecticut Cat came from?

Connecting to their earlier questions, students develop and share their initial ideas about how they can determine where the mountain lion hit by a car in Connecticut came from. Students develop a table that **lists the evidence** that would support each of **their ideas**.

Preparation

Student Grouping

☐ Pairs

Routines

☐ Rumors

Literacy Strategies

None

Materials

Handouts

- ☐ The Connecticut Cat
- ☐ Investigating Genetic Data

Lab Supplies

None

Other Resources

Surfacing Student Ideas

1. Revisit the story of the Connecticut Cat. Have students look at the range map showing North American mountain lion populations (from *The Connecticut Cat*).
2. Have students list the different hypotheses about where the mountain lion came from.
3. Have students decide what evidence they would need in order to test each hypothesis.
4. Use the group learning routine **Rumors** to share hypotheses and evidence that would be needed.

Routine



This is the first time the routine **Rumors** appears in this unit. The goal of the **Rumors** routine is to have students exchange ideas while listening for similarities and differences in

Implementation Tip



Students may struggle to come up with ideas for figuring out where the mountain lion came from. You may want to ask things like, “How would you figure out if a stray cat has an owner?” Possible hypotheses are in the table “Mountain Lion Hypotheses.”

thinking. It’s meant to be low stakes, so it is frequently used to surface initial student ideas about phenomena during the Engage phases. Please read the Biology Course Guide for detailed steps about this routine.

Mountain Lion Hypotheses

Independent Variable	Dependent Variable
Escaped from captivity	Microchip, non-wild food in stomach/intestine, other evidence of care
Part of endemic population	Presence of other mountain lions in Connecticut
walked from another place	Sightings, common markings from another population, DNA commonalities with population from another area

Developing a Plan for Investigation

1. Organize student hypotheses and evidence. Explain that no microchip was found, food in the animal’s intestine appeared to be deer meat, and there is no evidence of active mountain lion populations in the North East.

Look & Listen For



Students had the opportunity in Units 3 and 4 to consider how individuals and populations differ genetically. Listen for any students’ thinking about looking at genetics and genetic similarities as a way to figure out where the mountain lion came from.

2. Let students know that in the next lesson we will look at genetic data to see if it can be used to determine where Connecticut Cat came from.

3. Have students work in pairs to develop a plan for using genetic data to determine the origin of the Connecticut Cat, using *Investigating Genetic Data*.

Explore

How can we use genetic data to determine where the Connecticut Cat came from?

Students **analyze patterns in genetic variation data** from five different populations of North American mountain lions (California, Mexico, South Dakota, Texas, Florida) in order to figure out where the Connecticut cat may have originated.

Preparation

Student Grouping

☐ Pairs

Routines

☐ Consensus Building Share

Literacy Strategies

None

Materials

Handouts

- ☐ Visualizing Karyotypes
- ☐ Interpreting Microsatellite Data
- ☐ Mountain Lion Genotype Data
- ☐ Mountain Lion Genotype Data Investigation
- ☐ Making Sense of the Mountain Lion Genotype Data Investigation
- ☐ Determining Confidence in Sample Sizes
- ☐ Mountain Lion Genotype Data Investigation Rubric

Lab Supplies

None

Other Resources

- ☐ [Confidence Calculator](#)
- ☐ [Sample Size Explained](#)

Visualizing Karyotypes

1. Give students the handout *Visualizing Karyotypes*. If students are unfamiliar with the term *karyotype*, explain that a karyotype is an image of a complete set of chromosomes, taken from one cell in an organism and arranged in numerical order.

Integrating Three Dimensions

2. Provide time for students to work in pairs to compare the karyotypes.
3. Invite a few students to share what they noticed, making sure to highlight key ideas about chromosomes.

Look & Listen For



Some ideas that should come up as students review the karyotypes are the following:

Similarities:

- Chromosomes come in pairs.
- One chromosome comes from the mother, and one comes from the father.
- There is one pair of chromosomes where they aren't always identical. This can be used to know the sex of the animal.

Differences:

- Humans and mountain lions have a different number of total chromosomes.
- Mountain lions have fewer total pairs of chromosomes.



In discussing Karyotypes, this is a great opportunity to review core ideas from **LS3.A Inheritance of Traits** from Unit 3, and to preview core ideas in **LS4.B Natural Selection** in relation to genetic variation.

4. Point out to students that while we are able to see the number of chromosomes and their structure through the microscope images, the images do not tell us about the specific genes on these chromosomes. Let students know that they will now have an opportunity to understand how scientists are able to determine specific genes on these chromosomes, using base pair sequences.

Interpreting Microsatellite Data

5. Provide students with the handout, *Interpreting Microsatellite Data*. Introduce the idea of microsatellite analysis, using the images in the handout. Explain that in every organism's chromosomes there are repeating sequences of base pairs that occur in different lengths and can be used to identify individuals. The microsatellites show up in sequencing software as little peaks that indicate the location of the repeated segment. Since chromosomes come in pairs, it is possible for one individual to have two different microsatellites (alleles) or two of the same. If there are two of the same alleles that location is homozygous. If the allele is different then it is heterozygous.

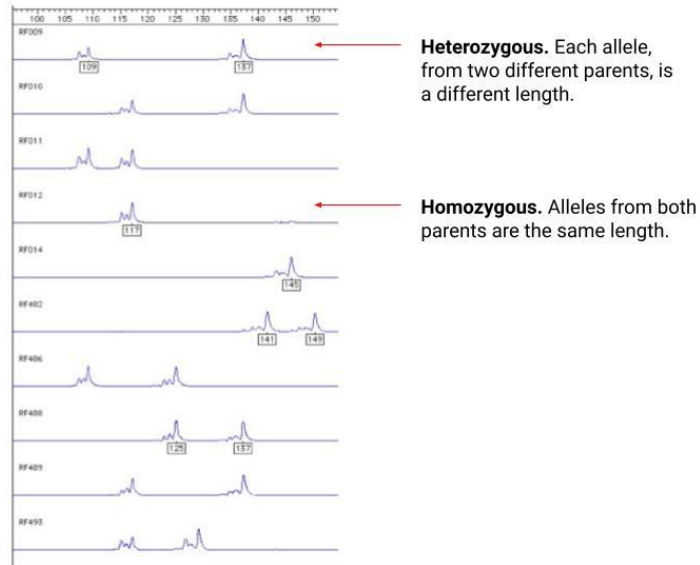
Note: The concept of heterozygosity vs homozygosity alleles is introduced here, but are not needed to identify which mountain lion population the Connecticut cat came from. They are introduced here simply to help students interpret the data. During the Engineering Gene Flow 5E, these concepts will need to be applied as

they analyze the genetic diversity of various mountain lion populations, including the Florida Panther population before and after 1995 conservation efforts.

Implementation Tip



The microsatellite analysis might be really tricky for students to understand, especially if prior concepts like chromosomes and karyotypes had to be reviewed as well. In Unit 3, we looked at the idea of alleles and inheritance, and here we are looking at genetic data that does not necessarily code for a trait. These sections of DNA are markers, but not linked to phenotypes. Take time to help students unpack this visual if needed, because their ability to make sense of diagrams will affect the subsequent parts of this lesson. Use this visual, if helpful. The peaks on each microsatellite line are a reading from several copies of that allele. If an individual has two peaks they are heterozygous. If they only have one peak then they are homozygous.



6. Support students to complete the Microsatellite Analysis table. It may be helpful to model determining allele length and zygosity for a few of the examples before having students work in pairs.

Investigation

1. Give students the *Mountain Lion Genotype Data*. Let students know that the genetic data comes from scat samples that were collected randomly. In order to prepare students to analyze the complex data set, ask students to independently jot what they notice about the data table, then have students engage in a **Think-Talk-Open Exchange** routine to share initial noticings about the table, and elicit some high-level points from the class.

Look & Listen For



This mountain lion genotype table might be really overwhelming at first! It may be helpful to show students a video of animals in the wild being tagged and tracked, so they understand the idea of data from different individuals in a population.

Make sure to highlight the following ideas from the class:

- Each code in the left column represents a unique, individual mountain lion.
- There are five mountain lions from each location – this is only a sample of the entire population from each location
- There are four different microsatellites we are comparing here: A106, A312, B207, B316.
- For each gene there are lots of different possible alleles!

2. Give students the *Mountain Lion Genotype Data Investigation*. Have students analyze the data in the *Mountain Lion Genotype Data*, in order to identify and list the alleles found in each population. These are *unique alleles*. Then have students identify alleles that are only found in one population. These are *private alleles*.

Whole-Class Investigation Summary

3. Provide students with *Making Sense of the Mountain Lion Genotype Data Investigation*. Ask students to work independently to complete the See-Think-Wonder, then discuss their observations, thoughts, and wonderings as a way to make sense of the investigation.
4. In table groups, have students discuss the guiding prompt: *Where do you think the Connecticut Cat came from? Evaluate the evidence you used to make that conclusion.*
5. Tying into student questions about population and sample sizes (e.g. Why are we only looking at the genetics from 5 individuals?), show students the video [Sample Size Explained](#). Explain to students that different sample sizes, in relation to total population size, result in different “confidence intervals” and

Routine



This is the first time the routine **Consensus-Building Share** appears in this unit. This routine is a way to make sensemaking visible and move towards a class-wide consensus around a new idea. As the whole-class

“standard errors.” Show them the online tool [Confidence Calculator](#) for calculating these statistical measures.

Tell them that the “confidence interval” means how many percentage points the answer could be between. A confidence interval of 0.05 means that the actual result is within 5% of your answer, while a confidence interval of .25 means that the actual result is within 25% of your answer. For example: if we use sample size 20 in a population of 10,000, the “confidence interval” produced by the calculator will be .225; if we calculate an average using that sample size of 20, that average will be within 22.5% of the true average of the whole population of 10,000.

Standard error refers to the amount that the real answer could vary from your answer. The lower the standard error and confidence intervals, the more confident students can feel in their data. In this case, the lower these two metrics, the more confident students can be that the samples contain all of the alleles in the population.

6. Have students use the tool [Confidence Calculator](#) to complete the final page of *Determining Confidence in Sample Sizes*, *Determining Confidence in Sample Sizes*.
7. Use the group learning routine, **Consensus Building Share**, to share student ideas.

activity for this Explore, it is important to surface as many of the ideas in the Look and Listen For section as possible.

For the first time using this routine, it is appropriate to prompt students with questions such as “Did any group find something similar?” or “Can anyone add to that?” Be sure to look at the Biology Course Guide for the action pattern for this routine.

Look & Listen For



- I think the Connecticut Cat came from the South Dakota mountain lion population.
- The Connecticut Cat genetic data indicates the presence of PcoA106 (length 258), PcoB207(length 302), PcoB316 (length 272).
- These are private alleles only found in the South Dakota population, so that’s the only population from which the Connecticut Cat could have inherited those genes.
- Based on statistical analysis, we can be relatively confident (about 80%) that no region’s population, other than South Dakota’s, contains the set of alleles found in the CT cat
- Increasing the sample size would improve our confidence in our conclusion
- Students may wonder why a cat from South Dakota would be found in Connecticut

8. If students don’t surface any of the important observations named in the Look and Listen For, direct students back to appropriate investigation resources and use conferring questions to support them in making those observations before moving on, as they will be key to success in the Explain phase that follows.

9. Provide students with *Mountain Lion Genotype Data Investigation Rubric*. Ask students to use the investigation rubric to self and peer assess their progress on engaging with the investigation individually and as a group.

Explain

Why would a mountain lion roam so far from his home territory?

Students incorporate **descriptions of mountain lion behavior** with their **analysis of genetic data** to **make and defend a claim** on the **cause** behind the Connecticut Cat's movements.

Preparation

Student Grouping

- ☐ Table groups

Routines

- ☐ Read-Generate-Sort-Solve
- ☐ Class Consensus Discussion

Literacy Strategies

- ☐ Text Annotation

Materials

Handouts

- ☐ Genotype Data Read-Generate-Sort-Solve
- ☐ Summary Task

Lab Supplies

None

Other Resources

Develop and Defend a Claim

1. Review what students figured out in the Explain phase, that based on the genetic evidence, the cat's original population is from South Dakota. Point to or highlight remaining students' questions, such as why the cat would be found so far away from home as a transition.
2. Prompt students to work in small groups on the *Genotype Data Read-Generate-Sort-Solve*, using the data analyzed in the investigation, and the on-line texts. Students respond to the prompt: Using the patterns found in the genetic data, and scientific concepts discussed in the articles: Develop and defend a claim on why the Connecticut Cat roamed so far from its original location. Students can use **text annotation** to pull out important information.

Routine



The **Read-Generate-Sort-Solve** routine promotes collaborative engagement in problem-solving and supports students in articulating their thinking and

3. At the end of the **Read-Generate-Sort-Solve** routine, each group should have a solid idea to share with the class.

making it transparent, before considering solutions. This is the first time this routine appears in this routine. Be sure to refer to the Biology Course Guide for planning support.

Class Consensus Discussion

1. Orient the class to the purpose and the format of the group learning routine **Class Consensus Discussion**. You may say something like this:

"We have a lot of different ideas circulating in the room right now, and they are in the form of different claims along with evidence and reasoning for our claims. It is really important for us to get to some agreement on what happened with this Connecticut Cat, so that we have a shared understanding to build upon as we move ahead. In order to do this we are going to do something called a **Class Consensus Discussion**. First I will select a few different groups to share their ideas. Then, we will discuss what we can agree to as a class."

2. You may decide to walk students through the entire poster, or take them through the steps as you facilitate it.

Class Consensus Discussion Steps

1. we select a few different groups' ideas.
2. The first group shares out their work.
3. one person repeats or reiterates what the first group shared.
4. Class members ask clarifying questions about the work.

Repeat steps 2-4 for each group that is sharing work.

5. Everyone confers in table groups.
6. Engage in whole-class discussion about the ideas that were shared, in order to come to agreement.

Routine



Class Consensus Discussions are so important for the Explain phase across this unit. This routine is a way to ensure that the accurate scientific ideas students are figuring out are made public and visible for all students to access. It requires skillful teacher facilitation, as it is important to not tell students what they need to know, instead supporting students as a class in using the information they have from investigations, their models and texts in order to figure out and state those important ideas.

This is the first time doing such a discussion in this unit, so focus more on the steps and the process. In future parts of this unit, you will use this format to do more in-depth

3. Select two or three groups' ideas to share with the class. At this point, do not select them randomly. The point of this discussion is to elevate ideas that move the class towards greater understanding of how and why animals seek genetic diversity. The decision about which models to share with the class should be based on both the ideas circulating in the classroom and the goals of this part of the 5E sequence.
4. Ask the first group to share their ideas. You can do this by:
 - Projecting using a document camera; OR
 - Copying the idea to be shared and passing them out to the class
5. Proceed through the steps in the Consensus Discussion Steps. During the whole-class discussion, there will be opportunities to identify important terms and concepts that emerge in the discussion. Sometimes, important points get buried in student talk; use the guidelines below to ensure the class focuses on ideas that will drive the lesson and unit forward.
6. Return to student questions from the start of the 5E (Engage), in order to bring up lingering issues not yet resolved, such as:
 - Where did the mountain lion come from?
 - How do we know?

discussions and consensus building. Refer to the Biology Course Guide for support with this routine.

Integrating Three Dimensions



This first lesson sequence is a great opportunity to formatively assess student understanding of the Disciplinary Core Ideas bundled in this unit. In this Explain phase, students can demonstrate their **partial** use of several core ideas from **LS3.B Variation of Traits**, **LS1.B Growth and Development of Organisms**, and **LS4.B Natural Selection**.

Take Time for These Key Points



Pause the discussion and ask for clarification, particularly of the following key points:

- The role of genetic data in explaining where an organism is from.
- Genetic data in a population represents all of the allele variations of that population – as individuals reproduce with other individuals in their population
- Genes/alleles are inherited from parents to offspring
- The patterns in the genetic data demonstrated that some populations had more private alleles than others (some had more genetic variation than others)
- The patterns found in the map demonstrate that the individual cat walked very far without encountering a new population of mountain lions – also it seemed to avoid large cities, etc
- Behavioral traits, such as the dispersion of males from ancestral population, may have contributed to the cat's impulse to move away from his original population – this could be an example of an advantageous behavioral trait acted upon by natural selection
- The majority of the data provided (and reasoning) lends itself to the claim that the Connecticut Cat's impulse to migrate may have been to find a mate (sexual reproduction)

Summary Task

1. Students individually complete the *Summary Task*. This can be completed as an exit ticket or for homework.
2. The results of this task can be used to make determinations about which students need more time to circle back to the ideas in this text, in the coming parts of the 5E lesson.

Implementation Tip

This summary is really important! It's an opportunity to check in on each student's thinking at this point in the unit, in a few different areas.



Summary Task

How did the class consensus discussion go?

1. One thing that went well in the discussion: _____
2. One thing we can improve the next time we have a discussion: _____
3. One person who helped me learn today: _____
What did you learn from this person? _____
4. One idea that I contributed to my group or my class: _____

Explain what you know about the following questions, based on what we discussed today.

5. Evaluate the evidence and reasoning behind the following claim: The Connecticut cat was originally from a population in South Dakota. It traveled to Connecticut, based on the behavioral trait of being shy. This cat could be beneficial because it would show the cat to seek out a genetically different mate for sexual reproduction (a mate that was not closely related to him), to your response, be sure to include:

- Strength of the evidence – what additional evidence would you want to collect or analyze to better establish specific cause and effect relationships?
- Strength/weakness of the scientific reasoning – is there appropriate scientific reasoning that can link the evidence to the claim? What additional scientific reasoning would strengthen this claim?
- Other counterclaims or additional critiques can you discuss?

New Visions
for Public Schools

Elaborate

How can we apply what we've learned about mountain lions to another kind of big cat?

Students apply what they learned about mountain lions in North America to **analyze data** about cheetah populations in Africa, in order to **make and defend a claim** on the **relationship between genetic variability and survival**.

Preparation

Student Grouping

None

Routines

None

Literacy Strategies

None

Materials

Handouts

☐ Are Cheetahs Like Mountain Lions?

Lab Supplies

None

Other Resources

- ☐ [Cheetahs: On the Brink of Extinction, Again | National Geographic Society](#)
- ☐ [Cheetahs 101 | Nat Geo Wild](#)

Comparing with Cheetahs

1. Provide students with *Are Cheetahs Like Mountain Lions?*
2. In this task, students use genetic data on cheetahs, along with readings and text, to surface ways that their learnings about mountain lions are relevant to other big cats. Students then make and defend a claim about the genetic variability of cheetah populations, and their ability to adapt and survive as a species. In addition to the factors affecting mountain lions, students also learn that in addition to current habitat loss, cheetah populations went through two bottlenecks, one about 100,000 years ago when they rapidly expanded their range and another during the last ice age so their genetic diversity was already diminished.

Integrating Three Dimensions



This task is a great opportunity to review the disciplinary core ideas **LS4.B Natural Selection** and **LS4.C Adaptation**, that

were first introduced in Unit 2
Humans vs Bacteria.

3. Students draw on the following resources for this task:
- a. Historical and Present Distribution of Cheetahs in Africa in *Are Cheetahs Like Mountain Lions?*
 - b. Cheetah Genetic Diversity Sample in *Are Cheetahs Like Mountain Lions?*
 - c. [Cheetahs 101 | Nat Geo Wild](#)
 - d. [Cheetahs: On the Brink of Extinction, Again | National Geographic Society](#)

Implementation Tip



The cheetah task introduces the idea of mutations, inbreeding, and the often beneficial nature of genetic variation for survival of a species. These concepts will be further explored and developed as students move through the storyline, so students should not be expected to master these core ideas yet, or have a full picture of how they relate to the migration of the Connecticut cat at this point in the unit.

Evaluate

How do changes in populations relate to genetic variation among individuals?

Students **develop a model, based on evidence**, to represent the **cause behind the migration** of the Connecticut cat at **different scales**.

Preparation

Student Grouping

☐ Table groups

Routines

None

Literacy Strategies

None

Materials

Handouts

- ☐ Mountain Lion Populations
- ☐ Mountain Lion Populations Mini Rubric

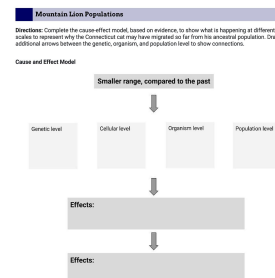
Lab Supplies

None

Other Resources

Revisit the Performance Task

1. Prompt students to consider where they currently stand on the question category from the Driving Question Board that they have been investigating throughout this 5E instructional sequence (for example: Why did the mountain lion end up in Connecticut?).
2. Students work individually on *Mountain Lion Populations*, in the Performance Task Organizer. They should make choices on how to represent their ideas using the model they are developing.
3. Confer with students while they are working.



Conferring Prompts



Confer with students as they work to develop their cause-effect models.

Suggested conferring questions:

- How are you using patterns at different scales to figure this out?
- Are there boxes that may be empty at this point in your learning?
- How did the cheetah data and reading inform your model?
- What evidence are you using to develop your model?

4. After completing their response, use the *Mountain Lion Populations Mini Rubric* to generate self, peer, or teacher feedback on their model and scientific reasoning. This feedback will be used to inform further iterations of the performance task throughout the unit.

Implementation Tip



When returning to the **Driving Question Board**, be sure to change these suggested teacher notes so that they match your class' actual questions!

Revisit the Driving Question Board

1. Use the **Driving Question Board** routine to discuss which of their questions have been answered.
2. Have students identify which categories/questions they have not figured out yet. Students should share out these questions, and document new questions that arise based on what they have been learning, which can be added to the Driving Question Board.

Implementation Tip



Use the **Driving Question Board** unit routine to document students' evolving questions.

Standards in Mountain Lion Populations 5E

Performance Expectations

HS-LS3-2

Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

Clarification Statement: Emphasis is on using data to support arguments for the way variation occurs.

Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.

In NYS the entire PE has been edited as follows: Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, (3) mutations caused by environmental factors and/or (4) genetic engineering.

[Clarification Statement: Emphasis is on using data to support arguments for the way variation occurs including the relevant processes in meiosis and advances in biotechnology.] [Assessment Boundary: Assessment does not include recalling the specific details of the phases of meiosis or the biochemical mechanisms of the specific phases in the process.]

Aspects of Three-Dimensional Learning

Science and Engineering Practices

Disciplinary Core Ideas

Crosscutting Concepts

Developing and Using Models

- Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system. SEP2(3)

Analyzing and Interpreting Data

- Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. SEP4(2)

Engaging in Argument from Evidence

- Make and defend a claim based on

LS3.B Variation of Traits

- In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. Although DNA replication is tightly regulated and remarkably accurate, errors do occur and result in mutations, which are also a source of genetic variation. Environmental factors can also cause mutations in genes, and viable mutations are inherited. LS3.B(1)

LS4.B Natural Selection

- Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2)

Patterns

- Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. CCC1(1)

Cause and Effect

- Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. CCC2(1)

Science and Engineering Practices

Disciplinary Core Ideas

Crosscutting Concepts

evidence about the natural world or the effectiveness of a design solution that reflects scientific knowledge, and student-generated evidence. SEP7(5)

variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. LS4.B(1)

Assessment Matrix

	Engage	Explore	Explain	Elaborate	Evaluate
Developing and Using Models				Are Cheetahs Like Mountain Lions?	Mountain Lion Populations Mountain Lion Populations Mini Rubric
Analyzing and Interpreting Data		Making Sense of the Mountain Lion Genotype Data Investigation			
Engaging in Argument from Evidence			Class Consensus Discussion Genotype Data Read-Generate-Sort-Solve Summary Task	Are Cheetahs Like Mountain Lions?	Mountain Lion Populations
LS3.B Variation of Traits	Investigating Genetic Data	Making Sense of the Mountain Lion Genotype Data Investigation	Class Consensus Discussion Genotype Data Read-Generate-Sort-Solve Summary Task	Are Cheetahs Like Mountain Lions?	Mountain Lion Populations Mountain Lion Populations Mini Rubric
LS4.B Natural Selection			Summary Task	Are Cheetahs Like Mountain Lions?	Mountain Lion Populations

	Engage	Explore	Explain	Elaborate	Evaluate
					<i>Mountain Lion Populations Mini Rubric</i>
Patterns		<i>Making Sense of the Mountain Lion Genotype Data Investigation</i>			<i>Mountain Lion Populations Mountain Lion Populations Mini Rubric</i>
Cause and Effect			Class Consensus Discussion Genotype Data Read-Generate-Sort-Solve Summary Task	<i>Are Cheetahs Like Mountain Lions?</i>	<i>Mountain Lion Populations Mountain Lion Populations Mini Rubric</i>

Common Core State Standards Connections

	Engage	Explore	Explain	Elaborate	Evaluate
Mathematics			MP3		
ELA/Literacy	SL.9-10.1	SL.9-10.1 SL.9-10.4	WHST.9-10.2 SL.9-10.1	RST.9-10.1	