LOUISIANA DEPARTMENT OF EDUCATION

Office of Assessments, Analytics, and Accountability

LEAP Released Item Guide for Science Grade 6

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Purpose

The LEAP released item guide is intended to be used as an instructional tool and not to predict performance on the summative test. These items are meant to help teachers better understand how the achievement level descriptors are used in creating assessment questions.

How to Use and Not Use

The recommendations and cautions that follow are meant to help teachers better understand the achievement level descriptors and help administrators better understand what should and should not be done with the released items.

How to Use

- Learn how achievement level descriptors work with the dimensions in an item;
- Provide guidance when selecting assessment items in terms of rigor, content, and item types

How Not to Use

- Avoid prioritizing the PEs used in the released items because they do not represent all of the content eligible for the operational test;
- Avoid limiting instructional strategies to the released items (creating instructional sets using only the PEs found in the document);
- Do not use only the stimulus materials provided in the released items for classroom instruction;
- Avoid creating assessment items that mirror the released items;
- Avoid designing instructional tasks and sets based on only one PE.

Assessment Design

Supporting Science Instruction

The LEAP tests will assess students' understanding of the LSS for Science, reflecting the multiple dimensions of the standards.

Apply content knowledge and skills (Disciplinary Core Idea, DCI)

On the LEAP test, students answer questions which require content knowledge and skills aligned to PE bundles (groupings of PEs) and the corresponding DCIs.

Investigate, evaluate, and reason scientifically (Science and Engineering Practice, SEP)

On the LEAP test, students do more than answer recall questions about science; they apply the practices, or behaviors, of scientists and engineers to investigate each real-world phenomenon and design solutions to problems.

Connect ideas across disciplines (Crosscutting Concept, CCC)

On the LEAP test, sets of questions assess student application of knowledge across the domains of science for a comprehensive picture of student readiness for their next grade or course in science.

Set Based Design

The grade 6 tests include item sets, task sets, and standalone items.

Item Sets

Item sets consist of four items that have a common stimulus. There are two one-point items and two two-point items in each item set on the LEAP test. For three of the item sets, one of the two-point items will be a Constructed Response item. In the released item sets, there may be more than four items or fewer than four items with a common stimulus.

Task Sets

Task sets consist of five items that have a common stimulus. There are two one-point items, two two-point items, and one nine-point Extended Response item. In the released task sets, there may be more than five items or fewer than five items with a common stimulus.

Standalone Items

Standalone items are one-point or two-point items that do not share a stimulus with other items.

Achievement-Level Definitions

Achievement-level definitions briefly describe the expectations for student performance at each of Louisiana's five achievement levels:

- Advanced: Students performing at this level have **exceeded** college and career readiness expectations and are well prepared for the next level of study in this content area.
- Mastery: Students performing at this level have **met** college and career readiness expectations and are prepared for the next level of study in this content area.
- Basic: Students performing at this level have **nearly met** college and career readiness expectations and may need additional support to be fully prepared for the next level of study in this content area.
- Approaching Basic: Students performing at this level have **partially met** college and career readiness expectations and will need much support to be prepared for the next level of study in this content area.
- Unsatisfactory: Students performing at this level have **not yet met** the college and career readiness expectations and will need extensive support to be prepared for the next level of study in this content area.

Achievement Level Descriptors

Achievement Level Descriptors (ALDs) indicate what a typical student at each level should be able to demonstrate based on his or her command of grade-level standards. ALDs are written for the three assessment reporting categories. Access the ALDs on the Assessment Resources Webpage for a breakdown of the knowledge, skills, and practices associated with each achievement level.

Released Items

This section includes released test items. With each item, item set, and task set, is a table containing alignment information and the answer key, where possible. Additionally, analyses of the multi-dimensional alignment, achievement level descriptor, rationales for answers, and rubrics for CRs and ERs are included with the items. An asterisk (*) denotes correct answer(s).

The achievement level descriptor provides information about how students who answer the item correctly are performing.

For example, an item is aligned to the SEP and DCI for 6-MS-PS2-3:

Performance Expectation	Level 5: Advanced	Level 4: Mastery	Level 3: Basic	Level 2: Approaching Basic
6-MS-PS2-3 Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. CCC: C/E SEP: 1	Evaluate data to describe a possible change to an investigation and predict an effect of that change on the strength of electric and magnetic forces.	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.	Identify data that can answer questions about variables that result in changes in electric and magnetic forces.	Identify variables that should be studied to answer a question about factors that cause changes in electric and magnetic forces.

Identifies the performance level of students who answer the question correctly.

Achievement Level Descriptor: Students who answer this item correctly are performing at a level of 4 or higher. The student can ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

Students observed that a compass needle changes direction in the presence of nearby magnets. The students want to collect data to prove that the compass needle direction always depends on the strongest magnet. The students place the compass between two different magnets.

Select the YES or NO column to show what questions the students can ask to assist them in collecting data.

Identifies how the item aligns to the dimensions.

Items Released:
Standalone Items
Item Set: Solar System Properties
Task Set: Aldabra Tortoises

Standalone Items

Item Type	PE	DCI	SEP	CCC	Points	Achievement Level
TEI	6-MS-PS2-3	MS.PS2B.a	Q/P		2	4
MC	6-MS-LS2-3	MS.LS2B.a		E/M	1	3
TEI	6-MS-ESS1-1	MS.ESS1A.b		PAT	2	4

SEP = blue; DCI = orange; CCC = green An asterisk (*) denotes correct answer(s).

Technology-Enhanced Item
Performance Expectation
6-MS-PS2-3 Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

Use the information and your knowledge of science to answer the question.

Students observed that a compass needle changes direction in the presence of nearby magnets. The students want to collect data to prove that the compass needle direction always depends on the strongest magnet. The students place the compass between two different magnets.

Select the YES or NO column to show what questions the students can ask to assist them in collecting data.

	YES	NO
Which direction is Earth's North Pole?	☐	☐
What direction will the compass point if the magnets are moved an equal distance farther away from the compass?	☐	☐
What direction will the compass point if only one magnet is moved farther away?	☐	☐
What direction will the compass point if it is placed between equally strong magnets?	☐	☐
What direction will the compass point if it is placed between a weak and a strong magnet?	☐	☐

Multi-Dimensional Alignment: While effectively applying the science practice of asking questions, the student demonstrates knowledge of the strength of electric and magnetic forces.

Achievement Level Descriptor: Students who answer this item correctly are performing at a level of 4 or higher. The student can ask questions about data to determine the factors that affect the strength of electric and magnetic forces.

Scoring

Students observed that a compass needle changes direction in the presence of nearby magnets. The students want to collect data to prove that the compass needle direction always depends on the strongest magnet. The students place the compass between two different magnets.

Select the YES or NO column to show what questions the students can ask to assist them in collecting data.

	YES	NO
Which direction is Earth's North Pole?	☐	☑
What direction will the compass point if the magnets are moved an equal distance farther away from the compass?	☐	☑
What direction will the compass point if only one magnet is moved farther away?	☑	☐
What direction will the compass point if it is placed between equally strong magnets?	☐	☑
What direction will the compass point if it is placed between a weak and a strong magnet?	☑	☐

Rationales

Response	Rationale
Yes: What direction will the compass point if only one magnet is moved farther away?; What direction will the compass point if it is placed between a weak and a strong magnet? No: Which direction is Earth's North Pole?; What direction will the compass point if the magnets are moved an equal distance farther away from the compass?; What direction will the compass point if it is placed between equally strong magnets?	Correct.
Yes: Which direction is Earth's North Pole?; What direction will the compass point if only one magnet is moved farther away?; What direction will the compass point if it is placed between a weak and a strong magnet? No: What direction will the compass point if the magnets are moved an equal distance farther away from the compass?; What direction will the compass point if it is placed between equally strong magnets?	The question "Which direction is Earth's North Pole?" will give information about where the magnetic north pole is located, not about the strength of the magnets.
Yes: What direction will the compass point if the magnets are moved an equal distance farther away from the compass?; What direction will the compass point if only one magnet is moved farther away?; What direction will the compass point if it is placed between a weak and a strong magnet? No: Which direction is Earth's North Pole?; What direction will the compass point if it is placed between equally strong magnets?	The question "What direction will the compass point if the magnets are moved an equal distance farther away from the compass?" will give information about the distance in which the magnetic fields are interacting, not about which magnet is the strongest.
Yes: What direction will the compass point if only one magnet is moved farther away?; What direction will the compass point if it is placed between equally strong magnets?; What direction will the compass point if it is placed between a weak and a strong magnet? No: Which direction is Earth's North Pole?; What direction will the compass point if the magnets are moved an equal distance farther away from the compass?	The question "What direction will the compass point if it is placed between equally strong magnets?" will give information about where the compass will point when the electromagnetic field is the same, not about which magnet is the strongest.

Multiple Choice
Performance Expectation
6-MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Use your knowledge of science to answer the question.

Which interaction transfers matter or energy that is not recycled through the ecosystem?

A. an animal eating its prey
B. animals releasing carbon dioxide
C. a plant absorbing sunlight*
D. fungi decomposing dead plants

Multi-Dimensional Alignment: The item requires the student to apply knowledge of cycles of matter and flows of energy among living and nonliving parts of an ecosystem to demonstrate an understanding of energy and matter.

Achievement Level Descriptor: Students who answer this item correctly are performing at a level of 3 or higher. The student can describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Which interaction transfers matter or energy that is not recycled through the ecosystem?

C. a plant absorbing sunlight*

Rationales
A. Matter and energy are transferred to the predator from the prey.
B. Carbon dioxide is absorbed by trees and is a component of photosynthesis, which converts chemical energy and transfers matter from the atmosphere to the plant.
C. Correct.
D. Decomposition releases nutrients and energy back into the environment in the form of nutrients or heat.

Technology-Enhanced Item
Performance Expectation
6-MS-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the reoccurring patterns of lunar phases, eclipses of the sun and moon, and seasons.

Use the information and your knowledge of science to answer the question.

Early people were curious about causes of lunar and solar eclipses.

Select from the drop-down menus to correctly complete the sentence.

A lunar eclipse occurs when light from [ ] is not reflected from [ ] because it is in the shadow of [ ].

the Sun
Earth
the Moon

Multi-Dimensional Alignment: The item requires the student to apply knowledge of the Earth-sun-moon system to demonstrate an understanding of patterns.

Achievement Level Descriptor: Students who answer this item correctly are performing at a level of 4 or higher. The student can explain reoccurring patterns in the Earth-sun-moon system to describe lunar phases, eclipses of the sun and moon, and seasons.

Scoring

A lunar eclipse occurs when light from [the Sun] is not reflected from [the Moon] because it is in the shadow of [Earth].

Rationales

Response	Rationale
A lunar eclipse occurs when light from the Sun is not reflected from the Moon because it is in the shadow of Earth.	Correct.
A lunar eclipse occurs when light from Earth is not reflected from the Sun because it is in the shadow of the Moon.	A lunar eclipse is caused by the light from the Sun.
A lunar eclipse occurs when light from the Moon is not reflected from Earth because it is in the shadow of the Sun.	A lunar eclipse is caused by the shadow of Earth.
A lunar eclipse occurs when light from the Sun is not reflected from Earth because it is in the shadow of the Moon.	During a lunar eclipse, the shadow of the Moon falls on Earth.

Item Set: Solar System Properties

Item Type	PE	DCI	SEP	CCC	Points	Achievement Level
MC	6-MS-ESS1-3	MS.ESS1B.a	4. DATA		1	3
MS	6-MS-ESS1-3	MS.ESS1B.a	4. DATA		1	3
TPD	6-MS-ESS1-3	MS.ESS1B.a	4. DATA	SPQ	2	4
CR	6-MS-ESS1-3	MS.ESS1B.a	4. DATA	SPQ	2	4

SEP = blue; DCI = orange; CCC = green An asterisk (*) denotes correct answer(s).

Use the information about solar system properties and your knowledge of science to answer the questions.

Solar System Properties

A scale model of the solar system needs to be a very big model. Students sometimes make these models, but they need to go outside to have enough space for an accurate model. Table 1 and Table 2 show some data on the solar system. Note that some of the Moon data in Table 1 describe Earth–Moon relationships (not Moon–Sun). The diameter of a planet refers to the distance from one side of the planet to the opposite side.

Table 1. Solar System Data for Inner Planets and Moon

	Mercury	Venus	Earth	Moon	Mars
Mass (10^{24} kg)	0.330	4.87	5.97	0.073	0.642
Diameter (km)	4,879	12,104	12,756	3,475	6,792
Gravity (m/s^2)	3.7	8.9	9.8	1.6	3.7
Escape Speed (km/s)	4.3	10.4	11.2	2.4	5.0
Length of Day (hours)	4,222.6	2,802.0	24.0	708.7	24.7
Distance from Sun (10^6 km)	57.9	108.2	149.6	0.384*	227.9
Orbital Period (days)	88.0	224.7	365.2	27.3	687.0
Orbital Speed (km/s)	47.4	35.0	29.8	1.0	24.1
Number of Moons	0	0	1	0	2

* Average distance from the Earth is given.

Source: NASA.

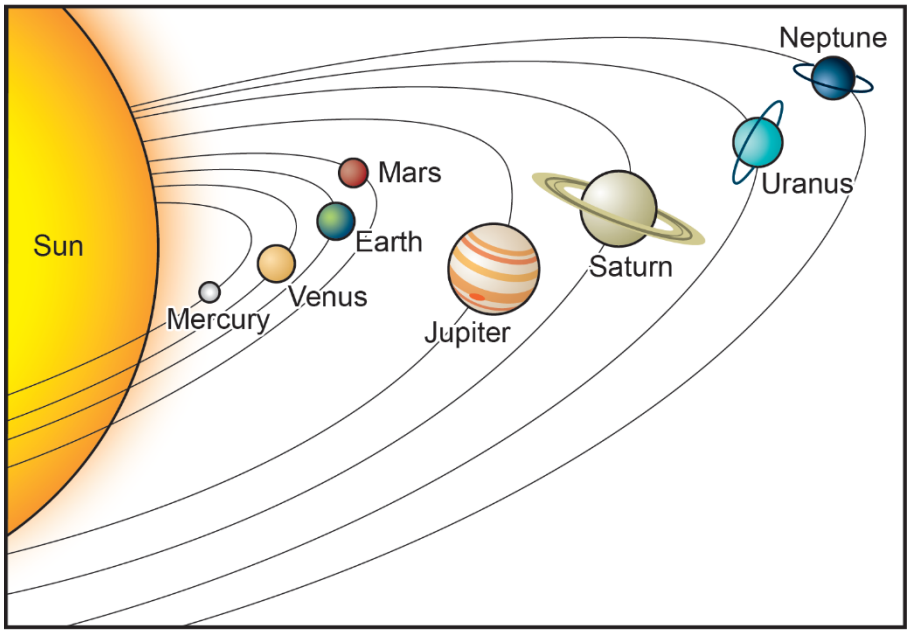
Table 2. Solar System Data for Outer Planets

	Jupiter	Saturn	Uranus	Neptune
Mass (10^{24} kg)	1,898	568	86.8	102
Diameter (km)	142,984	120,536	51,118	49,528
Gravity (m/s^2)	23.1	9.0	8.7	11.0
Escape Speed (km/s)	59.5	35.5	21.3	23.5
Length of Day (hours)	9.9	10.7	17.2	16.1
Distance from Sun (10^6 km)	778.6	1,433.5	2,872.5	4,495.1
Orbital Period (days)	4,331	10,747	30,589	59,800
Orbital Speed (km/s)	13.1	9.7	6.8	5.4
Number of Moons	67	62	27	14

Source: NASA.

A figure in a textbook can be misleading because it is not possible to show a completely accurate model at this scale. Figure 1 shows a typical figure of the solar system in a textbook.

Figure 1. Model of the Solar System



Note: Not to scale

Multiple Choice
Performance Expectation
6-MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

Which two sets of planet data from Table 1 and Table 2 follow the same pattern?

A. Orbital Period and Number of Moons
B. Number of Moons and Escape Speed
C. Distance from Sun and Orbital Period*
D. Escape Speed and Distance from Sun

Multi-Dimensional Alignment: While effectively applying the science practice of analyzing and interpreting data, the student demonstrates knowledge of properties of objects in the solar system.

Achievement Level Descriptor: Students who answer this item correctly are performing at a level of 3 or higher. The student can interpret qualitative data to compare the properties of objects in the solar system.

Which two sets of planet data from Table 1 and Table 2 follow the same pattern?

C. Distance from Sun and Orbital Period*

Rationales
A. The orbital period and the number of moons are unrelated to each other.
B. The orbital period and the escape speed are unrelated to each other.
C. Correct.
D. The escape speed and the distance from the Sun are unrelated to each other.

Multiple Select
Performance Expectation
6-MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

In Table 1 and Table 2, which properties are determined by gravity? Select the three correct answers. A. Mass B. Escape Speed* C. Length of Day D. Orbital Period* E. Orbital Speed*

Multi-Dimensional Alignment: While effectively applying the science practice of analyzing and interpreting data, the student demonstrates knowledge of the properties of objects in the solar system.

Achievement Level Descriptor: Students who answer this item correctly are performing at a level of 3 or higher. The student can interpret qualitative data to compare the properties of objects in the solar system.

In Table 1 and Table 2, which properties are determined by gravity?

Select the three correct answers.

B. Escape Speed*
D. Orbital Period*
E. Orbital Speed*

Rationales

A. Mass is a fundamental property of matter.
B. Correct.
C. The length of a day is related to the tilt of a planet and its revolution around the Sun.
D. Correct.
E. Correct.

Two-Part Dependent
Performance Expectation
6-MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

Part A	Part B
The Sun and Moon are different sizes, but they appear to be about the same size when viewed from Earth. Which types of data are needed to explain this phenomenon? Select the **two** correct answers. A. the masses of the Moon and Sun B. the diameters of the Moon and Sun* C. the gravity of Earth, the Moon, and the Sun D. the orbital periods of Earth and the Moon E. the distances from Earth to the Moon and Sun*	Which statement **best** describes how to use the data selected in Part A? A. Use the data to show how the scale of the solar system affects the size objects appear from Earth.* B. Use the data to show how the composition of the solar system affects the size objects appear from Earth. C. Use the data to show how the motion of objects in the solar system affects the size objects appear from Earth. D. Use the data to show how forces between objects in the solar system affect the size objects appear from Earth.

Multi-Dimensional Alignment: The item requires the student to apply the science and engineering practice of analyzing and interpreting data and knowledge of the properties of objects in the solar system to demonstrate an understanding of scale, proportion, and quantity.

Achievement Level Descriptor: Students who answer this item correctly are performing at a level of 4 or higher. The student can analyze and interpret data presented in tables or graphs to support explanations about the scale properties of objects in the solar system.

Part A
The Sun and Moon are different sizes, but they appear to be about the same size when viewed from Earth. Which types of data are needed to explain this phenomenon?

Select the **two** correct answers.

B. the diameters of the Moon and Sun*
E. the distances from Earth to the Moon and Sun*

Part B
Which statement **best** describes how to use the data selected in Part A?

A. Use the data to show how the scale of the solar system affects the size objects appear from Earth.*

Rationales
Part A
A. Masses are unaffected by the apparent sizes of objects in the solar system.
B. Correct.
C. The apparent sizes of objects in the solar system are unaffected by the gravitational pull of Earth, the Moon, and the Sun.
D. The apparent sizes of objects in the solar system are unaffected by the orbital periods of Earth and the Moon.
E. Correct.

Part B
A. Correct.
B. The composition of the solar system cannot be obtained from the data needed to understand the size of objects as they appear from Earth.
C. The motion of objects in the solar system cannot be obtained from the data needed to understand the size of objects as they appear from Earth.
D. The forces between objects in the solar system cannot be obtained from the data needed to understand the size of objects as they appear from Earth.

Constructed Response
Performance Expectation
6-MS-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system.

Uranus and Neptune are the only planets that cannot be seen from Earth without using a telescope. Explain this phenomenon using at least two pieces of evidence from Table 1, Table 2, and Figure 1.

Multi-Dimensional Alignment: The item requires the student to apply the science and engineering practice of analyzing and interpreting data and knowledge of the properties of objects in the solar system to demonstrate an understanding of scale, proportion, and quantity.

Achievement Level Descriptor: Students who answer this item correctly are performing at a level of 4 or higher. The student can analyze and interpret data presented in tables or graphs to support explanations about scale properties of objects in the solar system.

Uranus and Neptune are the only planets that cannot be seen from Earth without using a telescope. Explain this phenomenon using at least two pieces of evidence from Table 1, Table 2, and Figure 1.

Scoring Information	
Score	Description
2	Student's response correctly explains why Uranus and Neptune cannot be seen from Earth without a telescope, citing a total of at least two pieces of evidence from Table 1, Table 2, and Figure 1.
1	Student's response partially explains why Uranus and Neptune cannot be seen from Earth without a telescope, citing at least one piece of evidence from Table 1, Table 2, and Figure 1.
0	Student's response does not correctly explain why Uranus and Neptune cannot be seen from Earth without a telescope, and does not provide evidence to support the explanation.

Examples include:

Scoring Notes	Examples
Explanation of why Uranus and Neptune cannot be seen from Earth without a telescope, with at least two pieces of evidence from Table 1, Table 2, and Figure 1 (2 points)	• Uranus and Neptune are the farthest from Earth. • Uranus and Neptune are smaller than Saturn, which is the farthest visible planet.

Accept other reasonable answers.

Student Responses (CR)

Uranus and Neptune are the only planets that cannot be seen from Earth without using a telescope. Explain this phenomenon using at least **two** pieces of evidence from Table 1, Table 2, and Figure 1.

Response 1

Uranus and Neptune are the 2 furthest planets away from the Sun, Earth being closer than most (Neptune, Uranus, Saturn, Jupiter, and Mars) Also because these planets are the 2 smallest of the 4 Outer Planets, Uranus, and Neptune are less than half the size of Jupiter and Saturn, The distance of these planets, as well as how small they are compared to others make them impossible to see without the aid of a telescope.

Score: 2

This response earns a 2. It accurately explains that Uranus and Neptune cannot be seen from Earth without the help of a telescope because of their distances from Earth: "Uranus and Neptune are the 2 furthest planets away from the Sun." It accurately explains that Uranus and Neptune cannot be seen from Earth without the help of a telescope because they are smaller than Saturn or Jupiter: "Also because these planets are the 2 smallest of the 4 Outer Planets, Uranus, and Neptune are less than half the size of Jupiter and Saturn."

Response 2

We can't see them without a telescope because they are the furthest planets in our solar system so it is much harder to see those planets from earth. Neptune is the farthest planet in the solar system and it is also the coldest planet in the solar system if someone try to travel there they'll die because its to far. If someone did make it to Neptune they will still die because its very cold over there in Neptune. Uranus is the second most farthest planet in our solar system. It is the second coldest planet in our solar system. Also in figure one it shows a typical figure of the solar system. It shows how far the planets are from the sun on how cold it is. Now if we could think about us looking to find Neptune from earth we could not because it is to far from were we are. Same thing with Uranus its to far for us to see Uranus from were we are. If we go take a look in Table one we see the Earth is 149.6m from the sun. Uranus is 2,872.5m from the sun and Neptune is 4,495.1m from the sun. So there probably 1,474.0m away from earth.

Score: 1

This response earns a 1. It accurately explains that Uranus and Neptune cannot be seen from Earth without the help of a telescope because of their distances from Earth: "Now if we could think about us looking to find Neptune from earth we could not because it is to far from were we are. Same thing with Uranus its to far for us to see Uranus from were we are." It does not accurately explain that Uranus and Neptune cannot be seen from Earth without the help of a telescope because they are smaller than Saturn or Jupiter.

Response 3

Uranus and Neptune are the only planets cannot be seen from earth with a telescope because there orbits speed and the orbit period.

Score: 0

This response earns a 0. It does not accurately explain why Uranus and Neptune cannot be seen from Earth without a telescope or provide two pieces of data.

Task Set: Aldabra Tortoises

Item Type	PE	DCI	SEP	CCC	Points	Achievement Level
MS	6-MS-LS2-2	MS.LS2A.d	6. C/E		1	2
MC	6-MS-LS2-1	MS.LS2A.c	4. DATA	C/E	1	3
TPD	6-MS-LS2-1	MS.LS2A.c	4. DATA	PAT	2	4
TEI	6-MS-LS2-2	MS.LS2A.d	6. C/E		2	4
ER	6-MS-LS2-1	MS.LS2A.c	4. DATA	C/E	9	5

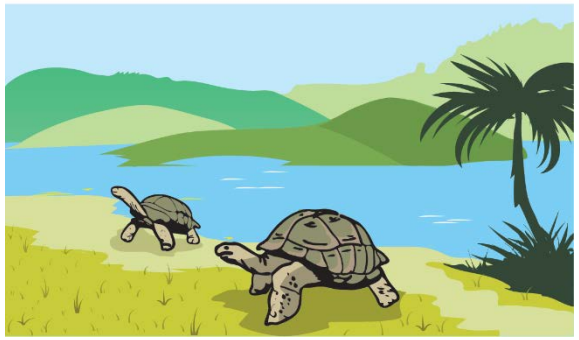
SEP = blue; DCI = orange; CCC = green An asterisk (*) denotes correct answer(s).

Use the information about Aldabra tortoises and your knowledge of science to answer the questions.

Aldabra Tortoises

Aldabra is a small, isolated island in the Indian Ocean. It is part of the Seychelles island group. The island is home to giant Aldabra tortoises, as shown in Figure 1. These tortoises can weigh hundreds of pounds and can live up to 250 years. They are plant eaters, living on grasses and the leaves of shrubs. This is the only place in the world where a reptile is the primary herbivore.

Figure 1. Aldabra Tortoises



These tortoises once lived on many other islands but were hunted to extinction in other locations by humans. They survived on Aldabra partly because of its geographical isolation. Even here, however, their population was reduced to the endangered level by hunting and by the introduction of nonnative species.

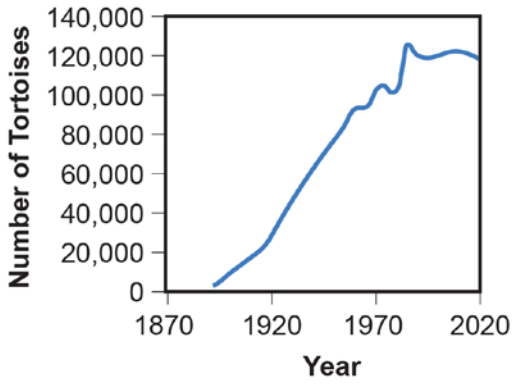
Goats once caused a decline in the tortoise population because they consumed some of the same resources. The goats were feral (they ran wild) and were descended from escaped domesticated animals. Goats fed on the leaves of the low shrubs that were an important part of the tortoises' diet.

The problem was made worse for the tortoises because they could only reach the low-hanging leaves of the plants. Like in any other ecosystem, overpopulation became a problem due to the loss of predators.

The adult tortoises have no natural enemies. Baby tortoises' natural enemies are coconut crabs and birds. They are also eaten by rats and feral cats, which were introduced to Aldabra by humans.

The tortoise population dropped to a few hundred and the tortoises were headed for extinction. Before it was too late, programs were put in place to save the Aldabra tortoises. Wild goats were completely removed from the island, and the rat and cat populations were greatly reduced. Graph 1 shows how the tortoise population has grown from a few hundred to over 100,000. One reason for the rapid population increase is that the tortoises will lay more eggs at one time when they are underpopulated. One more threat may loom in the future, however. Aldabra is not very far above sea level and if global temperatures continue to rise, so will the sea level, possibly covering part or all of the island with water.

Graph 1. Number of Tortoises over Time



Source: Gerlach et al., 2013, Chelonian Conservation and Biology.

Multiple Select
Performance Expectation
6-MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

Based on the information provided, which types of relationships with other species reduced the Aldabra tortoise population?

Select the **two** correct answers.

A. mutually beneficial
B. competitive*
C. cooperative
D. dependent
E. predatory*

Multi-Dimensional Alignment: While effectively applying the science practice of constructing explanations, the student demonstrates knowledge of the interactions among organisms across multiple ecosystems.

Achievement Level Descriptor: Students who answer this item correctly are performing at a level of 2 or higher. The student can identify an explanation of the interactions among organisms across multiple ecosystems.

Based on the information provided, which types of relationships with other species reduced the Aldabra tortoise population?

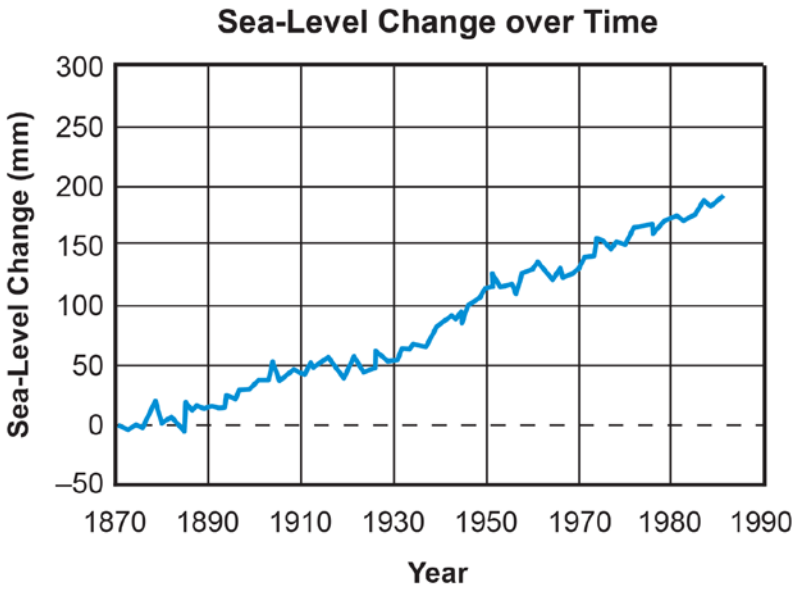
Select the **two** correct answers.

B. competitive*
E. predatory*

Rationales

A. Mutually beneficial interactions would have maintained or increased the tortoise population.
B. Correct.
C. Cooperative interactions would have kept the tortoise population stable.
D. Dependent interactions would have kept the tortoise population stable.
E. Correct.

Multiple Choice
Performance Expectation
6-MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

The graph shows sea-level changes since 1870.  *Source: NASA.*	Using the data in the graph and other information presented, which phrase **best** describes the future effect of sea-level changes on the Aldabra tortoises? A. loss of habitat area* B. increased food supply C. increased tortoise population D. less competition among tortoises

Multi-Dimensional Alignment: The item requires the student to apply the science and engineering practice of analyzing and interpreting data and knowledge of resource availability on organisms and populations of organisms in an ecosystem to demonstrate an understanding of cause and effect.

Achievement Level Descriptor: Students who answer this item correctly are performing at a level of 3 or higher. The student can interpret qualitative data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

Using the data in the graph and other information presented, which phrase **best** describes the future effect of sea-level changes on the Aldabra tortoises?

A. loss of habitat area*

Rationales

A. Correct.

B. An increase in sea levels will decrease the grasses and shrubs that tortoises use for food.

C. An increase sea levels will remove tortoise habitat, which will reduce tortoise populations.

D. An increase sea levels will reduce tortoise habitat, which will increase competition among tortoises.

Two-Part Dependent
Performance Expectation
6-MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

Graph 1 shows the tortoise population suddenly leveling off in about 1980. Part A Which statement **best** explains why the tortoise population stabilized in about 1980? A. Sea level began to rise. B. Ocean temperature increased. C. Tortoises had no predators. D. Tortoises began to lay fewer eggs.*	Part B Which statement **best** explains the answer to Part A? A. Sea level can change suddenly. B. Ocean temperature affected land animals. C. The tortoise population had reached the limit of available resources.* D. Lack of predators can be harmful to the health and fitness of a species.

Multi-Dimensional Alignment: The item requires the student to apply the science and engineering practice of analyzing and interpreting data and knowledge of resource availability on organisms and populations of organisms in an ecosystem to demonstrate an understanding of cause and effect.

Achievement Level Descriptor: Students who answer this item correctly are performing at a level of 4 or higher. The student can analyze and interpret data presented in tables and graphs to support claims that provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

Part A
Which statement **best** explains why the tortoise population stabilized in about 1980?

D. Tortoises began to lay fewer eggs.*

Part B
Which statement **best** explains the answer to Part A?

C. The tortoise population had reached the limit of available resources.*

Rationales

Part A

A. There is a lack of data showing that sea level rise would stabilize the tortoise population.
B. There is a lack of data showing that an increase in ocean temperatures would decrease the tortoise population.
C. There is a lack of data showing that tortoises not having predators would stabilize the tortoise population.
D. Correct.

Part B

A. Although sea levels may change suddenly, there is a lack of data to support this in the stimulus.
B. Although ocean temperatures may affect land animals, there is a lack of data to support this in the stimulus.
C. Correct.
D. Although a lack of predators may be harmful to the health and fitness of a species, there is a lack of data to support this in the stimulus.

Technology-Enhanced Item
Performance Expectation
6-MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

Select the correct words or phrases from the drop-down menus to complete the sentences.

Before humans arrived, the tortoise population was [ ] because predator-prey interaction [ ].

[ ]
- stable
- increasing

[ ]
- was balanced
- favored predators
- favored prey

After nonnative species were introduced, the tortoise population declined because [ ] [ ].

[ ]
- predators
- prey

[ ]
- had no natural enemies
- were feral
- spread disease

Multi-Dimensional Alignment: While effectively applying the science practice of constructing explanations, the student demonstrates knowledge of interactions among organisms across multiple ecosystems.

Achievement Level Descriptor: Students who answer this item correctly are performing at a level of 4 or higher. The student can construct an explanation that identifies interactions among organisms across multiple ecosystems.

Scoring

Before humans arrived, the tortoise population was [stable] because predator-prey interaction [was balanced]. After nonnative species were introduced, the tortoise population declined because [predators] [had no natural enemies].

Rationales

Response	Rationale
Before humans arrived, the tortoise population was stable because predator-prey interaction was balanced. After nonnative species were introduced, the tortoise population declined because predators had no natural enemies.	Correct.
Before humans arrived, the tortoise population was increasing because predator-prey interaction favored prey. After nonnative species were introduced, the tortoise population declined because prey were feral.	The tortoise population was stable prior to humans arriving, and an increase in favored prey would favor predators. Tortoise populations declined because predators did not have their own predators.
Before humans arrived, the tortoise population was stable because predator-prey interaction favored predators. After nonnative species were introduced, the tortoise population declined because predators spread disease.	When the tortoise population was stable, the predator-prey relationship was also stable and balanced. There is a lack of data that show that the tortoise population declined because predators spread disease.
Before humans arrived, the tortoise population was increasing because predator-prey interaction was balanced. After nonnative species were introduced, the tortoise population declined because predators had no natural enemies.	An increase in the tortoise population would benefit predators, putting the predator-prey relationship out of balance.

Extended Response
Performance Expectation
6-MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

Rats and feral cats both prey on baby tortoises, and cats also prey on rats. What if such predation on the isolated island eventually caused the extinction of the tortoises? Describe the pattern of changes that would be expected, and explain the causes of the changes.

As you respond to Part A and Part B, follow the directions below.

- Address all of the instructions in each prompt.
- Use evidence from the information provided and your own knowledge of science to support your responses.

Part A

Before extinction, how would the number of eggs laid by each tortoise change as their population decreased? Explain your reasoning.

Part B

- How would the cat population change as the tortoise population decreased? Explain your reasoning.
- How would the rat population change as the tortoise population decreased? Explain your reasoning.
- Which population would change more rapidly, cats or rats? Explain your reasoning.

Multi-Dimensional Alignment: The item requires the student to apply the science and engineering practice of analyzing and interpreting data and knowledge of resource availability on organisms and populations of organisms in ecosystems to demonstrate an understanding of cause and effect.

Achievement Level Descriptor: Students who answer this item correctly are performing at a level of 5 or higher. The student can use data presented in tables or graphs to construct a claim describing the effects of resource availability on organisms and populations of organisms in an ecosystem.

Rats and feral cats both prey on baby tortoises, and cats also prey on rats. What if such predation on the isolated island eventually caused the extinction of the tortoises? Describe the pattern of changes that would be expected, and explain the causes of the changes.

As you respond to Part A and Part B, follow the directions below.

- Address all of the instructions in each prompt.
- Use evidence from the information provided and your own knowledge of science to support your responses.

Part A

Before extinction, how would the number of eggs laid by each tortoise change as their population decreased? Explain your reasoning.

Part B

- How would the cat population change as the tortoise population decreased? Explain your reasoning.
- How would the rat population change as the tortoise population decreased? Explain your reasoning.
- Which population would change more rapidly, cats or rats? Explain your reasoning.

Score Points

PART A (0–2 points maximum)

- 1 point for correct identification of how the number of eggs laid by each tortoise would change as their population decreased
- 1 point for correct explanation of why the number of eggs laid by each tortoise would change as their population decreased

PART B (0–7 points maximum)

- 1 point for correct identification of how the cat population would change as the tortoise population decreased
- 1 point for each correct explanation of why the cat population would change as the tortoise population decreased (2 points)

- 1 point for correct identification of how the rat population would change as the tortoise population decreased
- 1 point for correct explanation of why the rat population would change as the tortoise population decreased

- 1 point for correct identification of which population would change more rapidly, cats or rats
- 1 point for correct explanation of why the identified population would change more rapidly

Sample Response:

Scoring Notes	Examples
Part A	
Identification of how the number of eggs laid by each tortoise would change as their population decreased (1 point)	• Each female tortoise would lay more eggs.
Explanation of why the number of eggs laid by each tortoise would change as their population decreased (1 point)	• There would be less competition among tortoises for resources. OR • The increase in eggs laid is a survival trait to restore a declining population.

Part B	
Identification of how the cat population would change as the tortoise population decreased (1 point)	• The cat population would decrease.
Explanation of why the cat population would change as the tortoise population decreased (2 points)	• The cats would have fewer baby tortoises to eat. • The cat population would still eat rats.

Part B	
Identification of how the rat population would change as the tortoise population decreased (1 point)	• The rat population would decrease.
Explanation of why the rat population would change as the tortoise population decreased (1 point)	• The rats would have less prey. OR • The rats would have more predators.
Identification of which population would change more rapidly, cats or rats (1 point)	• The rat population would decrease more rapidly than the cat population.
Explanation of why the identified population would change more rapidly (1 point)	• The population of rats would decrease faster than the population of cats because cats would start eating more rats.

Note: Accept other plausible explanations.

Student Responses (ER)

Part A

Before extinction, how would the number of eggs laid by each tortoise change as their population decreased? Explain your reasoning.

Response 1

Tortoise know when there all about to go extinct because theres only a few of them left so they will try to lay tons of eggs. If there population is high they feel like they don't need to lay that many eggs. Then when it's high they can have tons so it could maybe result in them having kids and the population growing. The passage even states "One reason for the rapid population increase is that the tortoises will lay more eggs at one time when they are underpopulated." This has happened before and there population increased tremdsly it showed between the years 1870 and 1920 the tortoise population was almost at 0 when it showed in 1970 the population was between 120,000 and 140,000.

Score: 2

This response earns a 2. It accurately identifies that tortoises would lay more eggs: "they will try to lay tons of eggs." It also explains that tortoises would lay more eggs as a survival trait: "Tortoise know when there all about to go extinct because theres only a few of them left so they will try to lay tons of eggs. If there population is high they feel like they don't need to lay that many eggs."

Response 2

Before extinction, the number of eggs laid by each tortoise would change as their population decreased by increasing. According to the passage it states, "One reason for the rapid population increase is that the tortoises will lay more eggs at one time when they are underpopulated." This proves my claim because when the population of the Aldabra tortoises is underpopulated, the eggs from each tortoise increase by a large amount.

Score: 1
This response earns a 1. It accurately identifies that tortoises would lay more eggs: "the number of eggs laid by each tortoise would change as their population decreased by increasing." It does not explain why the tortoises would lay more eggs as a survival trait.

Response 3

The number of eggs laid by each tortise changes as their population decreased goes down. If more tortoises are dying than eggs are being laid, then the tortoise population would still decrease, but tortoises would still be born.

Score: 0
This response earns a 0. This response does not accurately identify that tortoises would lay more eggs: "The number of eggs laid by each tortise changes as their population decreased goes down." It also does not accurately explain the change in the number of eggs that tortoises would lay: "If more tortoises are dying than eggs are being laid, then the tortoise population would still decrease, but tortoises would still be born."

Part B

- How would the cat population change as the tortoise population decreased? Explain your reasoning.
- How would the rat population change as the tortoise population decreased? Explain your reasoning.
- Which population would change more rapidly, cats or rats? Explain your reasoning.

Response 1

The cat population would decrease as the tortoise population decreased because the cat eats baby tortoises and also eats rats which also eat tortoises, so it's food sources would be decreasing causing their population to decrease too. The rats population will decrease because their food source is the tortoises and without the tortoises they will have less and less food. The rats population would decrease more rapidly because they wouldn't be able to find anything else to eat, but the cat could eat fish or other meat found on the island, but there wouldn't be anything else for the rat.

Score: 7
This response earns a 7. It accurately identifies that "the cat population would decrease as the tortoise population decreased." The response also accurately explains that the cat population would decrease because its food source decreased—"so it's food sources would be decreasing causing their population to decrease too"—and that the cat population would still eat rats: "and also eats rats which also eat tortoises." It accurately identifies that the rat population would decrease as the tortoise population decreased: "The rats population will decrease." The response also accurately explains that the rat population would decrease because its food source decreased: "because their food source is the tortoises and without the tortoises they will have less and less food." It accurately identifies that the rat population would change more rapidly than the cat population: "The rats population would decrease more rapidly." The response also accurately explains why the rat population would change more rapidly: "because they wouldn't be able to find anything else to eat, but the cat could eat fish or other meat found on the island, but there wouldn't be anything else for the rat."

Response 2

The cat population would decrease because their isn't as much food as before so they don't get as much ESM as before so they don't get as mch energy.

The rat population would decrease because they can't get any food so they don't get as much ESM and they don't get energy.

The rat population would decrease more rapidly than the cat population because the cats can still get food but rats can't so there would be less ESM and less energy for the rats.

Score: 6

This response earns a 6. It accurately identifies that "the cat population would decrease" as the tortoise population decreased, and accurately explains that the cat population would decrease because its food source decreased — "because their isn't as much food as before" — but does not explain that the cat population would still eat rats. The response accurately identifies that "the rat population would decrease" as the tortoise population decreased, and accurately explains that the rat population would decrease because its food source decreased: "because they can't get any food." The response accurately identifies that the rat population would change more rapidly than the cat population — "the rat population would decrease more rapidly than the cat population" — and accurately explains why the rat population would change more rapidly: "because the cats can still get food but rats can't."

Response 3

the cat population could change as the tortises population decreased then there population would go down some to. Im saying this because they don't have as many of the tortises but theys till have the rats. But once all of the wild cats eat all of the rats thne the cats will be extinct to. The rat population would decrease as the tortise population decreased because then the rats wont have anything else to eat sence that is what they mostly eat.

Score: 5

This response earns a 5. It accurately identifies that the cat population would decrease as the tortoise population decreased: "the cat population could change as the tortises population decreased then there population would go down some to." It also accurately explains that the cat population would decrease because its food source decreased — "Im saying this because they don't have as many of the tortises" — and explains that the cat population would still eat rats: "but theys till have the rats." The response accurately identifies that the rat population would decrease as the tortoise population decreased — "The rat population would decrease as the tortise population decreased" — and accurately explains that the rat population would decrease because its food source decreased: "because then the rats wont have anything else to eat sence that is what they mostly eat." It does not accurately identify that the rat population would change more rapidly than the cat population, and does not accurately explain why the rat population would change more rapidly.

Response 4

The cat population would change if the tortoise population decreased by them decreasing in numbers. This is because the wild cats eat the baby tortoises. The rat population would also decrease f the tortoise population decreased. This is because they also eat the baby turtles. I think both the rat and cat population would decrease, but I think the both populations would decrease equally because the cats would be able to eat other things, such as the rats, but if the rats re decreasing, and the cats eat them as well they are decreasing too.

Score: 4

This response earns a 4. It accurately identifies that the cat population would decrease as the tortoise population decreased — "The cat population would change if the tortoise population decreased by them decreasing in numbers" — and explains that the cat population would decrease because its food source decreased: "This is because the wild cats eat the baby tortoises." It does not accurately explain that the cat population would still eat rats. The response accurately explains that the rat population would decrease because its food source decreased — "The rat population would also decrease f the tortoise population decreased" — and that the rat population would decrease because its food source decreased: "This is because they also eat the baby turtles." It does not accurately identify that the rat population would change more rapidly than the cat population — "both populations would decrease equally" — and does not accurately explain why the rat population would change more rapidly than the cat population: "because the cats would be able to eat other things, such as the rats, but if the rats re decreasing, and the cats eat them as well they are decreasing too."

Response 5

Claim: The cat population will be decreased because their main food (baby tortoises) are now extinct. The rat population will decrease more rapidly because they have a smaller stomach then that of cats. Reasoning: This claim is reasonable because cats are much taller and sometimes wider than rats. They also need a bigger meal then a rat.

Score: 3

This response earns a 3. It accurately identifies that the cat population would decrease as the tortoise population decreased — "The cat population will be decreased" — and accurately explains that the cat population would decrease because its food source decreased: "because their main food (baby tortoises) are now extinct." The response does not accurately explain that the cat population would still eat rats. The response does not accurately identify that the rat population would decrease, and does not accurately explain that the rat population would decrease because its food source decreased. The response accurately identifies that the rat population would change more rapidly than the cat population — "The rat population will decrease more rapidly" — but does not accurately explain why the rat population would change more rapidly than the cat population: "The rat population will decrease more rapidly because they have a smaller stomach then that of cats."

Response 6

So as the torise population decrease the rat population too decrease due to the cats not being able to find as much food so the cats will start to prey on the rats so eventuly the rats will die off and the cats will starve.

Score: 2
This response earns a 2. It does not accurately identify that the cat population would decrease as the tortoise population decreased, and does not accurately explain that the cat population would decrease because its food source decreased. It also does not accurately identify that the cat population would still eat rats. The response accurately identifies that the rat population would decrease as the tortoise population decreased — "So as the torise population decrease the rat population too decrease" — and accurately explains that the rat population would decrease because of the predator-prey interaction between cats and rats: "due to the cats not being able to find as much food so the cats will start to prey on the rats so eventuly the rats will die off." The response does not accurately identify that the rat population would change more rapidly than the cat population, and does not explain why the rat population would change more rapidly than the cat population.

Response 7

The can population would not chang because if the tortoise population goes down the cats population would stay the some.

The rat population would chang because they wuld have more rats then tortoise would be not good because the rats can get in to peoples homes and thing.

The rats would go down faster because they would have more rat then cat and that is not good of the cats and stuff.

Score: 1
This response earns a 1. It does not accurately identify that the cat population would decrease as the tortoise population decreased — "The can population would not chang" — and does not accurately explain that the cat population would decrease because its food source decreased: "because if the tortoise population goes down the cats population would stay the some." It does not accurately identify that the cat population would still eat rats. The response does not accurately identify that the rat population would decrease as the tortoise population decreased — "The rat population would chang because they wuld have more rats" — and does not accurately explain that the rat population would decrease because its food source decreased: "because they wuld have more rats then tortoise would be not good because the rats can get into peoples homes and thing." The response accurately identifies that the rat population would change more rapidly than the cat population — "The rats would go down faster" — but does not accurately explain why the rat population would change more rapidly: "because they would have more rat then cat and that is not good of the cats and stuff."

Response 8

The cats help decreaces the tortoises by eating the baby tortoises. Cat Eat a lot of baby tortoises because cat might think they are a yummy snack.

The rats help decreaces the tortoises by eating the baby tortoises. But the rats might eat one or two baby tortoises because rats don't have that big of a stomach. They also think baby tortoises are a yummy snack.

In my opaoin I think the cat would be the the ones to have a huge affect of the tortoises population. The first reason is that they can have a bigger litter then rats can. Reason two is they have a bigger stomach then the rat so they can eat more then the rat can.

Score: 0

This response earns a 0. It does not accurately identify that the cat population would decrease as the tortoise population decreased, and does not accurately explain that the cat population would decrease because its food source decreased. It does not identify that the cat population would still eat rats. The response does not accurately identify that the rat population would decrease as the tortoise population decreased, and does not accurately explain that the rat population would decrease because its food source decreased. It does not accurately identify that the rat population would change more rapidly than the cat population, and does not accurately explain why the rat population would change more rapidly.

Resources

Contact the LDOE

- assessment@la.gov for assessment questions
- STEM@la.gov for instructional or curriculum implementation support
- AskLDOE for general questions
- ldoecommunications@la.gov to subscribe to newsletters; include the newsletter(s) you want to subscribe to in your email

Updates Log

The table below lists any updates made to this document after the original posting date.

Available	Description of Updates
July 2025	Document original posting.

Email assessment@la.gov with any questions or comments about this released item guide.