

MS-ESS1-3 Earth's Place in the Universe

California Science Test—Item Content Specifications

# MS-ESS1-3 Earth's Place in the Universe

Students who demonstrate understanding can:

Analyze and interpret data to determine scale properties of objects in the solar system.

[Clarification Statement: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object’s layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.] [*Assessment Boundary: Assessment does not include recalling facts about properties of the planets and other solar system bodies.*]

Continue to the next page for the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts.

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| Analyzing and Interpreting Data  Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.  Analyze and interpret data to determine similarities and differences in findings. | ESS1.B: Earth and the Solar System   1. The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. | Scale, Proportion, and Quantity  Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.  Connections to Engineering, Technology, and Applications of Science  Interdependence of Science, Engineering, and Technology  Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems. |

## Assessment Targets

Assessment targets describe the focal knowledge, skills, and abilities for a given three-dimensional Performance Expectation. Please refer to the Introduction (hyperlink to section on explanation of assessment targets) for a complete description of assessment targets.

### Science and Engineering Subpractice(s)

Please refer to appendix A for a complete list of Science and Engineering Practices (SEP) subpractices. Note that the list in this section is not exhaustive.

4.2 Ability to analyze data to identify relationships

### Science and Engineering Subpractice Assessment Targets

Please refer to appendix A for a complete list of SEP subpractice assessment targets. Note that the list in this section is not exhaustive.

4.2.2 Ability to identify patterns (qualitative or quantitative) among variables represented in data

4.2.3 Ability to apply concepts of statistics and probability to data

### Disciplinary Core Idea Assessment Targets

#### ESS1.B.3

* Organize given data on solar system objects from various Earth- and space-based instruments to allow for interpretation
* Describe that different representations illustrate different characteristics of objects in the solar system, including differences in scale
* Use quantitative analyses to describe similarities and differences among solar system objects by describing patterns of features of those objects at different scales including: distance from the Sun, diameter, surface features, structure, and composition
* Identify advances in solar system science made possible by improved engineering and new developments in engineering made possible by advances in science
* Use the patterns found in multiple types of data at varying scales to draw conclusions and the identifying characteristics of different categories of solar system objects based on their features, composition, and locations within the solar system
* Use patterns in data as evidence to describe how two objects may be similar when viewed at one scale but may appear to be quite different when viewed at a different scale
* Use the organization of data to facilitate drawing conclusions about the patterns of scale properties at more than one scale, such as those that are too large or too small to directly observe

### Crosscutting Concept Assessment Target(s)

CCC3 Use models to study time, space, and energy phenomena ranging from the very small to the very large

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides a randomized data table with all relevant information (e.g., sizes of a planet’s layers) on each planet in the solar system:

* Identifies the order of the planets from the Sun outward based on data provided (4.2.2, ESS1.B.3, and CCC3)
* Identifies the patterns seen when comparing the inner planets to the outer planets (4.2.2, ESS1.B.3, and CCC3)

Task provides a graphic of the diameter of asteroids versus the number of asteroids in our solar system:

* Describes the relationship between a given asteroid diameter and its frequency representation (4.2.2, ESS1.B.3, and CCC3)

Task provides a randomized chart of the average surface temperatures of the planets in our solar system:

* Creates a bar graph that correctly compares the temperature of each planet (4.2.3, ESS1.B.3, and CCC3)
* Explains any pattern found regarding the surface temperatures of each planet and its location in the solar system (4.2.3, ESS1.B.3, and CCC3)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Depth of crust and atmosphere, or other layers, of a celestial body
* Surface features of the Sun, including the relationship between sunspots and electromagnetic radiation released
* Surface features of other planets compared to surface features on Earth
* The orbits of planets, moons, asteroids, and comets:
  + Compare size (as diameter or mass), number, or characteristics (e.g., average distance from a planet, orbital period) of moons, asteroids, and comets
  + Compare the composition of a planet’s atmosphere and position in the solar system
  + Compare the surface temperatures of solar system objects and distance from the Sun

## Common Misconceptions

Note that the list in this section is not exhaustive.

* A diagram of the solar system built to scale for distances from the Sun can also present the relative sizes of the planets and the Sun at the same scale.
* Increased mass equals increased density.
* Larger diameter equals more density.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

MS-ESS1-3 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/MS-ESS1-3 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/MS-ESS1-3%20Evidence%20Statements%20June%202015%20asterisks.pdf)

The *2016 Science Framework for California Public Schools Kindergarten through Grade 12*

Appendix 1: Progression of the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts in Kindergarten through Grade 12 <https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix1.pdf>

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