

## Solar System Lesson 1: “The Solve” Educator’s Resource Guide

### Objective:

In The Solve, students will:

1. Create a mind map to explore relationships among complex Solar System vocabulary.
2. Solve a mystery that demonstrates how scale proportions can be used to predict the size of surface features on planets.
3. Communicate understanding of scale properties of objects in the solar system, such as planet features.

**Time Required:** 75 minutes

| Materials Required   | Safety Considerations | Science & Engineering Practices  |
|--|-----------------------|--|
| <ul style="list-style-type: none"><li>● Student Guide (<i>includes student agenda and vocabulary handout</i>)</li><li>● Solar System Comic</li><li>● Scissors</li><li>● Glue or Tape</li></ul> | None                  | <ul style="list-style-type: none"><li>● Developing and Using Models</li><li>● Constructing Explanations or Arguments From Evidence</li></ul> |

### Episode Description:

Marsha and Wes have planned to design the first amusement park on Mars. Though they constructed their attraction based on the dimensions of the Grand Canyon here on Earth, the ride plummets to the bottom of the Mars crater: their design is an epic failure.



Mosa and her team have their work cut out for them, and a tour to the science museum helps reveal all of the answers that they will need to succeed in this “scale in the solar system” mission!

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## **Inquiry Scale:**

“The Solve” can be completed in various settings including presentation-style, small groups, individually or, in the case of a flipped or blended classroom, can be completed entirely at home.

### **Level 1: most teacher-driven** *(recommended for grades 4-5)*

Project and complete the vocabulary handout as a class-wide activity. Have students informally quiz each other on the vocabulary until you feel they’re familiar with the terms. Use the discussion questions at the bottom of the vocabulary chart to have a group discussion.

Then, read through the comic twice as students follow along: once in full, and a second time along with the discussion questions, pausing as needed to answer the questions as a group. Finally, have students complete the quiz online or on paper as an exit ticket.

### **Level 2:** *(recommended for grades 5-6)*

Have students complete the vocabulary chart in small groups, coming back as a class to review correct answers as needed. Have students informally quiz each other on the vocabulary until you feel they’re familiar with the terms. Use the discussion questions at the bottom of the vocabulary chart to have a group discussion.

Then, assign students roles for the different characters in the comic. Read through the comic as class, with students reading out for their specific roles. After the class reading, have students answer the discussion questions in small groups. Finally, have students complete the quiz online or on paper as an exit ticket.

### **Level 3:** *(recommended for grades 6-7)*

Have students complete the vocabulary chart in table groups and quiz each other until you feel they’re familiar with the vocabulary. In table groups, have students go through the discussion questions on their own and review answers as a class.

Provide students with the comic and have students read the comic in small groups. Have students answer questions in their table groups to the best of their ability. Then, as a class, read the comic again, pausing as needed to discuss questions in a think-pair-share format. Finally, have students complete the quiz online or on paper as an exit ticket.

### **Level 4: most student-driven** *(recommended for grades 7-8)*

Have students complete the vocabulary chart in pairs and quiz each other until they feel they’re familiar with the terms. Have these same pairs go through the discussion questions in partners.

Provide students with the comic and have students read the comic and complete discussion questions in pairs. Have students review their answers with a neighboring table group. Finally, have students complete the quiz online or on paper as an exit ticket.

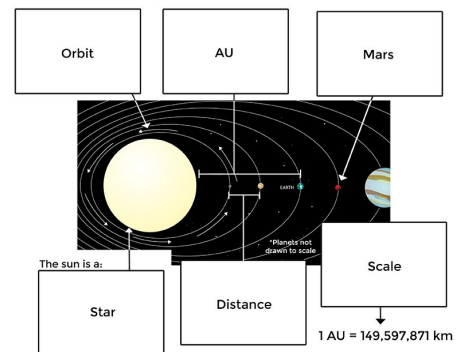
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## Agenda

### I. Warm Up: Vocabulary Mind Map (45 minutes)

**Differentiation Tip:** The Mind Map can be done as a class, in small groups, individually, or completed for homework.

1. Print and pass out the *Solve: Student Guide* for Solar System (located in the Student Guide)
  - a. Introduce the warm up task: students will be making a mind map of the vocabulary for this Solar System unit.
  - b. Model the directions carefully, emphasizing the following. Students should:
    - only cut on solid lines.
    - fold on the dotted lines.
    - **not** glue down their whole card, but instead make flaps over each picture.
    - check that they have matched their cards correctly before moving on to gluing or taping.
  - c. Students use glue, scissors, and vocabulary to create a Solar System Mind Map.
  - d. Discuss the questions with their group when they are complete.



### II. Solve the Solar System Comic Mystery (20 minutes)

**Differentiation Tip:** The comic can be read as a class, in small groups, individually, or completed for homework. For additional support, students can read the comic twice: once before completing the questions, and once with teacher guidance, pausing the video to discuss each answer.



1. Read the Mosa Mack comic on Solar System.
2. Students fill out questions on student handout as they watch. Encourage students to cite the specific page numbers in the comic to promote writing with supporting evidence. Answers can be found in the key below.

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## III. Exit Ticket: Check for Understanding (10-15 minutes)

**Differentiation Tip:** This can be done in groups, pairs, individually or more formally as a quiz online.

1. Students complete the exit ticket to check for understanding. This can be done online by selecting this "Quiz" button or on paper in the student worksheet. Answers are in the key below.

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STUDENT GUIDE

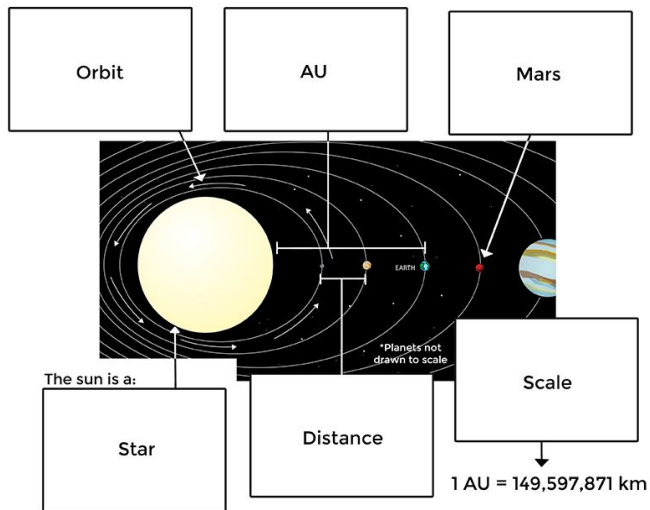
III. Exit Ticket: Check for Understanding  
Complete the exit ticket below or you can take the quiz online!

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. Which of the following is an example of a (SOLAR SYSTEM) resource?  
a. Water  
b. Solar Wind  
c. Resources  
d. Planets
2. Resources are equally distributed throughout the world. True or False?  
a. True  
b. False
3. How long does it take for light to reach Earth?  
a. Millions of millions of years  
b. 10 years  
c. A few years  
d. 8 minutes
4. Burning fossil fuels releases which gas into the air, making the Earth warmer?  
a. Oxygen  
b. Nitrogen  
c. Carbon Dioxide  
d. Helium
5. Which of the following does not show a galaxy?  
a. Spiral  
b. Elliptical  
c. Barred  
d. Galaxy

## Answer Key

### Mind Map Answer:



## Episode Questions Answers

1. Marsha and Wes are trying to create an amusement park on Mars. What dimensions do they need to create their first attraction, the Crater Craze Climber?

*Marsha and Wes would need to know the width and depth of the canyon on Mars in order to build a successful Canyon Craze Climber.*

2. Why did Marsha and Wes fail in their mission?

*Marsha and Wes failed in their mission because the Crater Craze Climber was too small and fell into the crater on Mars.*

3. What feature on Earth did Marsha study in order to help her design the Crater Craze Climber attraction?

*Marsha based the Crater Craze dimensions on the Grand Canyon, found here on Earth.*

4. What did Mosa and her team look at to gather information about the Mars canyon?

*Mosa and her team looked at a scale model of Mars, drawings and photographs.*

5. Why were the models, drawings and photographs helpful?

*These items contained measurement keys, or scales, on them which helped the team determine the actual dimensions of the Mars canyon.*

6. If 1 cm on a model is equivalent to 2 km on Mars, how tall would a Mars mountain be if it measured 2 cm on the model?

*The Mars mountain would be 4km tall.*

7. Why couldn't Marsha and Wes to use the Grand Canyon as a point of comparison when designing the Canyon Craze Climber on Mars?

*The Grand Canyon here on Earth is much smaller than the the canyon on Mars.*

8. How did Mosa determine the width of the crater?

*By studying the scale drawing of the crater on Mars, Mosa found another key, or scale, for Mars when calculating width.*

*Extension: In this conversion, 1 cm = 1000 km . Since the width measured on the model was 4 cm, the actual width of the crater on the planet would be 4000 km.*

## Exit Ticket Answers

1. The Canyon Craze Climber was originally built as 16 km wide and 2 km deep. Why was this incorrect?
  - a. The Canyon Craze Climber was too large for the canyon found on Mars.
  - b. The depth of the crater on Mars is only 1 cm in depth.
  - c. **The Canyon Craze Climber was built according to the dimensions of the Grand Canyon on Earth which was much smaller than the canyon found on Mars.**
  - d. The width of the crater on Mars was smaller than Marsha realized.
2. What information did Mosa need in order to calculate the dimensions of the canyon on Mars?
  - a. The depth of the canyon on Mars.
  - b. The width of the canyon on Mars.
  - c. A key showing the size of the map compared to the size of the actual canyon.
  - d. **All of the above**
3. True or False: A kilometer (km) is larger than a centimeter (cm) in metric measurement.
  - a. **True**
  - b. False
4. What type of data **cannot** be obtained by studying a scale model of a planet?
  - a. The relative size of the planet.
  - b. **The temperature of the planet.**
  - c. The depth of a canyon on the planet.
  - d. The width of a canyon on a planet.
5. What materials did Mosa Mack and her crew study at the science museum in order to learn more about the canyon on Mars?
  - a. Photographs (taken from a telescope) of the canyon on Mars
  - b. Scaled drawings of the canyon on Mars
  - c. A scaled model of Mars
  - d. **All of the above**