

# Space Odyssey Online Teacher's Guide

## Cosmic Communication

Previsit Activity for Space Exploration



Courtesy SEDS

**Grades 9-12**  
**CDE Standards**  
Science: 4.4  
Language Arts: 2  
Math: 3

## **Preparation and Materials**

**Estimated Preparation Time:** 15 minutes

**Estimated Activity Time:** 1-2 class periods of 30 minutes or more

## **Materials**

Graph paper

Pencils

Colored pencils or markers

## **Learning Goals/Objectives**

Students will

- Articulate important messages to send to an alien life-form
- Translate messages into pictorial and mathematical representations

## **Connection to *Space Odyssey***

The SETI (Search for Extra-Terrestrial Intelligence) Institute was founded to explore the possibilities of intelligent life in the universe. Its purpose is to "explore, understand, and explain the origin, nature, and prevalence of life in the universe." A space exploration pathway would not be complete without some discussion of the possibility of finding life in space. Many of the interactive exhibits and demonstrations found in *Space Odyssey* are based in theory around the search for life in space.

## **Advanced Preparation**

1. Locate information about the Arecibo broadcast from the SETI Institute's Web site and about the Voyager messages from the NASA Web site. This information should be shared with students so that they have the background information needed to complete this assignment.

[http://www.seti.org/seti/seti\\_background/arecibo\\_broadcast.html](http://www.seti.org/seti/seti_background/arecibo_broadcast.html)

<http://voyager.jpl.nasa.gov/spacecraft/goldenrec.html>

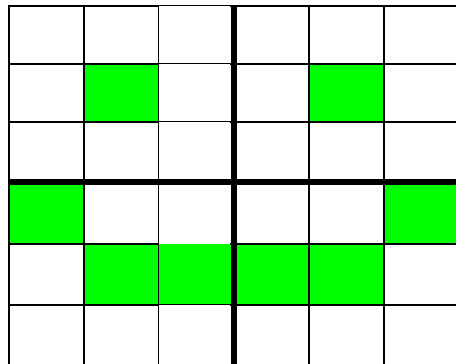
## **Classroom Activity**

Share information about the Arecibo broadcast and the Voyager messages with your students.

1. Ask students to think about and brainstorm ideas for messages they would like to send into space. What important information would they like alien civilizations to know about our planet? SETI sent a mathematical message,

which when decoded would show a picture. NASA sent music and sound clips, as well as messages in several different languages.

2. Discuss how the Arecibo message was sent mathematically and ask students to ponder why scientists chose to send the message this way. Have them brainstorm other ways to send the message, mathematically or otherwise.
3. Have students write a short message they would like to send into space. The message needs to communicate an important concept about the way we live on Earth. Students will then need to "translate" their message into a pictorial representation.
4. Students will re-create their picture "message" on graph paper. Then students will record "directions" for decoding the message.



Directions for Decoding:

- |                |                |
|----------------|----------------|
| (2, 2) green   | (-2, 2) green  |
| (-2, -2) green | (-3, -1) green |
| (3, -1) green  | (1, -2) green  |
| (2, -2) green  | (-1, -2) green |

5. Have students give their decoding directions to a friend to see if the friend can reproduce the correct image. Students should try not only to duplicate the picture but also to interpret what the picture's intended message is.

### Variations/Extensions

1. Have students create a "communication capsule" similar to a time capsule of things they could send into space to communicate a message about our planet. What sorts of items would they send?
2. Have students read their directions to a small group of students. Can each student come up with the right picture? Have the group discuss why the pictures might have looked different from person to person. To make it more interesting, put certain time restriction and repetition rules on different groups. See which rules make it more difficult for students to come up with the right picture.

3. Students and teachers with the appropriate mathematical background knowledge can translate their messages into binary code. Here are some great links for information and tutorials on using binary numbers.  
<http://www.math.grin.edu/~rebelsky/Courses/152/97F/Readings/student-binary.html>  
<http://www.cs.colorado.edu/~l3d/courses/CSCI1200-96/binary.html>  
<http://www.howstuffworks.com/bytes.htm>
4. Students with the necessary mathematical background knowledge can complete the Messages from Space worksheet.
5. Students can develop their own code for translating pictorial messages into mathematical representations. When finished, students can trade codes with other students.

## Resources

### Web sites

<http://www.math.grin.edu/~rebelsky/Courses/152/97F/Readings/student-binary.html>

<http://www.cs.colorado.edu/~l3d/courses/CSCI1200-96/binary.html>

<http://www.howstuffworks.com/bytes.htm>

[http://www.seti.org/seti/seti\\_background/arecibo\\_broadcast.html](http://www.seti.org/seti/seti_background/arecibo_broadcast.html)

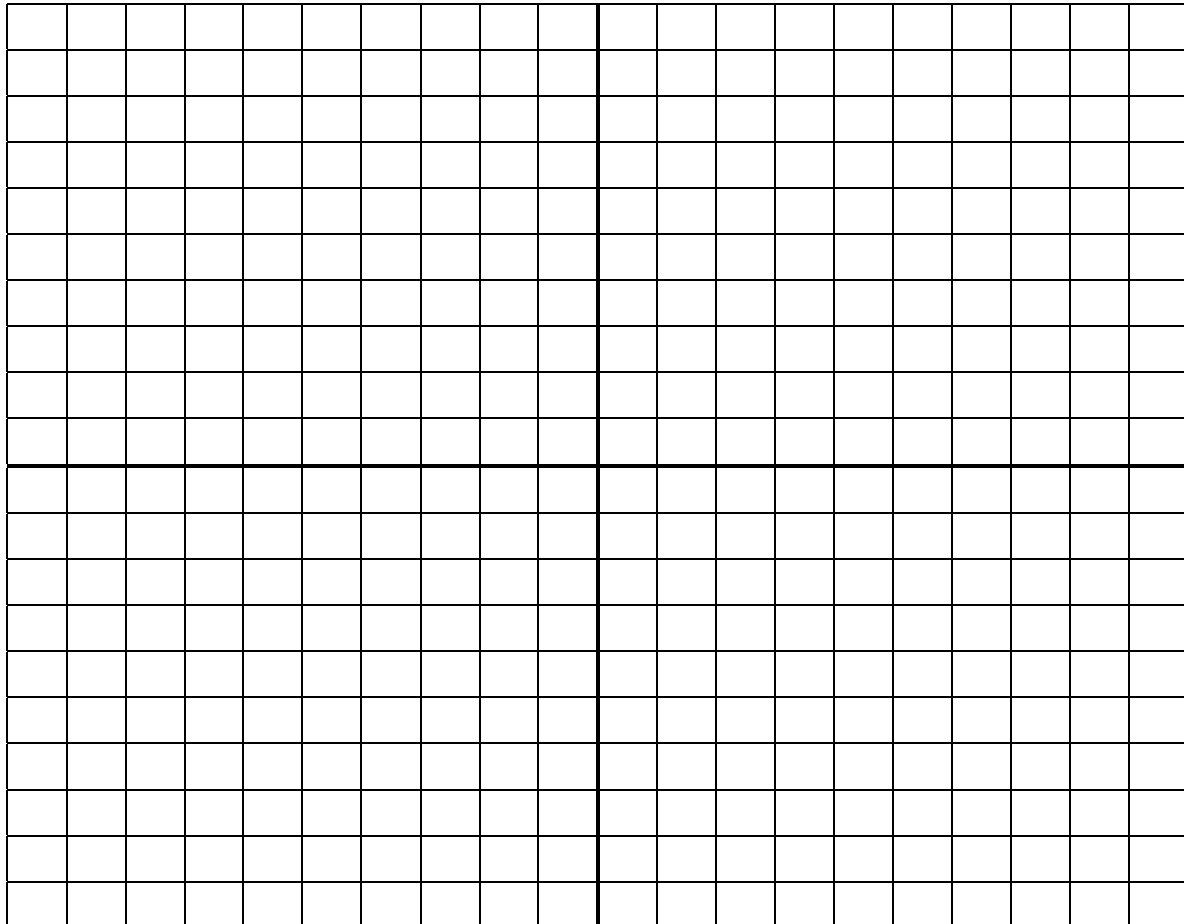
<http://voyager.jpl.nasa.gov/spacecraft/goldenrec.html>

Name \_\_\_\_\_

# Messages from Space

You are part of a SETI team researching messages from space. Your team intercepts a message from outer space. The message is received in code. Your mission is to decode the message. Using the code below, plot the message on the graph.

|          |         |          |          |          |          |          |
|----------|---------|----------|----------|----------|----------|----------|
| (1, 1)   | (-1, 3) | (-3, -2) | (3, -2)  | (-1, 1)  | (-1, -1) | (-3, -3) |
| (-2, -2) | (4, 1)  | (-3, 3)  | (-4, 1)  | (2, -2)  | (2, 4)   | (-2, -1) |
| (-1, -4) | (4, -2) | (1, 2)   | (-1, 4)  | (-4, -2) | (4, -1)  | (1, 4)   |
| (3, -3)  | (-1, 2) | (2, -4)  | (4, 2)   | (-2, 4)  | (3, 3)   | (2, -1)  |
| (-4, 2)  | (1, -4) | (-2, -4) | (-4, -1) | (1, 3)   | (1, -1)  |          |



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

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| (-1, -4) | (4, -2) | (1, 2)   | (-1, 4)  | (-4, -2) | (4, -1)  | (1, 4)   |
| (3, -3)  | (-1, 2) | (2, -4)  | (4, 2)   | (-2, 4)  | (3, 3)   | (2, -1)  |
| (-4, 2)  | (1, -4) | (-2, -4) | (-4, -1) | (1, 3)   | (1, -1)  |          |

