

ACTIVITY 14

DECODE THE ALIEN MESSAGE



Level:
Grades 3-6

Preparation:
easy

Number of students:
individual

Length:
15 min.

Place:
classroom

Type of activity:
riddle

BRIEF DESCRIPTION

Students decode a message using the same code that scientists use to try and communicate with aliens.

MATERIALS

- sheet with the message (1 per person)
- pencil and eraser

PREAMBLE

One of humanity's biggest questions is whether we are alone in the Universe, or whether other civilizations exist on distant planets. Scientists scan the skies with radio antennas to detect possible extraterrestrial messages. They have also already sent messages that may one day be detected by other civilizations.

But how do we communicate with aliens, since they would not speak the same language as us? Scientists and philosophers believe that it would be interesting to use a system based on science and mathematics, since the laws of nature are the same everywhere in the Universe. So the first attempts at communication used a binary code, made up of 1s and 0s, to create messages. This same language is used in computers and other electronic devices.

In this activity, binary language has been used to create a secret message that the students will decode. Though, of course, it's not a real message from an extraterrestrial civilization!

PREPARATION

Print out more sheets than the number of students. If mistakes are made filling-in the grid, it may be easier to start all over again than to erase.

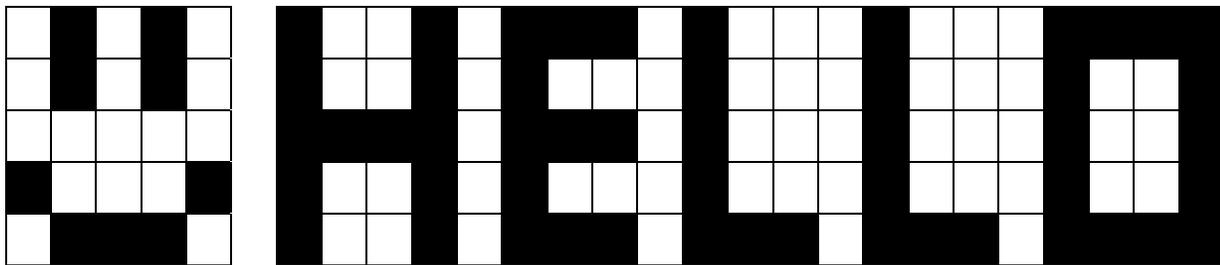


STEPS

The secret messages are a series of 0s and 1s, and each number corresponds to a cell in the grid, starting at the top left. The boxes associated with a 1 are to be coloured in, and the boxes associated with a 0 are to be left white.

Tip: In the easy message, each row of the grid has five squares. It may be useful to start by dividing the sequence of 0's and 1's into five series of five to limit the risk of error when filling in the grid. You can do this by putting a line after each set of five digits in the sequence, or rewrite the sequence of 0's and 1's on five lines of five digits. You can then apply the same principle to the advanced level grid, but be careful to count the number of squares per row.

Here are the two decoded messages:



You can jump right into the activity since it's easy enough to decode the secret message. However, it's a good idea to take the opportunity to get your students thinking about the possibility of extraterrestrial life and the difficulties of communicating with such a civilization if it exists.

Here are some ideas for reflection and discussion, before or after decoding the message.

- Do you believe that aliens exist?
- How would we go about communicating with them? What language would we use?
- What problems did we encounter on Earth when two civilizations didn't speak the same language?
- Do you think aliens might understand a message written in binary code?

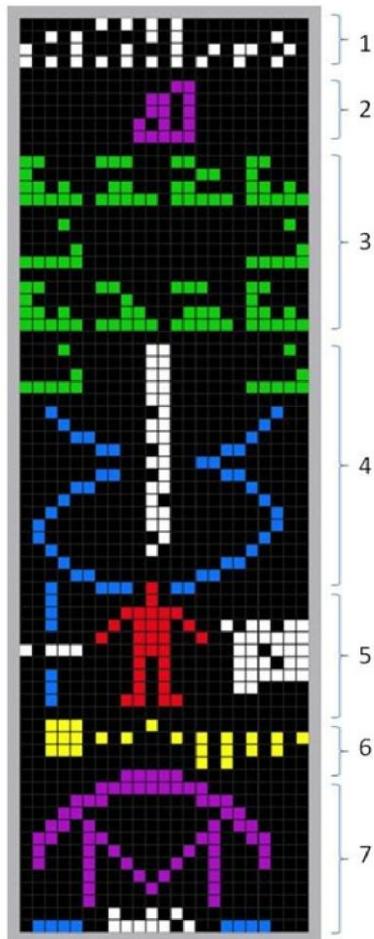
You could also have students create their own message in binary code, and let their parents or friends decipher it.

INFORMATION

This activity is inspired by a message that scientists sent into space in 1974. Commonly known as the Arecibo message, this radio message was sent from the Arecibo radio telescope in Puerto Rico. This is a giant radio antenna 300 metres in diameter.

This message consists of a sequence of 1679 binary numbers, i.e. 0's and 1's. Rearranging the sequence into a grid of 23 columns and 73 rows, the following drawing appears (colour has been added to the image to clearly see the different parts of the message).

It contains information about the Earth, humans, and life on Earth in general.



Message from Arecibo.
Image Credit: Arne Nordmann
/ Wikimedia Commons.

Here are the details of the different sections of the message:

1. Numbers from 1 to 10.
2. The atomic numbers of the five most common elements in living species on Earth: hydrogen, carbon, nitrogen, oxygen, and phosphorus.
3. Chemical formulas for nucleotides, the basic molecules in our DNA.
4. The DNA double helix.
5. A human with their height and the Earth's population at the time of the message (approx. 4 billion).
6. The Sun and the planets. The Earth is offset to highlight it.
7. The Arecibo radio telescope and its diameter.

This message was sent to the M13 star cluster, more than 20,000 light-years away. Travelling at the speed of light, this message would take over 20,000 years to reach its destination. If aliens living there receive the message, understand it and decide to respond, we'll receive our answer in more than 40,000 years!

DO ALIENS REALLY EXIST?

Nobody knows! There are billions of planets in our galaxy, many of which could have conditions similar to Earth. However, because they are extremely far away, it's a challenge for us to see what's on their surface. There is ongoing research to discover and to study exoplanets. There is one type of research that involves using radio telescopes in the hope of detecting a signal from an extraterrestrial civilization. While we do get signals from space, we've always been able to explain them as natural phenomenon, but this doesn't mean that extraterrestrials don't exist. Discovering the presence of life elsewhere in the Universe would be one of the greatest discoveries in human history.



HOW CAN WE COMMUNICATE WITH ALIENS?

In science-fiction movies, humans and aliens often end up understanding one another. Typically, the aliens even speak human languages! But in reality, communication with an extraterrestrial civilization would be very difficult, since we would have no common language and our cultures would be entirely different. That's why scientists believe that the best way to communicate would be through science and mathematics.

SOURCE

This activity is inspired by *Decode an extraterrestrial message* activity from the *Rio Tinto Alcan Planetarium* in Montreal.

TO FIND OUT MORE

- [Arecibo Message](#), *Wikipedia* page.

Did you know that a light-year is the distance light travels in one year, or nearly ten thousand billion kilometers?

DID YOU
KNOW...?



Decode your messages by colouring in the boxes corresponding to the number 1 (black) and leaving the boxes corresponding to the number 0 blank (white).

EASY LEVEL

0-1-0-1-0-0-1-0-1-0-0-0-0-0-0-1-0-0-0-1-0-1-1-1-0

Start here →

HARD LEVEL

1-0-0-1-0-1-1-1-0-1-0-0-0-1-0-0-0-1-1-1-1-0-0-1-0-1-0-0-0-1-0-0-0-1-0-0-0-1-0-0-1-1-1-
 1-1-0-1-1-0-0-1-0-0-0-1-0-0-0-1-0-0-1-1-0-0-1-0-1-0-0-0-1-0-0-0-1-0-0-0-1-0-0-1-1-0-0-1-
 0-1-1-1-0-1-1-1-0-1-1-1-0-1-1-1-1
