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## Mission 11 Do You Get the Message?

### Background and a Practice Message

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

In October 1992, NASA scientists began a large-scale search of the skies with radio telescopes for signals coming from extraterrestrial civilizations. Although Congress terminated funding for the project after only one year, the targeted star search is continuing with private funding. The research is now conducted at the Allen Telescope Array (ATA) in northern California. Several other small searches have been tried and are under way at this time.

What would a signal from an extraterrestrial civilization be like? The extraterrestrial probably would not know any Earth language. Their transmitter would be very far away, and their signal may be weak. It might be very simple, nothing more than a series of pulses, repeated over and over, like the call sign on a radio or television station.

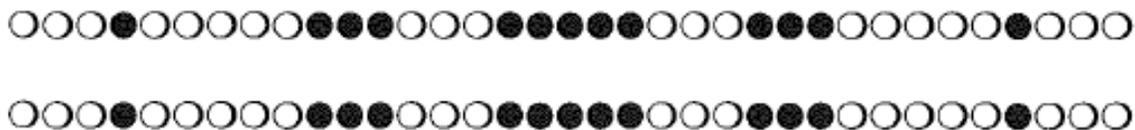
How would you broadcast a message, in pulses, to somebody who does not know your language? Could you create a message in a code so simple that the person receiving it would surely figure it out, even an extraterrestrial who knew nothing about you? The exercise that follows imagines that we on Earth have received a message in this kind of code.

When you were introduced to *Project Haystack*, you knew you would be asked to find where the signal was coming from, to find the needle in a celestial haystack. You did that! You found a signal originating near a star, in fact from a planet orbiting that star. Your challenge now? You must decipher the message!

Your radio telescope has received a simulated radio transmission. The signal is repeated over and over again. It is a string of long and short pulses. Before you try to decipher the long message that is coming in, try deciphering the short message as a practice/warm-up exercise.

#### The Practice Message

Figure 11.6.



*Note:* This shows two repetitions of the short message. If you cannot figure it out on the first try, you have another set of data for another try.

Hints:

How many dots are there in one repetition?

Is there anything special about this number?

Can you arrange them in a way that would make sense besides in a straight line?

Using a pencil, try drawing different arrangements of the dots in one repetition. When you think you've found an arrangement that deciphers the message, cut out one of the repetitions, and arrange the dots to show your solution.



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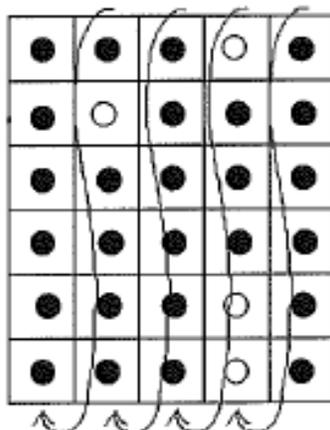
### Decoding the Message– Directions Worksheet

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

Did you figure out the practice message? If not, ask your teacher for assistance. Now use the same method on the full-scale extraterrestrial message. There are a lot of dots, so you will need to be more careful and systematic, but you should be able to make sense of it even though the extraterrestrials do not speak English. Good luck!

1. With a pair of scissors, cut the strips on your “A Message for Earth” page vertically, along the lines between the columns. The top of the first column attaches to the bottom of the next column with a piece of tape (see fig. 11.7). Cut only one strip at a time, and tape it in place before you cut another. Keep cutting and attaching columns until you get one long string of data. You may receive two copies of this sheet so that you can try different ways of putting the message together. If not, you may pair up with another team. One team can do it one way, and another team another way, and then you can look at both.
2. You are now ready to work on the message. This one will be more difficult for you than the practice message. You should count the total number of bits of information. Try to think about what may be unique about the number of bits of information that you come up with.
3. The bits of information can be arranged any way you choose. You may cut your long single strip of dots to any length that you choose. You may stack these pieces in order after they are cut. If you become stuck, ask your teacher for help, or clues, to solving this message puzzle. When you have done this assignment correctly, you will see a definite pattern.

**Figure 11.7**–How to Connect the Paper Strips.



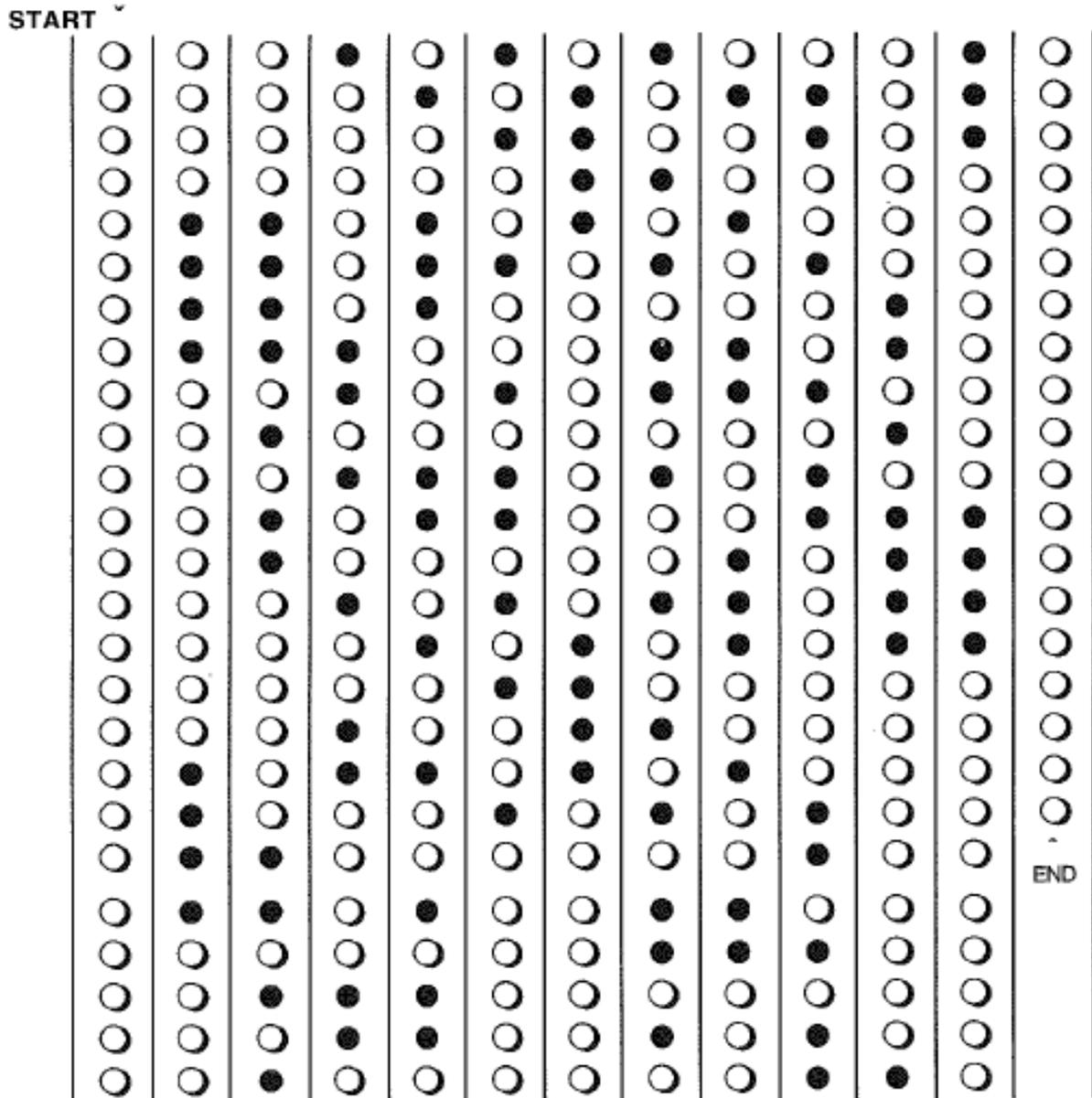


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A Message for Earth

Figure 11.8





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## **Mission 11 Do You Get the Message?**

### **Summary Questions–Worksheet**

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

1. Describe the process you and your team members used to solve this simulated message received from space:
2. Now that you have it put together, what do you think it means?
3. Knowing the star system that this simulated message came from, how many years did it take to get to Earth, assuming that it was received this year? How do you know this?
4. If you wanted to send a message back using radio waves, how long would it take to reach the extraterrestrial civilization?
5. Let's say that you would like to send back a reply message. What form would it take? What would you like it to say or express? Can you think of a reason why you might want to send the same message back to the extraterrestrials?
6. Do you think that it is important that the message be composed of a total number of bits of information that is the product of two prime numbers? Why or why not?



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## **Mission 11 Do You Get the Message?**

### **Sending a Reply– Directions**

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

You have explored many aspects of communication across interstellar space. Although astronomers have not yet detected a signal from other beings, the mission you have completed has raised many interesting and fascinating questions. Imagine for a moment that your data had been picked up by a real radio telescope:

- What was this stream of data? What did the data look like?
- How could these data be interpreted?
- Where was the information coming from?
- If indeed the information was coming from another star system in deep space, what might the effect be on our civilization?
- How would Earth respond to the signal? Should Earth return the signal?

Answers to these questions are not immediately evident. Now that you are close to completing the series of missions in *Project Haystack*, perhaps you are close to answering these questions. The project you are about to begin will require you to draw upon the expertise and knowledge you have gained on the subject of communication across the vastness of space.

### **This Is Your Challenge!**

You want to communicate with the civilization that sent the message that you deciphered earlier in this mission. You must take the following questions into consideration:

1. **What** will your message be to them?
2. **How** (by what means) will you send the message?
3. **Where** will you send it?

You must answer these three questions to create a plan, and each step of your plan must have rationale or justification. This means that you must explain:

4. **Why** the message you have chosen is the best one.
5. **Why** the approach you have chosen is the best one.
6. **Why** the destination you have chosen is the best one.

In some creative way tell an audience of your choosing, how you would go about responding to the simulated communication that you have already received. You do not have to gear your presentation to seventh-, eighth-, or ninth-graders. You could present it to Galileo, the president's science advisor, a NASA space shuttle crew, the general assembly of the United Nations, any of the *Star Trek* crews, Oprah Winfrey, a first-grade class, or maybe even your favorite rock group. How about presenting it as a television newscast, a live drama, a poem, a children's book, a video, a television show, a magazine spread, or a comic strip? How about as a story for a tabloid magazine? There are certainly many other audiences and many other ways you could organize your presentation.

**Use your imagination!**

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