Message from the Duo

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from:	engineeringadventures@mos.org
to:	You
subject:	Deep Freeze

11:42 AM

Hi engineers,

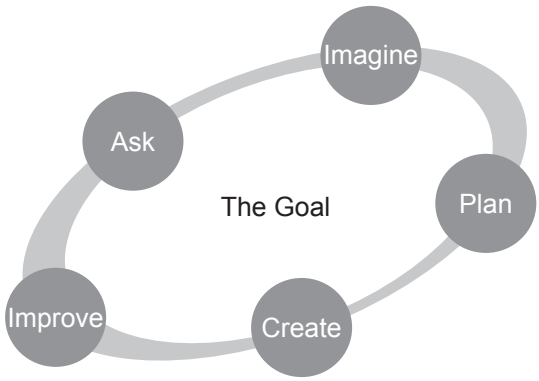
You did a great job investigating the gloves we sent. Are you ready for a new materials challenge?

Remember how we said space can be really hot or really cold? Maru told us that one of the reasons her materials research team works in Antarctica is because the temperatures there are some of the coldest on Earth. The coldest temperature recorded was −89 degrees Celsius (°C). That's −128 degrees Fahrenheit (°F)! These conditions make Antarctica an ideal place to test out new space equipment for astronauts.

It's time to do some materials testing of your own. Can you find out which materials work well to protect against cold temperatures? I've sent you a few materials to try.

Let me know what you find out!

Jacob



Cold Test Procedure

1. Cut the material and tape it in **1 layer** on the outside of a plastic bag.

2. Place the plastic bag with the materials inside the other plastic bag.

   The material should now be sandwiched between the 2 plastic bags. This is your mitt.

3. Put the model hand with attached thermometer into the inner bag of the mitt.

4. Place the ruler into the corner of the mitt.

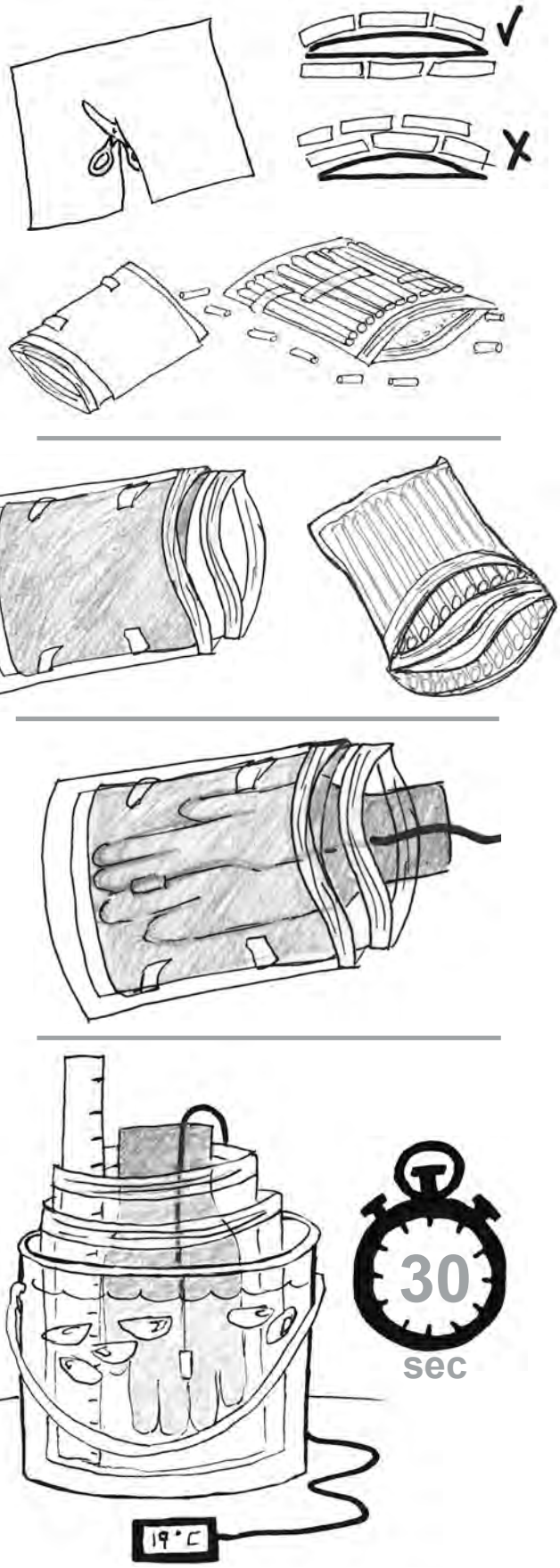
5. Record the starting temperature.

6. Place the mitt straight down into the ice water and start the timer. Use the ruler to keep the mitt under water.

7. Record the temperature after **30 seconds.**

8. Subtract to find the difference in temperature.

9. Record your results on *Temperature Changes*, p. 13 in the Engineering Journal.



Directions:
Record temperatures for the empty mitt and the mitt with your testing material below. Look at the example for the type of information you should include in each column.

Is your material good at protecting against the cold?

Not Good	Good	Great
7 °C or more	3–6 °C	0–2 °C

Test Results				
Mitt Material	**Starting Temperature**	**Temperature after 30 Seconds**	**Difference in Temperature**	**How well does it protect against cold?**
Example	*20 °C*	*17 °C*	*3 °C* *(20 °C – 17 °C = 3 °C)*	*Good*
Empty Mitt				

Reflect

Which materials were great at protecting against the cold?

Why do you think these materials worked well?

Did You Know?
The Celsius temperature scale is often used in science. It is used by almost every country in the world.