



# Solar Cooker Design

Take STEAM learning outside with this fun camp classic! Inspired by the Summer Camp Classics Enrichment Program, this STEM activity will challenge veteran campers to create a solar cooker oven — a low-cost, environmentally-friendly technology. Harnessing the power of the sun, campers will convert sunlight to heat and discover a new way to make s'mores, a campfire classic.



## HANDS-ON STEM EDUCATION

For over 30 years, PCS Edventures has inspired students to develop a passion for Science, Technology, Engineering and Mathematics (STEM), focusing our efforts on making learning and discovery a fun and interactive process for grades K-12.

- Classroom
- After-School
- Home Learning

## BACKGROUND INFORMATION

While you may not be able to cook an egg on a sidewalk, did you know that it's entirely possible to cook with the power of the sun? Now, we aren't talking about using the power generated from solar panels. No, we're talking about good ol' fashioned summertime solar cooking using nothing but the sunlight and some science — campfires are so last century. Let's break down solar cookers.

As a low-cost, environmentally-friendly technology, solar cookers harness the power of the sun to cook food by converting sunlight to heat energy. For the purpose of this activity, the solar cookers created won't be capable of much more than melting some marshmallows, but the science of solar cooking is sound, with designs known as parabolic solar cookers able to fry foods with just the power of the sun.

So how do they work? Well, a solar cooker is designed to:

- Make use of reflective materials to capture the heat energy in sunlight.
- Concentrate sunlight onto food in a specific location.
- Retain as much heat as possible using insulation.

Solar cooking wouldn't be possible without the energy in the sun's rays. Radiation is one of the ways heat can move. Unlike conduction (heat transfer from one object to another through direct contact — think burning your hand by touching a hot pan) or convection (heat transfer caused by the movement of gas or liquid molecules — imagine a boiling pot of water), radiation is the movement of electromagnetic waves. These high-energy particles, called photons, travel from the Sun to the Earth in a matter of minutes, bringing both light and heat. If you think about a direct wave from the sun coming into contact with your skin, over time, you'll feel the radiating heat of the massive star. A solar cooker taps into that energy by reflecting and focusing all of that heat into one amplified area.

Many solar cookers also incorporate some type of insulation to create a miniature greenhouse effect. Box-type solar cookers have insulated sides like an oven. Parabolic solar cookers like the one in this activity work best combined with insulating cookware, such as black pans or oven bags to trap the heat.

Now, while it might seem like a quick process, solar cookers take time to power up, and they're really only at their most effective during particular times of the year (March 20 - October 1 in the northern hemisphere).

Despite these limitations, one of the main benefits of cooking with the sun is the renewable energy it provides — it costs us nothing to utilize the solar rays! On top of saving money, solar cookers can help prevent deforestation, climate change and the human health problems caused by air pollution and lack of access to clean drinking water. Instead of burning firewood, coal, gas or some other combustion source to cook food, solar cookers take from what is already around us and leave no footprint in their place. In fact, solar cookers are used across the world in environmentally-friendly communities and places where electricity isn't always available.

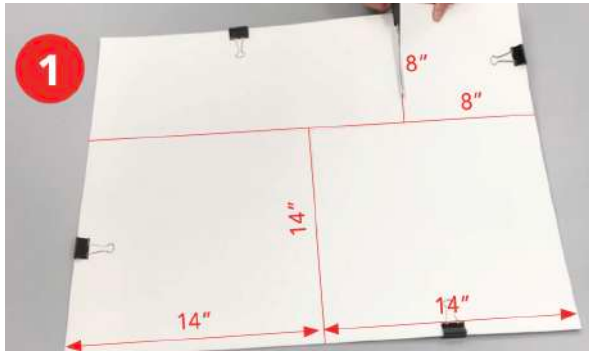
## Solar Oven:

### Materials:

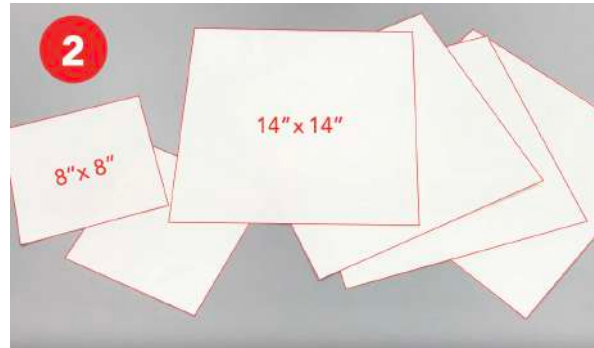
- 1-5 paint brushes (Use one and clean, or use different brushes for each color)
- 22"x28" poster or railroad board
- 4 medium to large binder clips
- Aluminum foil
- Hole punch
- Liquid glue
- Paint (red, yellow, blue, white, black)
- Paper plates or deli containers (to hold paint)
- Pencil and eraser
- Ruler
- Scissors
- Yarn
- Optional: Table covers (to prevent mess from painting)



## Step-By-Step Instructions for a Solar Oven:



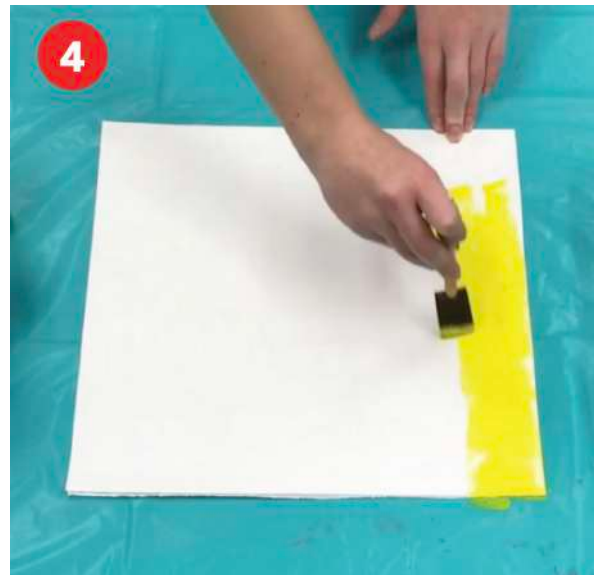
Start with two sheets of 22"x 28" poster or railroad board, stacked on top of each other, and clipped together. Measure out two 14"x14" squares and one 8"x 8" square.



Cut out the squares and set aside the rectangular scraps.



Set aside one of the two 8"x 8" squares. For the remaining 5 squares, cover one side with foil.

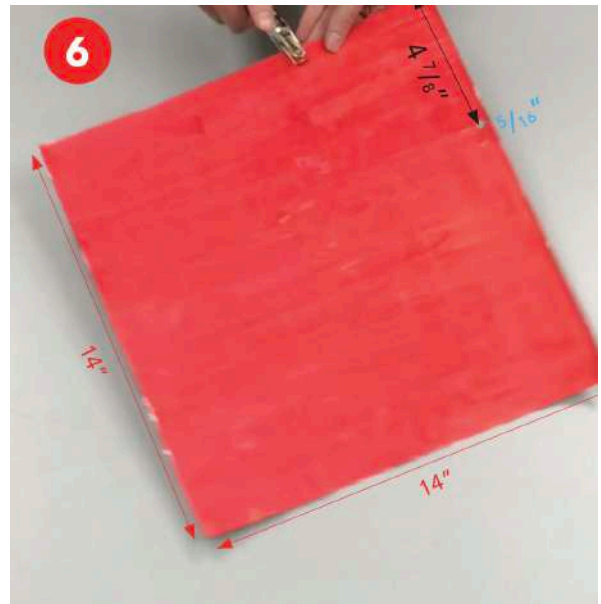


Paint the blank side of all six of the squares. Allow to dry.

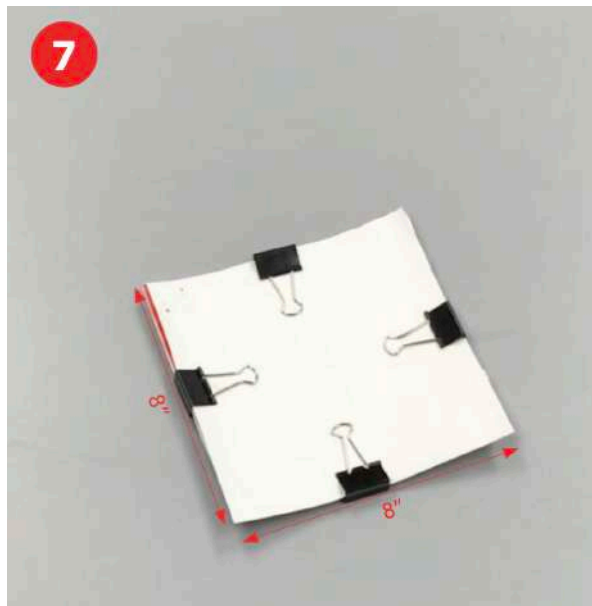
## Step-By-Step Instructions for a Solar Oven:



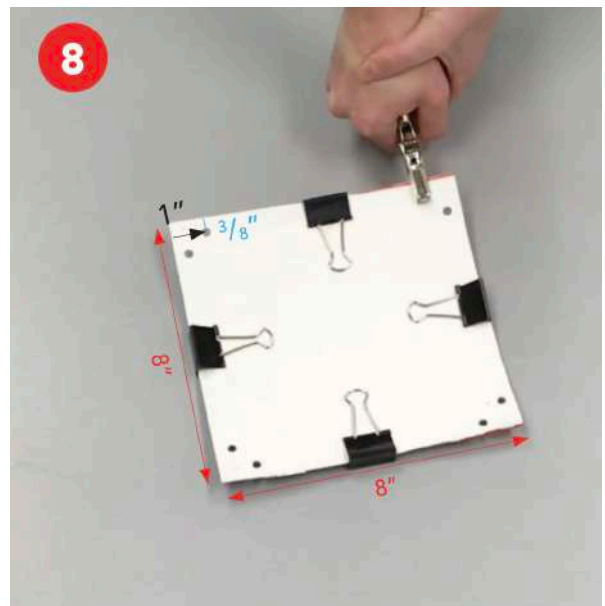
On a 14" x 14" square, punch holes on either side of one corner,  $4 \frac{7}{8}$ " from the corner and  $\frac{5}{16}$ " from the edge.



Repeat on the other 14" x 14" squares, so each 14" x 14" square has holes punched on either side of one of the corners.



Clip the two 8" x 8" squares together.

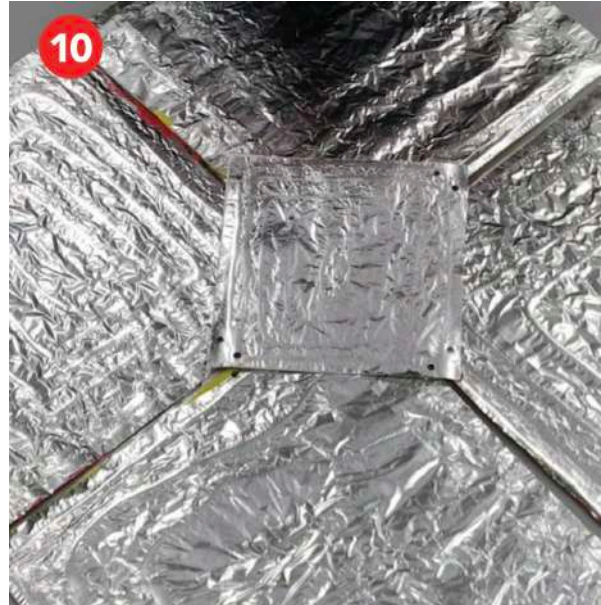


Punch holes on either side of all four corners, 1" from the corner and  $\frac{3}{8}$ " from the edge.

## Step-By-Step Instructions for a Solar Oven:



To assemble the solar cooker, place the four larger squares on top of the un-foiled small square.



Place the foiled small square on top of the larger squares so it's directly above the smaller square underneath.



String a length of yarn through the aligned holes. The yarn should pass through the small square on the top, the large square and the small square underneath before coming back up through the next set of holes in reverse.



When all four panels are threaded together, tighten and tie the yarn.

## Step-By-Step Instructions for a Solar Oven:



Clip together the inner panels.



Use two more clips to secure the outer panels in a closed configuration for storage.



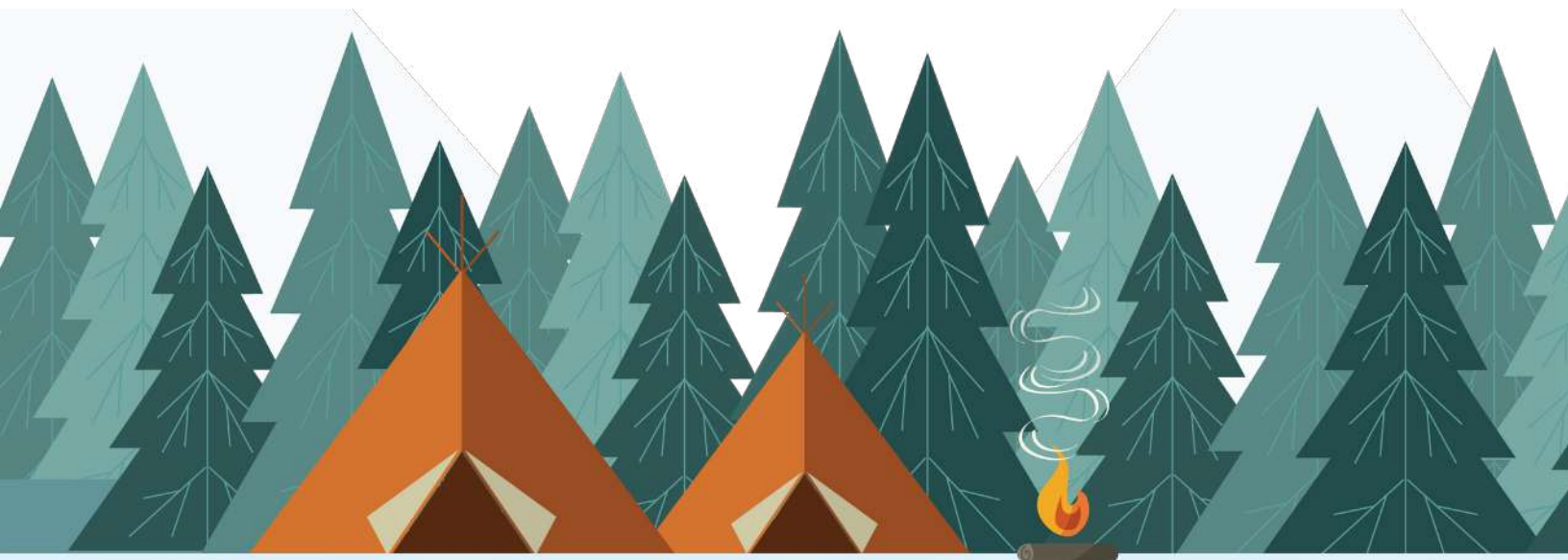
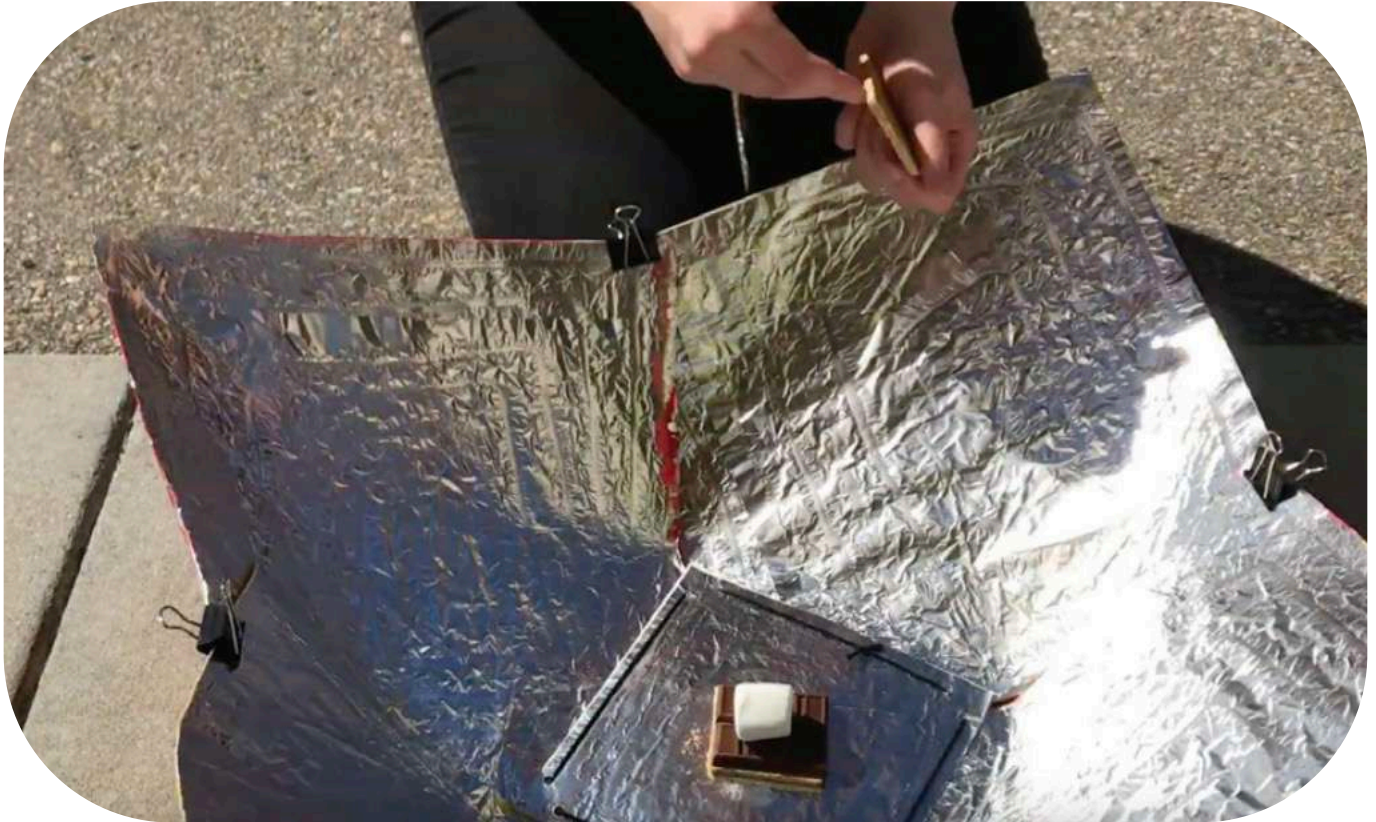
For cooking, move the clips and open up the panels.



Experiment with the best opening angle and enjoy!

## Discussion Questions:

- What is renewable energy?
- How do solar cookers heat food?







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