

# What is a “model”?

## Quick Start Guide



### Overview

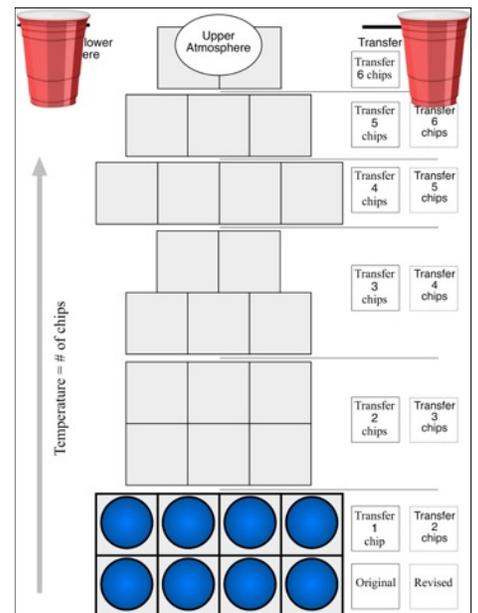
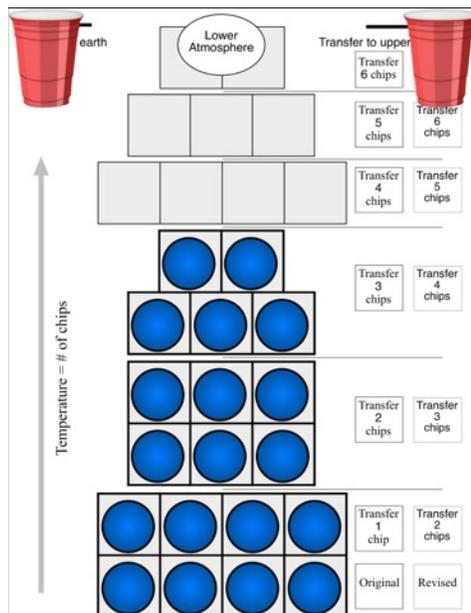
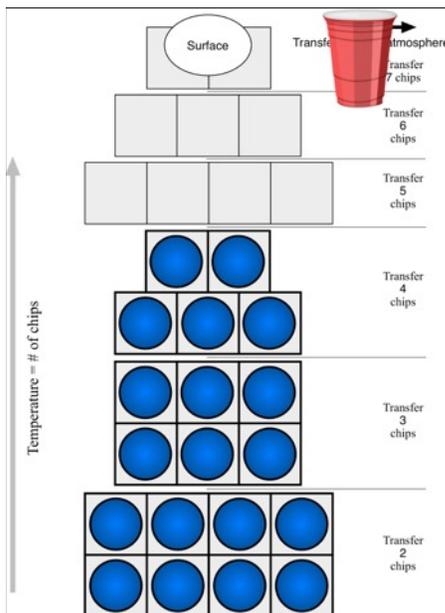
Think of this as a game for 4 players. One player represents each of the following: *the sun*, *upper atmosphere*, *lower atmosphere* and Earth’s *surface*. A game board with chips are used to represent the amount of energy each layer of the atmosphere and the surface have. The more energy you have, the higher your temperature. If it helps, you can think of your temperature as the number of chips you have on your board. Also, the more energy you have the more energy you will give off through radiation.

Have the three players representing the Earth sit in order, with the surface on the left, lower atmosphere in the middle, and upper atmosphere on the right.

### Setting Up The Game Boards

Each player begins filling their board with chips starting at the bottom of the board. Fill in only the squares with the dark outlines. The surface and lower atmosphere should have 19 chips each, while the upper atmosphere only has 8 chips. The surface and layers of the atmosphere will place a transfer cup on any each arrow on the top corner of their game board. The surface only has 1 cup, while the layers of the atmosphere have two each. The sun holds one transfer cup and has all the extra chips.

See pictures below.



## **The First Turn**

During the day, the sun shines on the Earth. The energy from the sun goes straight through the atmosphere and warms the surface. To represent this, the sun will take 3 chips and put them in a transfer cup to give to the surface. Do not give the chips yet! All transfers will occur at the end of the turn.

The surface and atmosphere layers will radiate depending on how much energy they have at the beginning of the turn. Look just to the right of your topmost chip, and it will tell you how much energy you will radiate for your entire turn. The upper and lower atmosphere should use the left number and ignore the right number for now.

The surface will transfer 4 chips to the lower atmosphere. Place the 4 chips in the transfer cup on the top right corner of your board.

The lower atmosphere will transfer 3 chips each to the surface and upper atmosphere. Place three chips in each transfer cup on top of your board.

The upper atmosphere will transfer 1 chips each to the lower atmosphere and out two space. Place one chip in each cup on top of your board.

Now you can exchange cups! The sun gives the surface a transfer cup. The surface gives one to the lower atmosphere. The lower atmosphere gives one to the surface, and one to the upper atmosphere. The upper atmosphere gives one to the lower atmosphere and one to space. The sun can also take on the role of space.

Place the chips on your board, again starting from the bottom. Reset any transfer cups you may have used to the top corners of your board. Notice if your temperature has gone up or down.

## **Day and Night**

Play 3 full turns of the game to represent the day time. Then, night will occur. At night, the sun no longer warms the surface of the Earth, so the sun will not give any chips to the surface. The surface and atmosphere will give chips just as before. Notice, the surface of the Earth does cool during the night, but not nearly as much as it would without an atmosphere. This is called the *Greenhouse Effect*.

Play 3 full turns of night and then it become day again. Keep on playing until you notice a pattern.

## **Enhanced Greenhouse Effect**

Certain gasses such as carbon dioxide can make the greenhouse effect stronger. To model this, the layers of the atmosphere will transfer one extra chip to each cup every time they transfer. The upper and lower atmosphere will now use the right (revised) column of transfer number.

## **Summing Up**

This is a very simple model, but it captures the key elements of what a model is and does. And it can be made more complex.