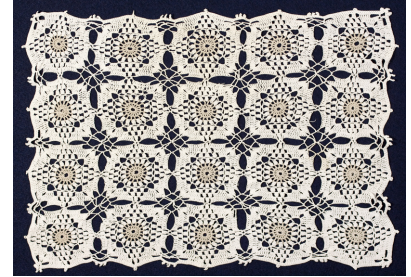# $\mathcal{L}aces$

We use the term *Lace* to describe a 2 dimensional LEGO® artifact that is *porous*, *connected*, but is not a curve. A lace can be created by repeating a special kind of pattern that we will call a *lace pattern*. The following algorithm describes how to create a lace.

> Step 1: Start with an $n \times n$ square and an initial LEGO® artifact. A good choice for the initial LEGO® artifact is a 1-bit brick. Next, form a *lace pattern* by placing the (initial) LEGO® artifact at various locations in the square. When designing your lace pattern be sure to leave some locations in the square empty (these locations will make up the porous part of the lace). The *lace pattern* you create in this step will provide a blue print for constructing larger and larger laces. The lace you produce in this step (Step 1) will be the LEGO® artifact used in Step 2.
>
> Step 2: Repeat the lace pattern using the LEGO® artifact produced in Step 1.
>
> Step 3: Repeat the lace pattern using the LEGO® artifact produced in Step 2, and so on.

Important: Laces grow exponentially in size. This means that you can quickly create a lace that is very large.

Example

In general, to define a lace all you need do is define (1) a *lace pattern*, and (2) an initial LEGO® artifact (which is usually a 1-bit brick). Below is an example of a lace definition involving a square whose size is 2×2.
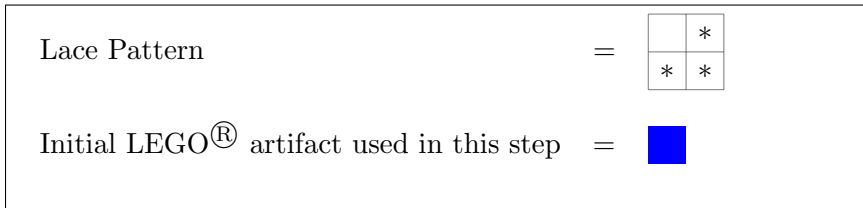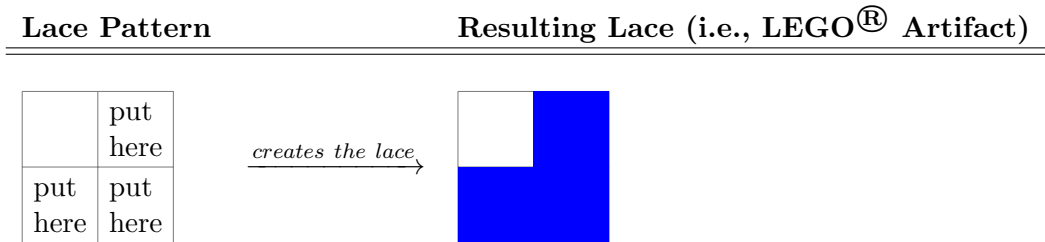
Lace Pattern	=
Initial LEGO® artifact	=

We will now show how to create a lace corresponding to this definition.

Step 1

Lace Pattern	$=$
Initial LEGO® artifact used in this step	$=$

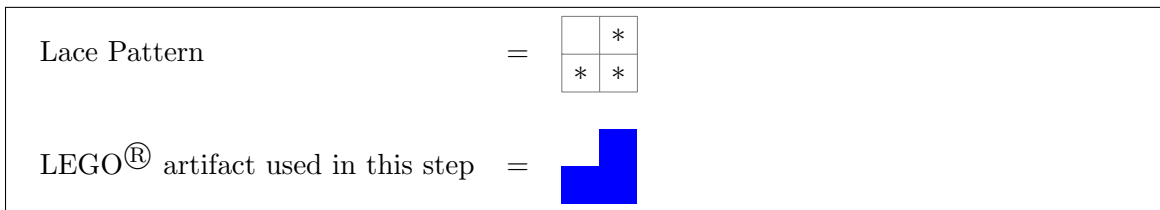In this example, our *lace pattern* is the shape of a "lower right corner". The LEGO® artifact produced in Step 1 (shown below) is created by placing our initial LEGO® artifact (i.e., in this case a 1-bit brick) in each of the cells containing the words *put here*.
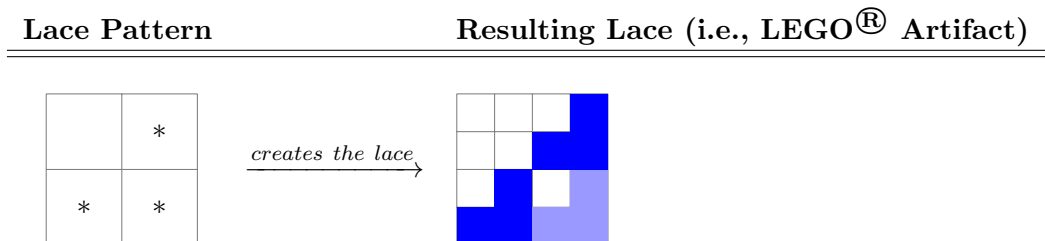
Lace Pattern	**Resulting Lace (i.e., LEGO® Artifact)**

creates the lace →

The lace shown above will be the the LEGO® artifact used to create the lace of step 2.

Step 2

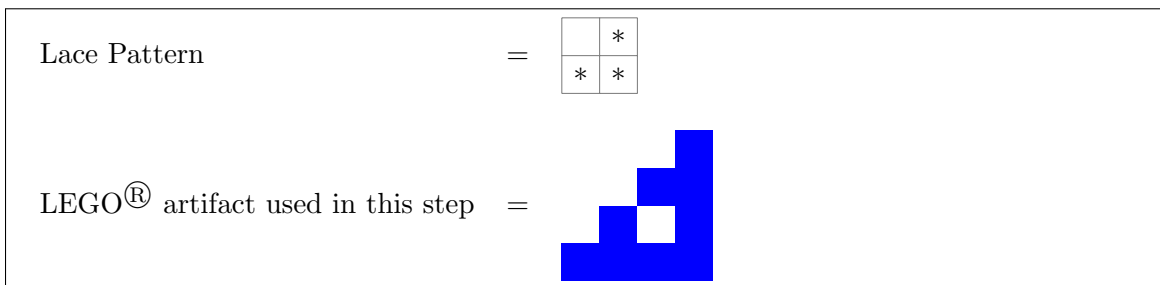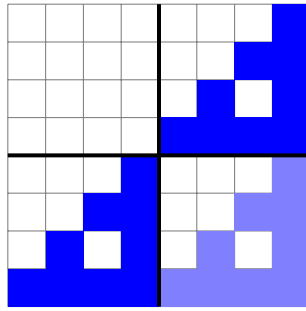|	
Lace Pattern	$=$
LEGO® artifact used in this step	$=$

The LEGO® artifact produced in Step 2 is created by placing the LEGO® artifact (produced in Step 1) in the "lower right corner" pattern (i.e., the lace pattern we are using in this example).

Lace Pattern	**Resulting Lace (i.e., LEGO® Artifact)**

creates the lace →

The resulting lace (shown above) will be the the LEGO® artifact used to create the lace of step 3.

Step 3

Lace Pattern	$=$
LEGO® artifact used in this step	$=$

The lace shown above will be the the LEGO® artifact used to create the lace of step 4, and so on.