Building Blocks
Engineering Our Community

STEM Activities for Kids Ages 10–13
Unit 1: Building a Model City

BOYS & GIRLS CLUBS
OF AMERICA

Activity 3: How do we create an engineering model?

Get Prepared

What kids will do: Learn about the concept of an engineering model and then build a scale model of their community

Time needed: Four 45-minute sessions (as needed to complete the 3D models)

What you will need:

Printouts	Materials	
• <u>Activity Sheet C: 3D City</u> • <u>Letter to the Editor Template</u> *(optional)*	• Samsung tablets • construction paper • pencils and markers • glue gun • craft materials (yarn, pipe cleaners, glitter, etc.)	• grid paper • cardboard • rulers • scissors • glue or tape • popsicle sticks and toothpicks
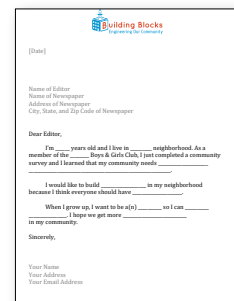
Connect With the Community *(optional)*:

After kids have completed Unit 1, they will have identified important needs in their community. Now you can give them a chance to have their voices heard! Wrap up the unit by helping them write letters to the editor of their local newspaper about their community's needs. After they've researched the address of their favorite local newspaper, download the <u>Letter to the Editor Template</u> to help them figure out what to say.

Note: Kids may use the activity sheet printouts or they may follow along on their tablets at: **www.scholastic.com/STEM**.

Introduce Them to STEM Careers   10 minutes

Session 1

Share this fun fact before having kids use the tablets to open the **STEM Career Flip Book**. *Did you know 20 percent of all jobs in the U.S. are in STEM fields? That's about 26 million jobs!**

Introduce the food scientist and the wildlife biologist from the science section in the **Flip Book**. Ask kids what they think food scientists and wildlife biologists do. If necessary, provide background with the following information:

- Food scientists study food to: make new food and flavors, invent foods for astronauts and soldiers, research ways to package food to keep it from going bad, and test foods for vitamins and minerals, as well as germs.

- Wildlife biologists study wild animals and their ecosystems to: find out how they interact with other species and the environment, find out how their health helps the planet and human survival, and protect wildlife species.

After the discussion, explain that you will continue to discuss careers from the **STEM Career Flip Book** on future days.

*National Math + Science Initiative

Engineering in the Community   10 minutes

Show kids an image of an architectural model on your tablet, using the following link: http://architecturalmodels.tumblr.com. Then ask:

- *What is a model?* (A 3D representation, usually done on a small scale, of an object or structure.)

- *Why do you think models are important to engineers?* (They help them show others how an engineering project will look, and function in the communities where the projects will be built.)

- *What do engineers have to consider before building a model?* (How large the real-life structure will be and how the real-life structure compares to the size of the model; in determining the size of the model, engineers will consider the area of the space where the real-life structure will be built, the scale they will use to build the model, the structures and terrain that will surround the structure, as well as the building materials that will be used to build the structure.)

Building Blocks
Engineering Our Community

STEM Activities for Kids Ages 10–13
Unit 1: Building a Model City

BOYS & GIRLS CLUBS
OF AMERICA

Activity 3: How do we create an engineering model? (continued)

Use the Tablets! 25 minutes

1. Have kids break off into their design teams. Hand out <u>Activity Sheet C: 3D City</u>. Kids will now get the chance to build a 3D model of their community.

2. Explain that they will start by determining the area of their model. Ask teams to use their tablets to view their neighborhoods on **Google Maps**. They should select an area that's no more than two blocks by two blocks. Have them write down the street names that will border their models on the activity sheet.

3. Finally, teams will draw in the buildings, parks, and other structures that will make up their models on graph paper. Remind them they can use both **Google Maps** and **Google Earth** to get an idea of what they should include.

4. Now that they have mapped out their models, have teams use the activity sheet to consider the scale of their models' structures. If they need computing help, have them use the **Calculator app** on the tablet.

5. When this planning session is complete, make sure to hold on to the teams' sketches and scale charts. They'll need them for the next session.

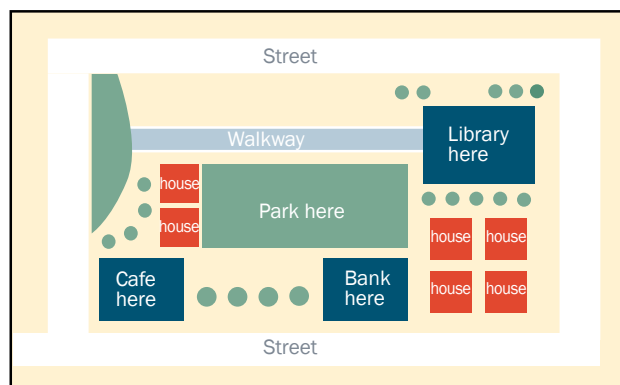### STEM Challenge! Three 45-minute sessions

Session 2

1. Now that kids have used the first session to plan out their models, they are ready to build! Pass out large pieces of cardboard for kids to use as the bases for their models. Allow teams to decide how large they would like their models to be. Then circulate among the teams as they cut the cardboard to their desired foundation size.

2. Instruct kids to draw in the streets, buildings, and other structures they will include in their models. This will be a flat plan where they will place all the structures and elements that will be included in their models. This is their opportunity to sketch in the shapes and decide where to place all the items they will build. Please refer to the illustration on the right for a visual example of a foundation.

Sessions 3 and 4

During the final sessions of this activity, kids will build the buildings, trees, and other structures that will make up their models. Explain that this project will require them to think creatively about how to make the structures in their models.

Provide them with different construction options. For example, they can use popsicle sticks or toothpicks to build the shape and structure of houses and other buildings. Once the structures are complete, they can cover them with paper to serve as walls and roofs. Another option is to fold paper into long rectangular shapes to make taller buildings. Remind them to use all the materials they have access to.

As kids work, evaluate whether they are on track and provide feedback on the construction of their models. Answer any questions teams may have if they become stuck and encourage them to revise their models as needed. Depending on how quickly kids completed session 2, they may only need one session (session 3) to complete their models. If you find your kids need an additional day to put the finishing touches on their models, provide them with more time so that they will have models they can be proud of.

BOYS & GIRLS CLUBS
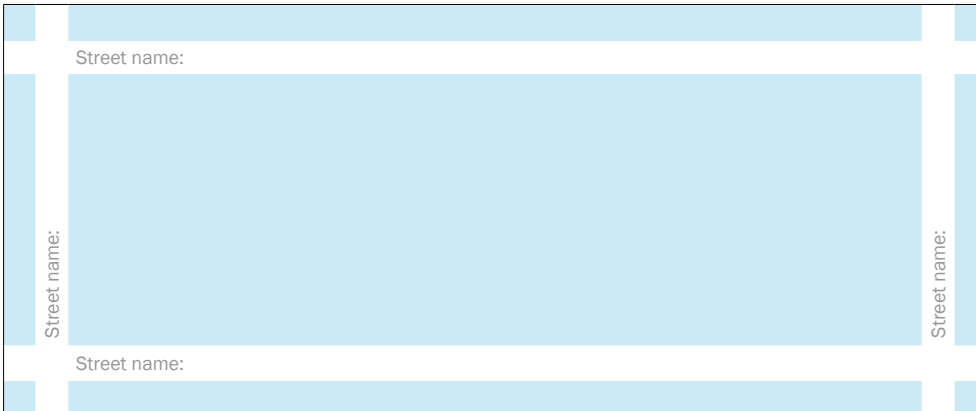OF AMERICA

TEAM NAME: _____

3D City

Maps are very useful, but the view they show of the world can fall, well, flat. Engineers draw their ideas, then build 3D models of their sketches. This allows them to see what their designs will look like in real life.
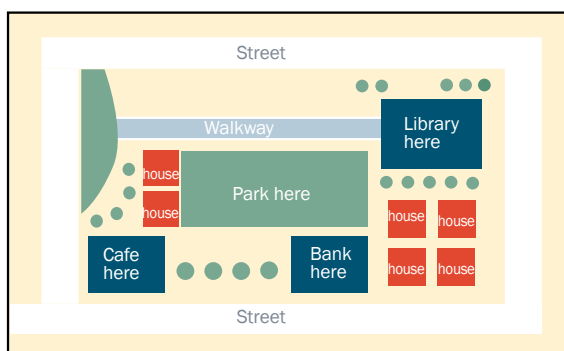
You've mapped out your neighborhood, so why not bring that 2D world off the paper? Follow the step-by-step instructions below to build a 3D model of your community.

Session 1: Planning the Model

Step 1: Choose Your Area: Choose whether you'd like to build a whole city block or just the front of one block.

Street name: _____

Street name: _____

Street name: _____

Street name: _____

Step 2: Map Out Your Model: Use the space above to draw in the streets, building lots, parks, and other features you will include on your model.

Street
Walkway
Library here
house
house
Park here
house house
Cafe here
Bank here
house house
Street

Step 3: Consider the Scale: You want structures in your neighborhood to be proportional to those in real life. Decide the appropriate size of the houses, trees, and other structures in your neighborhood. Select dimensions for those items and write them in the chart below.

	Height	Length	Width
Houses			
Trees			
Other Structures			

Session 2: Drafting the Model

Create Your Foundation: Cut a piece of cardboard to the size you'd like to have for your model. Then use your model sketch as a guide to draw in the streets, buildings, and other structures you will include in your model.

Session 3: Building the Model

Build the Block: To build your neighborhood, cut pieces of cardboard and tape or glue them together to shape buildings' walls and roofs. Think about structures like bridges or water towers. How can you build your city out of the materials at hand? Add finishing touches to make your 3D model more realistic. For example, show grass or parks by coloring these areas green or by covering them with a piece of green construction paper.