

# DIY



BOYS & GIRLS CLUBS  
OF AMERICA

# STEM

# #2

## WEEKLY ACTIVITY GUIDES: ENGINEERING DESIGN

You've been a natural engineer since you were born – most likely you were building and knocking down block towers when you were small. Hands-on, project-based learning is the essence of engineering. This week, you'll be building bridges, towers and fidget spinners. You'll also be learning from books and coding on the computer.

### ABOUT THE DIY STEM PROGRAM

DIY STEM is a program supported by Samsung as part of a shared commitment with Boys & Girls Clubs of America to inspire the next generation in science, technology, engineering, and math.

# SAMSUNG

Participate this summer by sharing photos of your experiments on social media **#STEM**



No matter your age, please enjoy conducting these experiments under the supervision of a responsible adult.

### MONDAY: MAKE YOUR OWN FIDGET SPINNER

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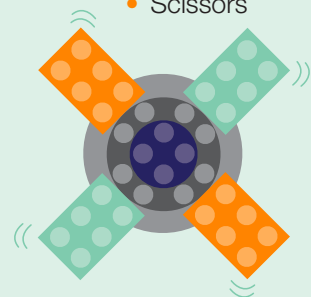
#### MATERIALS:

##### LEGO FIDGET SPINNER: (all materials are Legos)

- 4x4 round plates (2)
- 6x6 round plate
- 2x2 round tiles (2)
- 2x2 round tile (with X shaped hole)
- Axle (3 studs long with stud at the end)
- 2x3 plates (8)
- 2x3 plates (4)

##### CARDBOARD FIDGET SPINNER:

- Cardboard
- Toothpick
- Penny (2)
- Glue stick
- Strong PVA glue
- Pin
- Scissors

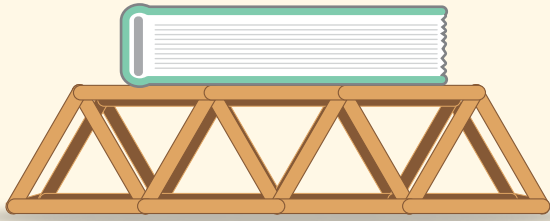


#### LEARNING OPPORTUNITY:

What other materials could you use to build your own fidget spinner? Use things you find around your house – try pennies, zipties, paracord, nuts and bolts or anything in your recycling bin.

## TUESDAY: BUILD A POPSICLE BRIDGE

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### MATERIALS:

- 200 Popsicle sticks
- 1 lb. and 5 lb. weights (or everyday objects like a book or can of green beans)
- Craft glue
- Glue gun



### LEARNING OPPORTUNITY:

If your bridge did not hold the 1 lbs. or 5 lbs. weight, what flaws did you notice in your design?

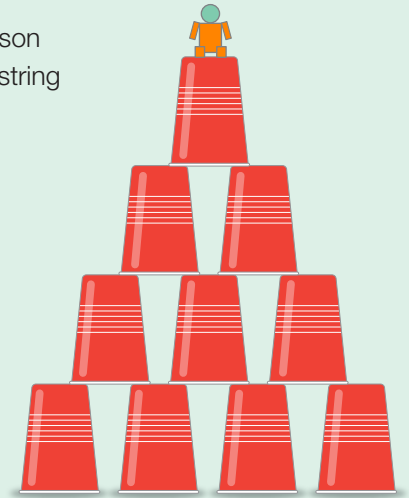
What are some of the changes that you made to your original bridge design to strengthen it?

## WEDNESDAY: MAKE A TOWER

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### MATERIALS:

- 10 plastic cups
- 2 straws per person
- 1 – 2ft length of string per person
- 1 rubber band per person
- 1 Lego figure per team



### LEARNING OPPORTUNITY:

After you make your tower, remove a tool or a handicap and try building it again.

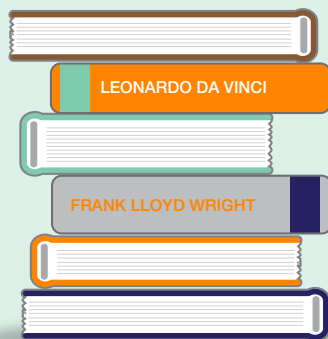
## THURSDAY: READ ABOUT FAMOUS ENGINEERS

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### MATERIALS:

FIND BOOKS AND READ ABOUT...

- Alexandre Gustave Eiffel
- Frank Lloyd Wright
- Joseph Strauss
- Leonardo Da Vinci
- Montgolfier brothers: Joseph-Michel and Jacques-Étienne



### LEARNING OPPORTUNITY:

Share stories about the engineers you read about with a friend or a family member. Tell them three things that you thought were cool!

## FRIDAY: GET AN HOUR OF CODE

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### MATERIALS:

- Computer with internet access



### LEARNING OPPORTUNITY:

Commit to doing an hour of code every week this summer. Or invite a friend over and enjoy an hour of code together.

## WEEKLY ACTIVITY GUIDES: ENGINEERING DESIGN

*You've been a natural engineer since you were born – most likely you were building and knocking down block towers when you were small. Hands-on, project-based learning is the essence of engineering. This week, you'll be building bridges, towers and fidget spinners. You'll also be learning from books and coding on the computer.*

### Monday: Make your own Fidget Spinner

#### Materials for Lego Fidget Spinner:

- 4x4 round plates (2)
- 6x6 round plate
- 2x2 round tiles (2)
- 2x2 round tile (with X shaped hole)
- Axle (3 studs long with stud at the end)
- 2x3 plates (8)
- 2x3 plates (4)

#### Build Your Own Lego Fidget Spinner

1. Put your 4x4 round plates on both the top and bottom of your 6x6 round plate.
2. Slide one of your 2x2 round tiles onto your axle.
3. Place your 6x6 round plate on the axle.
4. Add your other 2x2 round tiles to the axle and attach it to the 4x4 round plate.
5. Slide your 2x2 round tile (with an X shaped hole) onto the top of your axle. Make sure to leave space so the spinner is free to spin.
6. Make four arms surrounding the spinner
  - a. Place a 2x3 plate under the 6x6 round plate

- b. Place a 2x2 plate on top of the 2x3 plate
- c. Place a 2x3 plate on top of the 2x2 plate and connect to the 6x6 round plate
- d. Repeat around the spinner

7. Place your fingers on the axle and spin!

#### Materials for Cardboard Fidget Spinner:

- Cardboard
- Toothpick
- Penny (2)
- Glue stick
- Strong PVA glue
- Pin
- Scissors

#### Build Your Own Cardboard Fidget Spinner

1. Use your scissors to cut a piece of cardboard into the shape of a fidget spinner.
2. Stick a pin in the center of your fidget spinner.
3. Use your scissors to make the pin hole slightly larger.
4. Use your strong glue to glue the pennies onto both sides of the fidget spinner.
5. Cut two small circles out of cardboard and put them on the top and bottom centers of the spinner.
6. Put a toothpick through the circles and put a small dab of strong glue to adhere the toothpick to the circle on both sides. (You still want the spinner between to be free to spin. So be careful with the glue.)
7. Cut the remainder of the toothpick and your fidget spinner is ready to go!

## Tuesday: Build a Popsicle Bridge

### Materials:

- 200 Popsicle sticks
- Craft glue
- Glue gun
- 1 lb. and 5 lb. weights (or everyday objects like a book or can of green beans)

### Build a Popsicle Bridge

1. Familiarize yourself with the types of bridges by checking out our infographic. (LINK)
2. The goal is to design and build a bridge that will hold one- to five-pound weights.
3. Use the materials given to make your bridge. The bridge must span at least 14 inches. When the bridge is constructed, place it at least 1 foot above the floor (in between two chairs, for example) and test it with a weight for structural integrity.
4. Before you start building, develop a plan for your bridge.
5. Begin to construct the bridge based on your plans. Be sure to evaluate your design as you build and, if necessary, start over or make modifications.

## Wednesday: Make A Tower

### Materials:

- 10 Plastic cups
- 2 straws per person
- 1 – 2ft length of string per person
- 1 rubber band per person
- 1 Lego figure per team

### Stack the Cups (Without Touching Them)

1. Without using your hands, make a pyramid with your cups and put the Lego Figure on the top.
2. You can lift cups with straws or tie the strings to cups and lift them up while holding the two ends.

## Thursday: Read About Famous Engineers

### Visit your local library or your favorite bookstore and search for books about these famous engineers:

- Alexandre Gustave Eiffel
- Frank Lloyd Wright
- Joseph Strauss
- Leonardo Da Vinci
- Montgolfier brothers:  
Joseph-Michel and Jacques-Étienne

### Eiffel

- **Check out some books on Amazon:** [https://www.amazon.com/Where-Eiffel-Tower-Dina-Anastasio/dp/0451533844/ref=sr\\_1\\_fkmr2\\_1?ie=UTF8&qid=1528296303&sr=8-1-fkmr2&keywords=Alexandre-Gustave+Eiffel+books](https://www.amazon.com/Where-Eiffel-Tower-Dina-Anastasio/dp/0451533844/ref=sr_1_fkmr2_1?ie=UTF8&qid=1528296303&sr=8-1-fkmr2&keywords=Alexandre-Gustave+Eiffel+books)

### Wright

- **Check out some books on Amazon:** [https://www.amazon.com/Frank-Lloyd-Wright-Surprising-Stories/dp/0615830137/ref=sr\\_1\\_5?s=books&ie=UTF8&qid=1528296932&sr=1-5&keywords=frank+lloyd+wright+books&refinements=p\\_n\\_feature\\_eighteen\\_browse-bin%3A8622846011](https://www.amazon.com/Frank-Lloyd-Wright-Surprising-Stories/dp/0615830137/ref=sr_1_5?s=books&ie=UTF8&qid=1528296932&sr=1-5&keywords=frank+lloyd+wright+books&refinements=p_n_feature_eighteen_browse-bin%3A8622846011)

### Strauss

- **Check out some books on Amazon:** [https://www.amazon.com/Building-Golden-Gate-Bridge-Interactive/dp/1491404035/ref=sr\\_1\\_4?s=books&ie=UTF8&qid=1528297172&sr=1-4&keywords=golden+gate+bridge+books](https://www.amazon.com/Building-Golden-Gate-Bridge-Interactive/dp/1491404035/ref=sr_1_4?s=books&ie=UTF8&qid=1528297172&sr=1-4&keywords=golden+gate+bridge+books)

### Da Vinci

- **Check out some books on Amazon:** [https://www.amazon.com/Who-Leonardo-Vinci-Roberta-Edwards/dp/0448443015/ref=sr\\_1\\_1?s=books&ie=UTF8&qid=1528300866&sr=1-1&keywords=leonardo+da+vinci+for+kids](https://www.amazon.com/Who-Leonardo-Vinci-Roberta-Edwards/dp/0448443015/ref=sr_1_1?s=books&ie=UTF8&qid=1528300866&sr=1-1&keywords=leonardo+da+vinci+for+kids)  
[https://www.amazon.com/Leonardo-Vinci-Giants-Science-Kathleen/dp/0142408212/ref=sr\\_1\\_13?s=books&ie=UTF8&qid=1528301309&sr=1-13&keywords=leonardo+da+vinci+books](https://www.amazon.com/Leonardo-Vinci-Giants-Science-Kathleen/dp/0142408212/ref=sr_1_13?s=books&ie=UTF8&qid=1528301309&sr=1-13&keywords=leonardo+da+vinci+books)

## **Montgolfier Brothers**

- **Check out some books on Amazon:** [https://www.amazon.com/Early-History-Ballooning-Age-Aeronaut/dp/1473320860/ref=sr\\_1\\_8?s=books&ie=UTF8&qid=1528301545&sr=1-8&keywords=montgolfier+book](https://www.amazon.com/Early-History-Ballooning-Age-Aeronaut/dp/1473320860/ref=sr_1_8?s=books&ie=UTF8&qid=1528301545&sr=1-8&keywords=montgolfier+book)

## **Friday: Get an Hour of Code**

### **Materials:**

- Computer with internet access
1. Visit <https://hourofcode.com/us/learn> and choose your grade.
  2. Go through the filters on the left-hand side, like topic and length of activity.
  3. Click an activity that interests you and press “start.”