

GSK Science in the Summer™

In partnership with The Franklin Institute

Be an Engineer!

LAB NOTEBOOK

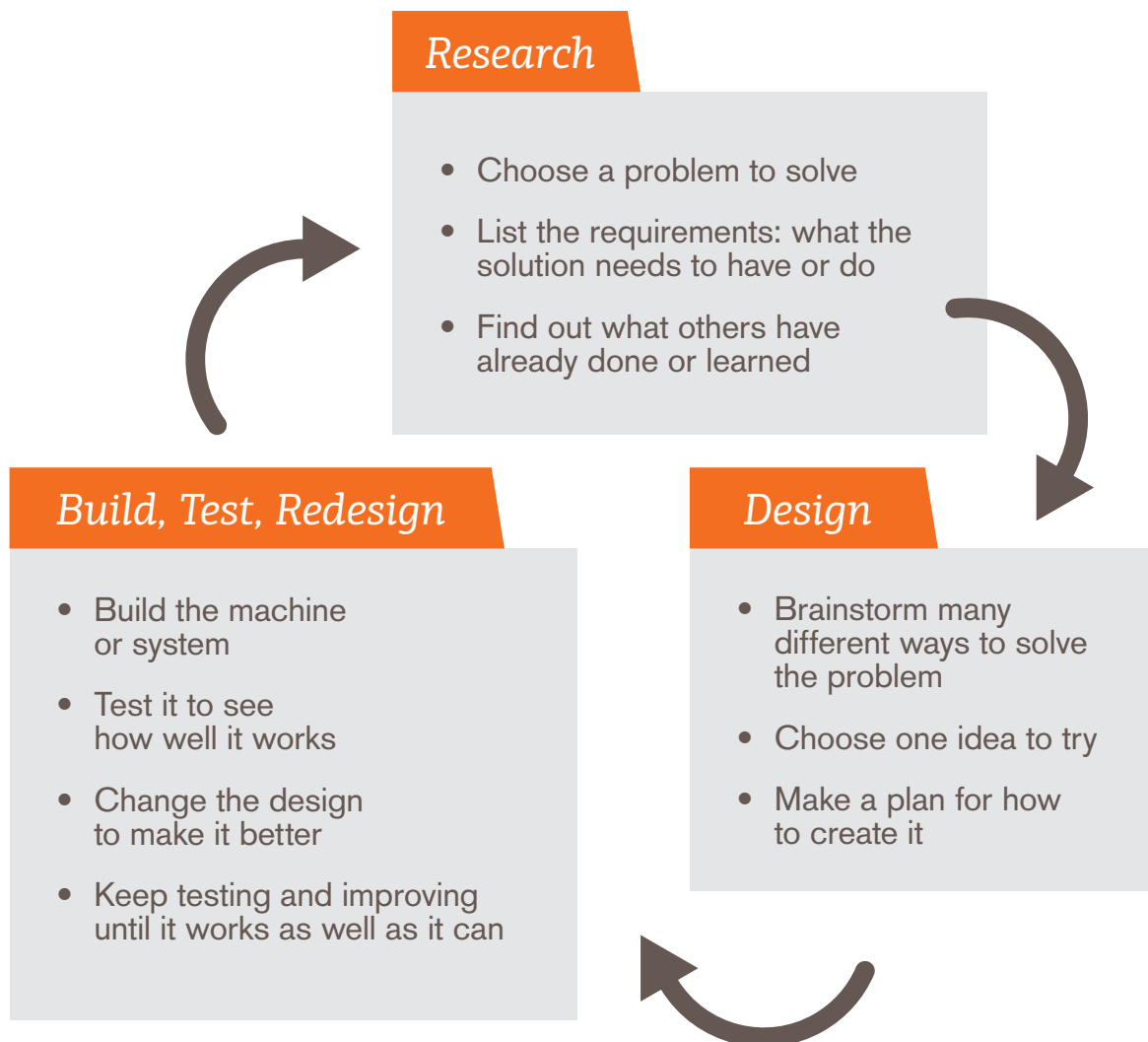
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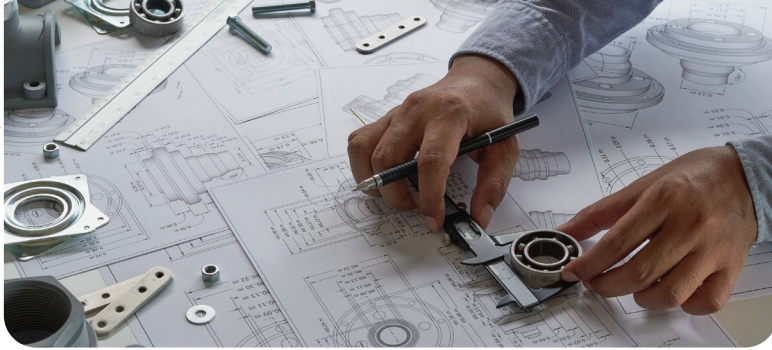
*Use this notebook to take notes, record your discoveries,
and try new experiments at home.*

*What can
you create with*
ENGINEERING
?

Engineers design machines, objects, or systems to solve problems.

Engineering Design Process



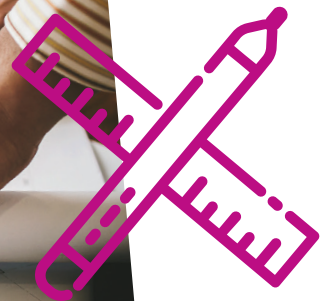


Think Like an Engineer

- **Make a difference.** Look for ideas and solutions that will help make people's lives easier or better.
- **Be optimistic.** There's always a way to make something better, even if no one has found it yet.
- **Be creative.** Sometimes the wildest idea turns out to be the best one!
- **Keep trying.** Learn from things that don't work—even the second, tenth, or hundredth time.
- **Notice connections.** Pay attention to how different parts of a system work together. How do they affect each other?
- **Work together.** Sharing ideas makes it easier to find the best solution.



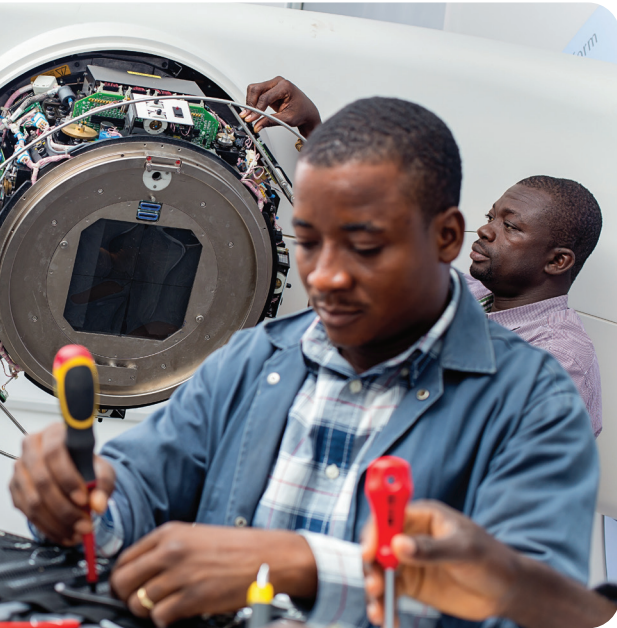
Engineering
is more than
what you do—
it's **how you**
think.



Biomedical Engineer

Biomedical engineers use engineering skills and ideas to solve problems relating to people's health.

They might design new medical tools, create devices for people with disabilities, or make apps to help people.



RESEARCH: Requirements

What does your tool need to have and do?

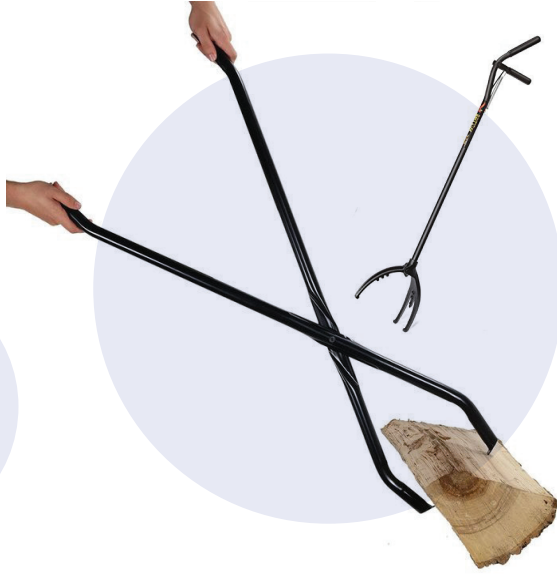


Your project:

Design a **reaching tool** to help someone with limited movement pick up a piece of paper.

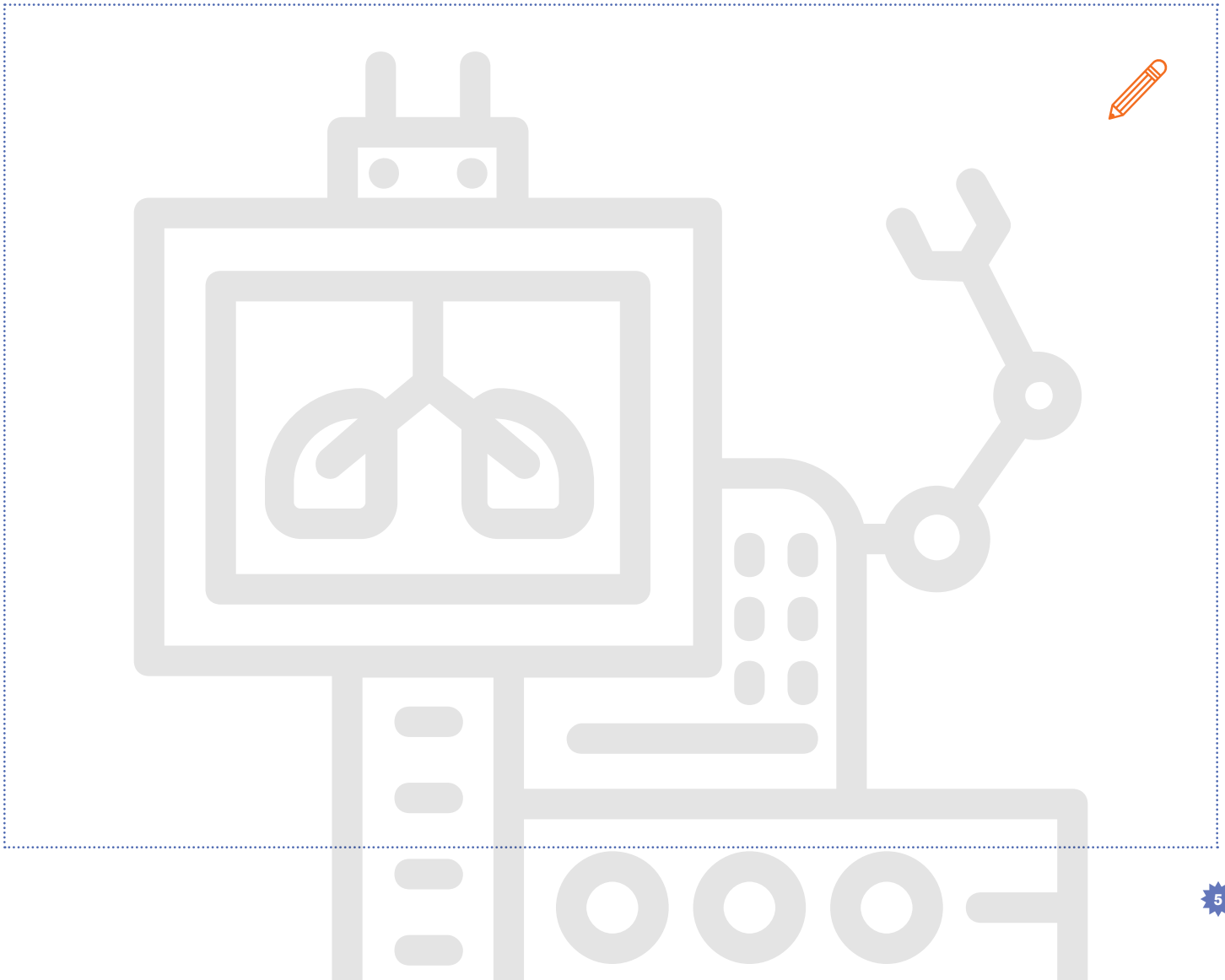


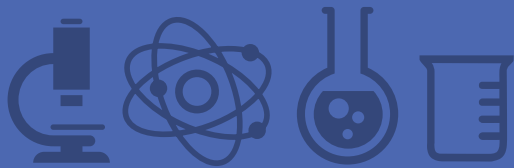
Examples



DESIGN: Brainstorm

Write or draw different ideas for your reaching tool.





DESIGN: Plan

Write or draw a plan for which idea you will try first.



BUILD, TEST, REDESIGN

Make notes about what you try, what happens, and how you change your design.



REFLECT

How were you like a biomedical engineer?



KEEP EXPLORING!

What could make the reaching tool even more helpful for your customer?

- Straps to fasten it to their arm?
- Better gripping material on the end?

Add more features to your tool to improve the design.

PLACE
STICKERS
HERE

What
skills
did you
practice?

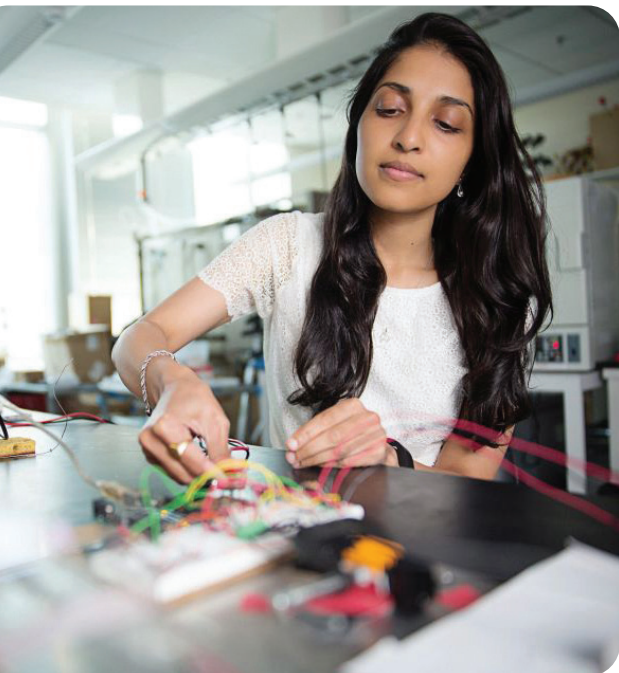
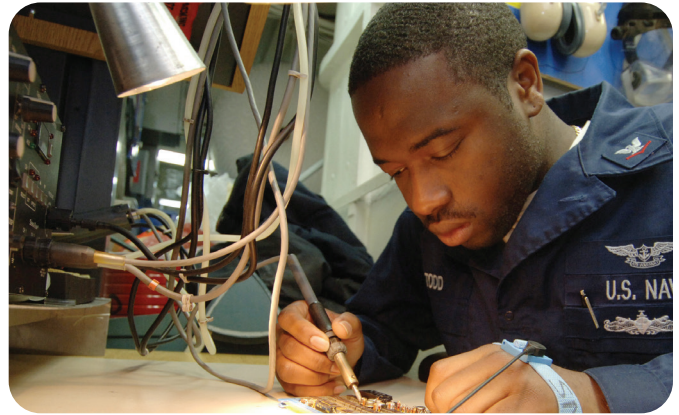
PLACE
STICKERS
HERE



Electrical Engineer

Electrical engineers solve problems that involve electricity.

They might create electronic systems for satellites or robots, design the power plants that deliver electricity to people's homes, or improve the microchips that power computers and mobile phones.



RESEARCH: Requirements

What does your switch need to have and do?



Your project:

Improve the buzzer's switch so it can be turned on and off more easily.



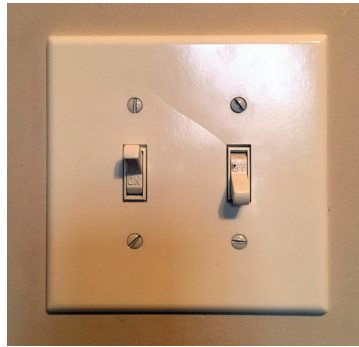
ELECTRICAL CIRCUIT

BUZZER



BATTERY

SWITCH



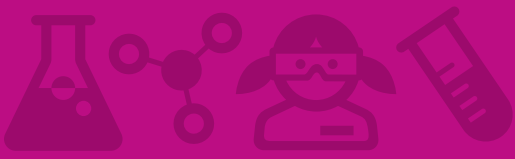
Examples



DESIGN: Brainstorm

Write or draw different ideas for your switch.





DESIGN: Plan

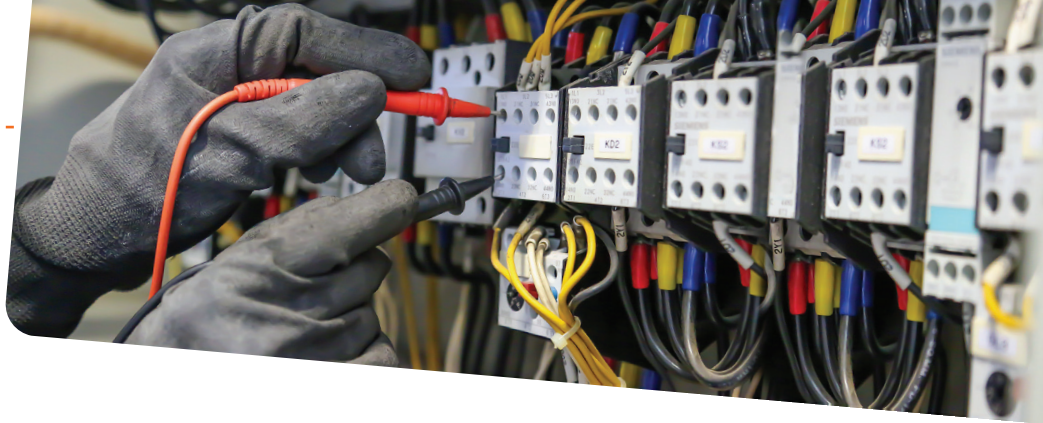
Write or draw a plan for which idea you will try first.



BUILD, TEST, REDESIGN

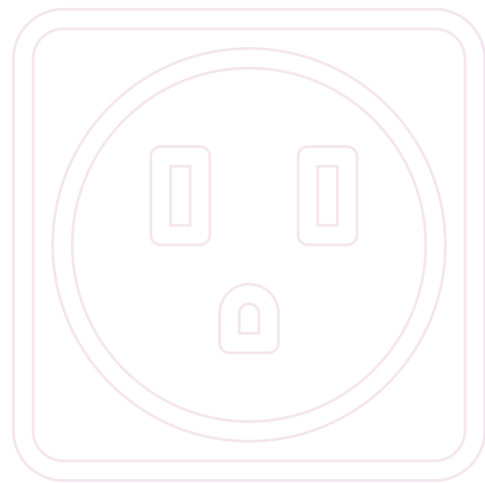
Make notes about what you try, what happens, and how you change your design.





REFLECT

How were you like an electrical engineer?



KEEP EXPLORING!

What other devices can you imagine that could use a buzzer circuit?

- A box that sounds an alarm when the lid is opened?
- A board game that buzzes when a player loses?

Use your circuit materials to design a different kind of buzzing device.



Environmental Engineer

Environmental engineers solve problems to protect air, water, soil, and people.

They might make devices to test air pollution, design a city's drinking water system, or find new ways to remove harmful chemicals from the soil.



RESEARCH: Requirements

What does your system need to have and do?



Your project:

Design a **stormwater system** to keep rain from flooding a playground.



RESEARCH: Rain Patterns

Where does the water go in your landscape?



DESIGN: Brainstorm

Write or draw different ideas for your stormwater system.



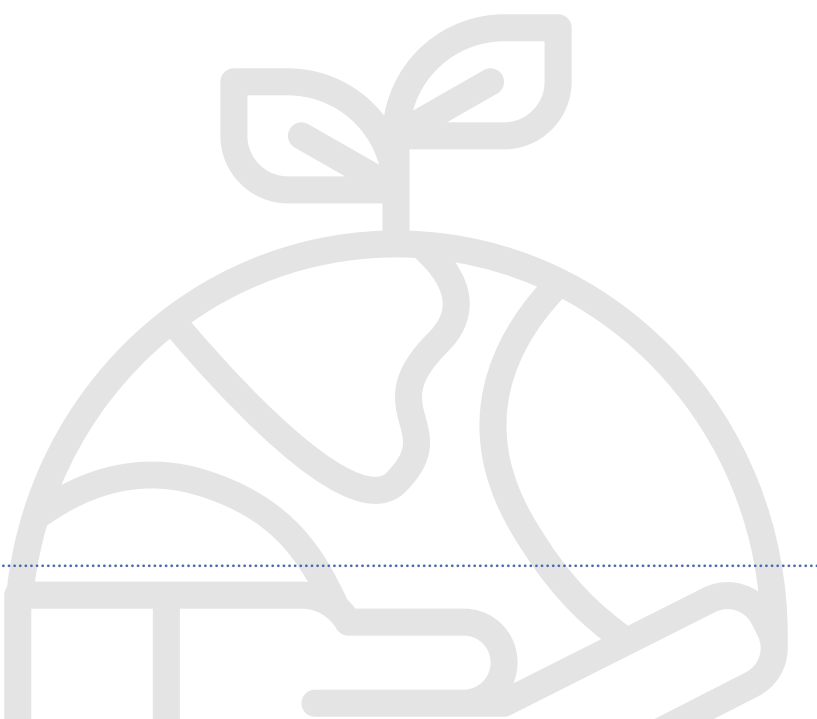


DESIGN: Plan

Write or draw a plan for which idea you will try first.

BUILD, TEST, REDESIGN

Make notes about what you try, what happens, and how you change your design.





REFLECT

How were you like an environmental engineer?



KEEP EXPLORING!

How would your stormwater system work on a different landscape?

Change your model landscape by making the paint tray steeper or flatter, or by making the surface bumpier with clay, aluminum foil, or plastic bags.

How does rainwater flow on the new landscape?
How can you change your stormwater system to work best for the new landscape?



Structural Engineer

Structural engineers solve problems to make sure buildings, bridges, and other structures are safe and stable.

They might design skyscrapers to survive strong winds, test bridge plans to make sure they are strong enough to hold cars, or study the strength of different kinds of building materials.

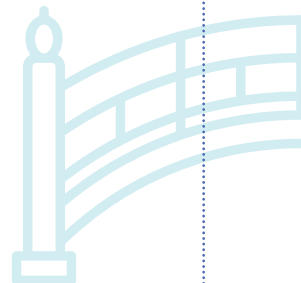


RESEARCH: Requirements

What does your bridge need to have and do?

Your project:

Design a **strong bridge** for a hiking trail, using as little material as possible.

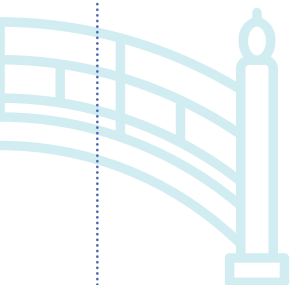
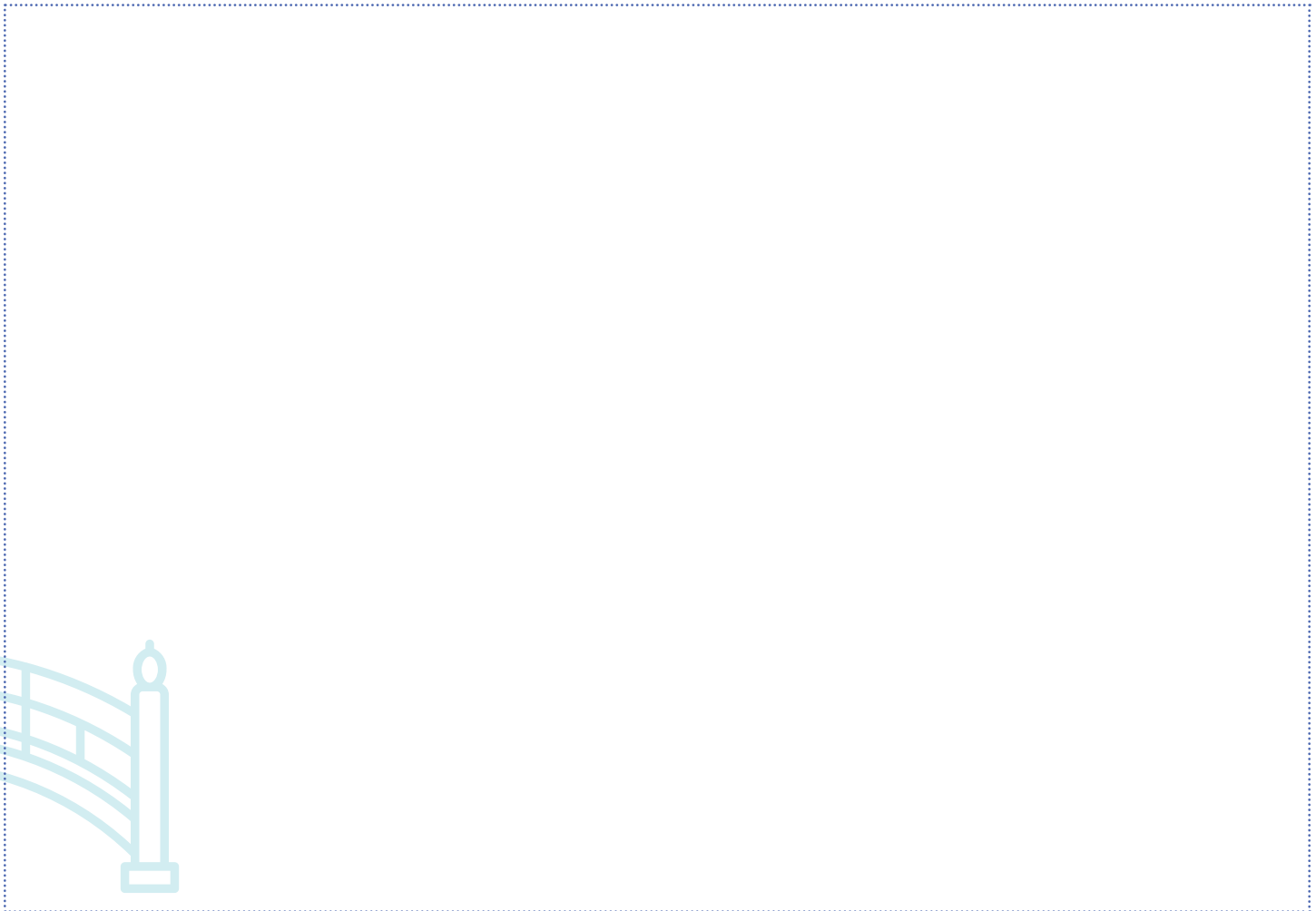


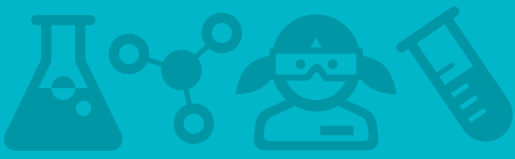
RESEARCH: Bridge Shapes

Shape	Number of Washers	Notes

DESIGN: Brainstorm

Write or draw different ideas for your bridge.





DESIGN: Plan

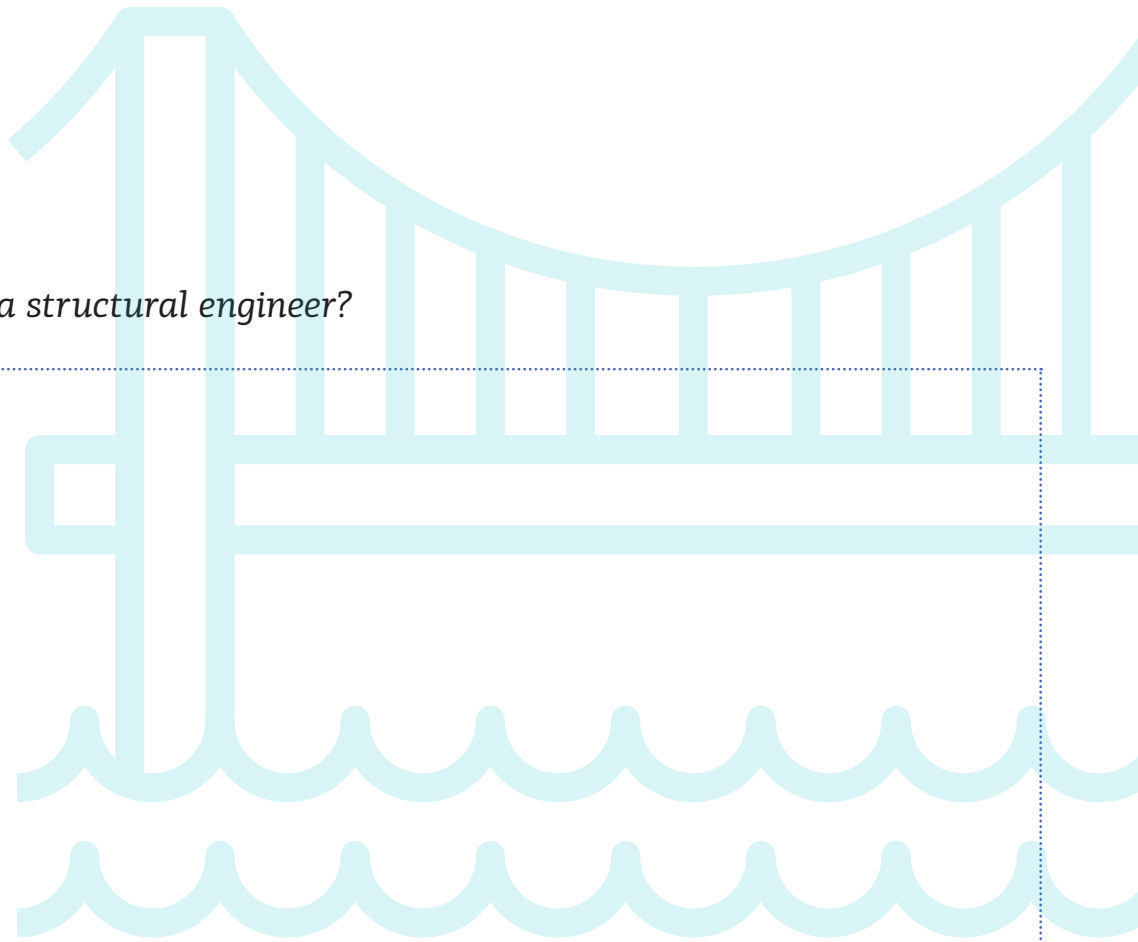
Write or draw a plan for which idea you will try first.

BUILD, TEST, REDESIGN

Make notes about what you try, what happens, and how you change your design.

REFLECT

How were you like a structural engineer?



KEEP EXPLORING!

Will your bridge design work for a wider river? Move your “riverbanks” twice as far apart and design a strong bridge that reaches across them.

Test other lightweight building materials like aluminum foil, paper towel, or construction paper. Do they behave the same way as the paper? How can you build a strong bridge from each of these materials?

PLACE
STICKERS
HERE

What
skills did you
practice?

PLACE
STICKERS
HERE



RESOURCES



WEBSITES:

GSK

Be an Engineer – scienceinthesummer.fi.edu/be-an-engineer

Official website for 2021 GSK Science in the Summer™

Science in the Summer – scienceinthesummer.fi.edu

Learn about the national GSK Science in the Summer™ program, locations, and resources.

The Franklin Institute

fi.edu Learn about The Franklin Institute science museum, programs and resources.

fi.edu/franklin-at-home *frankin@home* STEM activities and videos

Institute of Electrical and Electronics Engineers (IEEE) – tryengineering.org

Resources for adults and students

PBS Kids – pbskids.org/designsquad

Videos, design challenges, and games

STEM Challenges - jamesdysonfoundation.co.uk/resources/challenge-cards.html

STEM challenges, activities, and more!

BOOKS:

Izzy Gizmo by Pip Jones

Rosie Revere, Engineer by Andrea Beaty

Iggly Peck, Architect by Andrea Beaty

The Most Magnificent Thing by Ashley Spires

The Boy Who Harnessed the Wind by William Kwamkwamba & Bryan Mealer

Engineered!: Engineering Design at Work by Shannon Hunt

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