

DESIGNER'S NOTEBOOK

BRAINSTORM | TEST | CREATE

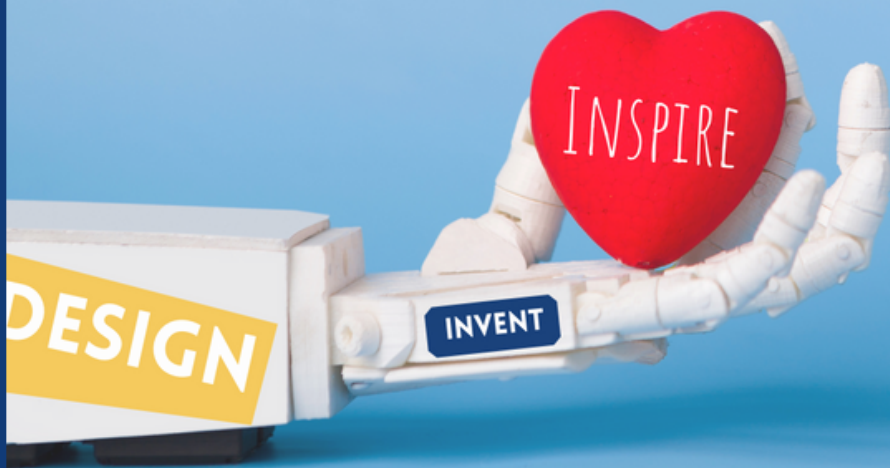
NAME: _____



STEM WEEK

2022

ONLINE & IN-PERSON
MAY 14-22



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MAKE-IT MONDAY

TODAY'S CHALLENGE: MAKE A LUTE

AGE GROUP: ALL AGES!

CHALLENGE

Lutes are instruments you can use to make music with vibrating strings. They are all around us and on every continent. Design your own to strum and pluck!

MATERIALS

- Cardboard box
- Paper roll or cardboard
- Rubber bands or elastic
- Duct tape
- Scissors
- (Use what you have!)



ENGINEERING DESIGN PROCESS

Use the Engineering Design Process to build your lute.

- **Define**-What needs to be accomplished and what tools or materials do you have available?
- **Brainstorm**- What are your ideas for meeting the criteria of the challenge?
- **Plan**- Draw and discuss your design.
- **Make it and Test it!** How did it go? What improvements can you make to improve the lute's sound or strength?

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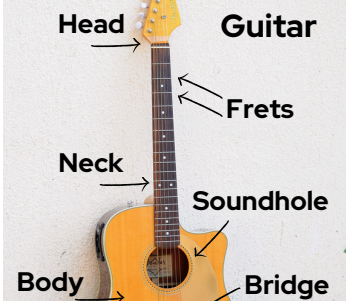
Mandolin



Banjo



Ukulele



QUESTIONS TO THINK ABOUT

- What design changes lead to different sounds?
- How do you make a louder sound?
- How do you make a lower or higher sound?

LEARN MORE!

- How is sound made? [What is Sound](#) (video)
- Look and listen to string instruments from around the world - [String instruments for kids](#) (video)

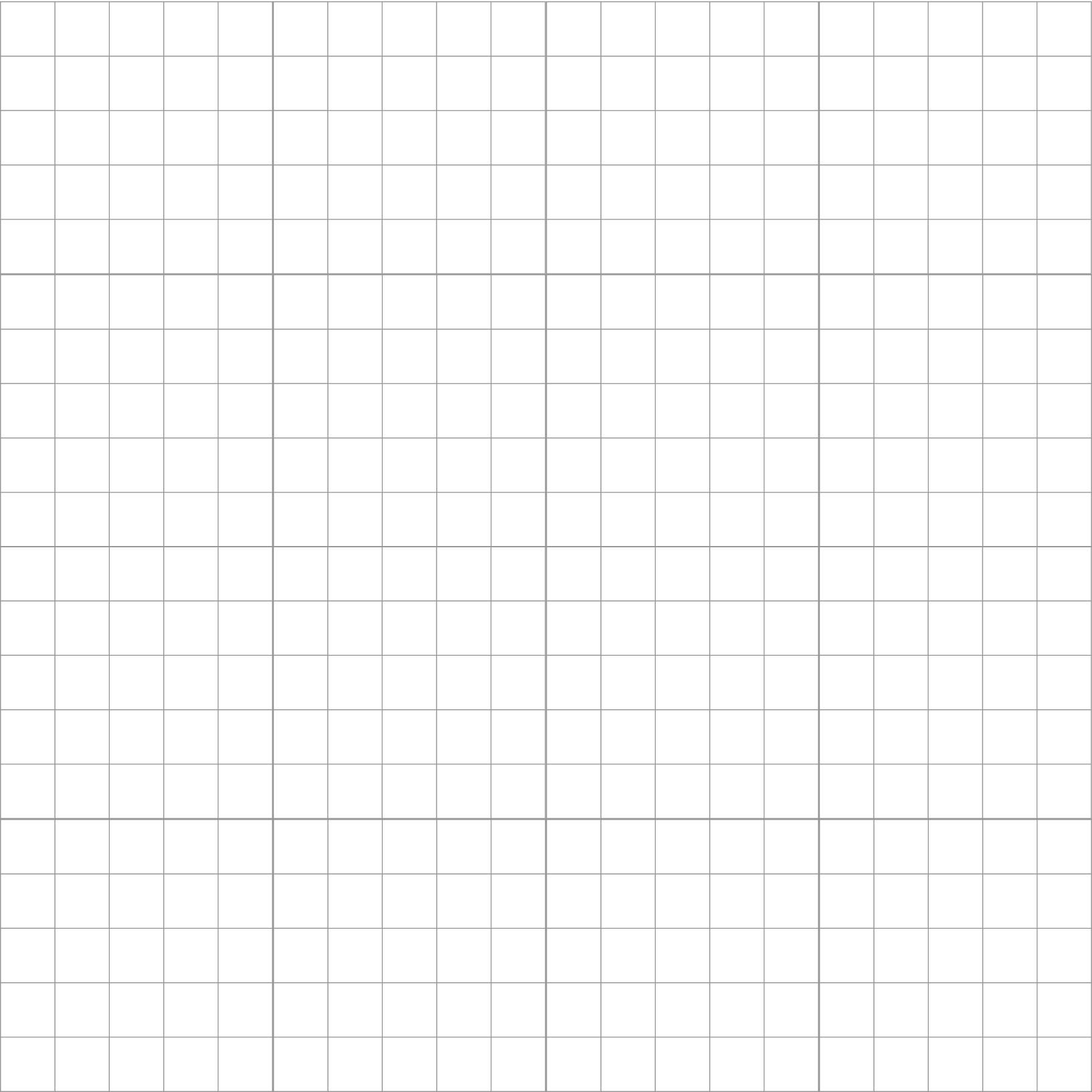


MAKE-IT MONDAY

TODAY'S CHALLENGE: MAKE A LUTE

AGE GROUP: ALL AGES!

Plan - Draw your design



TAKE-IT-APART TUESDAY

TODAY'S CHALLENGE: NATURE DISSECTION

AGE GROUP: ALL AGES!

CHALLENGE

Collect an item from nature—maybe a leaf, flower, bug or pinecone. Carefully dissect your item and look closely at its parts.

- What do you see, notice or wonder?
- Can you label or name each part?
- What happens when you place each part in water?

MATERIALS

- Collection Container—recycled container, box or tub
- Basic Tools—tweezers, scissors, magnifying glass, magnet
- Tape, glue or string
- Paper, pencil, markers/crayons
- Cup or bucket

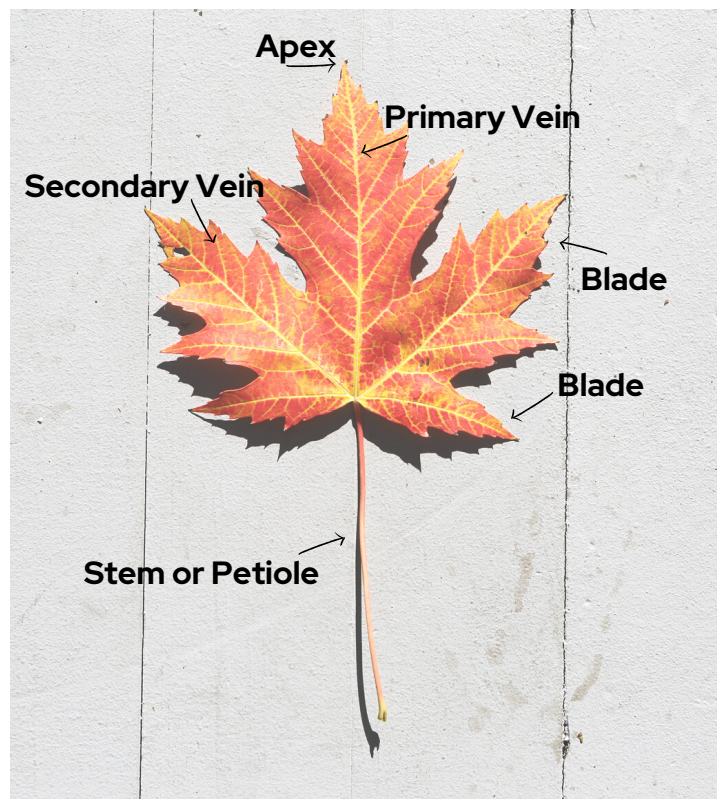
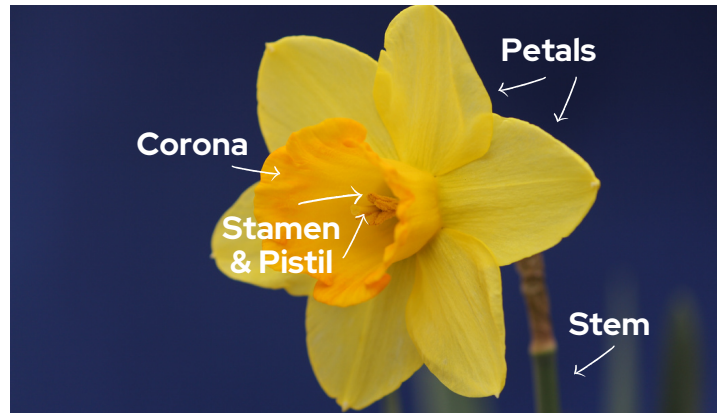
NEXT STEPS

Create something new with the individual parts!
Can you turn the individual nature parts into a new work of art? Use glue, tape, string or paper to make something new!

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TAKE-IT-APART TUESDAY

TODAY'S CHALLENGE: NATURE DISSECTION

AGE GROUP: ALL AGES!

Draw and Color a picture of your dissection.

Family tip: do a web search (or image search) to help understand the parts of the item you dissected. For example, "parts of a beetle." Use the information you find to label the picture of your dissection.

WHAT ARE YOU WONDERING WEDNESDAY

TODAY'S CHALLENGE: OBSERVE, ASK QUESTIONS & SEEK TO FIND ANSWERS

AGE GROUP: ALL AGES!

CHALLENGE

Look out your window or take a walk and **notice** the things around your school, home or community. What questions do you have about what you **observe**?

Draw a picture of what you see and **jot down** questions you may have. Think about how you could answer the questions you have about your world.

Keep a notebook of all your observations and questions and continue to find ways to answer them!

MATERIALS

- Notepad or notebook
- Pencil, pen, crayon or markers

GUIDED QUESTIONS

- **What do you already know** about this topic that might help you answer your questions?
- What are some **strategies** we can use to help find the answers to your questions?
- Where could you go for **more information** or **who could you talk to** that might be able to help you answer your questions?

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IDEAS

Don't know what to observe? Here are some ideas:

- **Live creatures:** ants, worms, birds, squirrels, pets and even people
- **Plants or Trees:** What's blooming, growing, thriving or dying?
- **Man-Made Structures:** roads, bridges, houses, playgrounds
- **Weather:** sun/rain/rainbow, clouds, shadows, temperature

WHAT ARE YOU WONDERING? WEDNESDAY

TODAY'S CHALLENGE:

OBSERVE, ASK QUESTIONS & SEEK TO FIND ANSWERS

AGE GROUP: ALL AGES!

What did you observe?
Draw it or describe it

What Questions
do you have?

How will you find
the answer?

THINK-ABOUT-IT THURSDAY

TODAY'S CHALLENGE: 3D STRUCTURE MODEL

AGE GROUP: ALL AGES!

CHALLENGE

Think about a bridge, tower, or building in your community. Using the materials you have chosen, **build a 3 Dimensional model** of the structure. Look closely at the **shape of the structure** and use your materials to recreate it!

MATERIALS

Use what you have, but here are some possibilities:

- toothpicks & marshmallows
- clay/mud & sticks
- play dough & popsicle sticks
- index cards & tape
- newspaper & tape
- toilet paper rolls & glue
- recycled cardboard & tape
- anything you have available
- Also: ruler or measuring tape, paper, pencil, marker/crayon

THINK ABOUT IT

- What parts of your structure **seem sturdy** and which parts **need to be reinforced**?
- If you used a different combination of materials, how might this **change your structure's stability**?
- Why do you think the architects chose this **style** for the structure?

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ENGINEERING DESIGN PROCESS

Use the Engineering Design Process to build your 3D structure model.

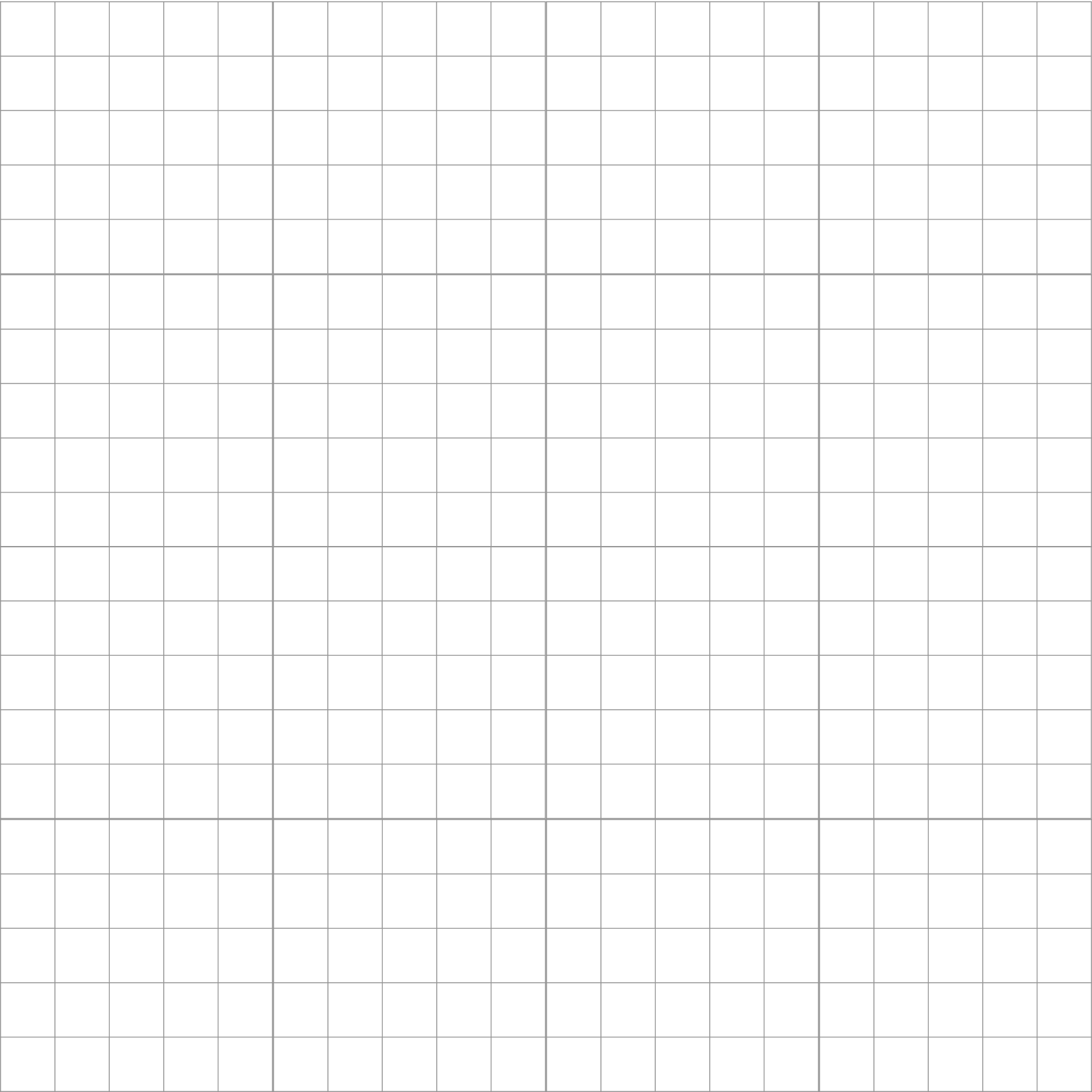
- **Define**-What needs to be accomplished and what tools or materials do you have available? Which structure from your community will you try to build a model of?
- **Brainstorm**- What are your ideas for building your structure?
- **Plan**- Draw and discuss your design.
- **Make it and Test it!** How did it go? Did you meet the challenge? Can you improve your design? How is your structure similar/different from the real one?
- **Improve**- Make your design better by repeating the Engineering Design process again!

THINK-ABOUT-IT THURSDAY

TODAY'S CHALLENGE: 3D STRUCTURE MODEL

AGE GROUP: ALL AGES!

Plan - Draw your design



FIELD TRIP FRIDAY

TODAY'S CHALLENGE: CHOOSE YOUR OWN ADVENTURE

AGE GROUP: ALL AGES!

MAP & TREASURE HUNT

Hide something in your neighborhood, home or playground.

Draw a map using words, symbols and pictures to show your hiding place. Challenge a friend to find your treasure!

To really challenge your friends, create an alphabet code for your words or directions (example: A=1, B=2).

MATERIALS

- Paper, pencil, marker/crayon
- Collection Container—recycled container, box or tub
- Tape, string, glue

EXTENSION #1

NATURE COLLECTION MOBILE

Take a walk in nature and collect a few items—leaves, sticks, interesting rocks, pinecones, etc. Use your materials to create a hanging mobile.

EXTENSION #2

EPHEMERAL ART

Using only items in nature, create a work of ephemeral art that could be blown away, fall over or washed away with water. You might consider a leaf design, rock balance structure, dirt drawing or stick/rock path.



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FIELD TRIP FRIDAY

TODAY'S CHALLENGE: CHOOSE YOUR OWN ADVENTURE

AGE GROUP: ALL AGES!

Draw your map, include
a key

KEY

EXAMPLE:  = PARK  = HOME

SHADOW SATURDAY

TODAY'S CHALLENGE: MAKE & FOLLOW SHADOWS

AGE GROUP: ALL AGES!

CHALLENGE: PREK - GRADE 2

Explore shadows! Notice your shadow and then see **what other things can create shadows**. Try out a few toys and things you can find in nature (leaf, pinecone, stick).

Draw a silhouette of one of the items, or ask a parent or friend to trace your shadow with sidewalk chalk.

MATERIALS

- Sidewalk chalk
- Paper
- Pencils, crayons, markers
- Toys or natural objects
- Light source—sun on a sunny day or a lamp inside

GUIDING QUESTIONS PREK - GRADE 2

- Where does the object need to be, **relative to the light**, to make a shadow?
- Why is the shadow a **different size** than the item casting the shadow?
- What might be the **best time of the day** to explore shadows?
- What might be the **most difficult time of day**?

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CHALLENGE: GRADES 3 - 5+

Make a sundial! Observe how the position of the sun in the sky changes your shadow. **Mark where you are standing** with chalk, a rock, or a stick. Mark the top of your shadow and record the time of day.

During **different times of the day**, return to your spot and notice how your **shadow position changes as the sun changes**. Mark each shadow with the time of the day, as well as how "tall" your shadow is.

MATERIALS

This version of the project uses the same materials. See materials list to the left.

GUIDING QUESTIONS GRADES 3 - 5+

- Why was it important for you to move back to the same spot before measuring your shadow?
- How did your shadow's **placement change** as the day progressed?
- What did you notice about the **length of your shadow** as the day progressed?



SHADOW SATURDAY

TODAY'S CHALLENGE: MAKE & FOLLOW SHADOWS

AGE GROUP: ALL AGES!

Draw a picture of your shadow silhouette or your sundial data

A large empty rectangular box with a blue border, intended for drawing a shadow silhouette or sundial data.

SOARING SUNDAY

TODAY'S CHALLENGE: TWIRLY HELICOPTERS

AGE GROUP: ALL AGES!

CHALLENGE

Create a helicopter, with blades, that when twirled between your hands can fly and land at least 10 feet away from you.

MATERIALS

- Smooth, straight stick or straw
- Paper, cardboard
- Tape or Glue & scissors
- String or Ribbon
- Measuring tape or ruler

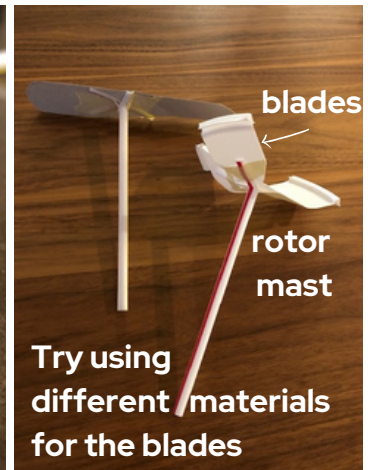
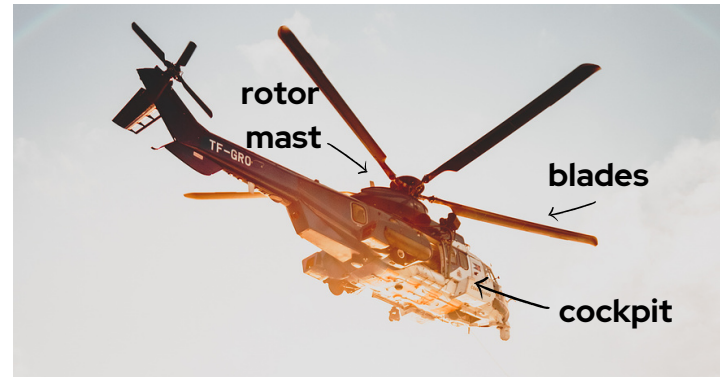
GUIDING QUESTIONS

- What can you do to **change how far** your helicopter flies?
- Does **changing the position or length** of the wings make a difference?

EXTENSION

Consider tying small items of various shapes & sizes to your helicopter to determine if it can carry weight (small stones, toys or leaves).

Make changes to your helicopter design!



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SOARING SUNDAY

TODAY'S CHALLENGE: TWIRLY HELICOPTERS

AGE GROUP: ALL AGES!

Plan - Draw your design

