

# STEAM Bingo



**Ingenium**  
Canada's Museums of Science and Innovation  
Musées des sciences et de l'innovation du Canada

IngeniumCanada.org

**Canada**



# Instructions

Welcome to the Canada Science and Technology Museum's STEAM bingo!

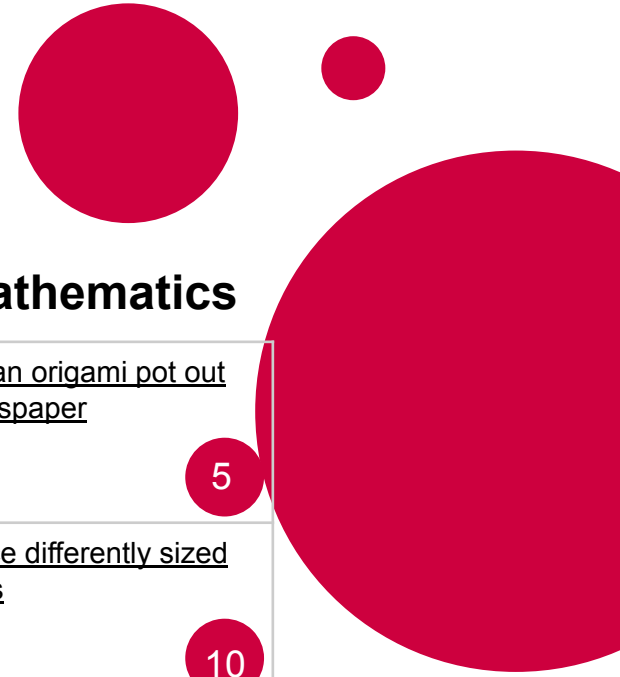
STEAM stands for Science, Technology, Engineering, Art and Mathematics. For this bingo activity, we offer you a series of challenges at the intersection of two disciplines.

For each challenge, take time to think creatively about how you would solve this problem. Use materials that are available to you. They too will influence how you face the challenge at hand. The challenges are open for anyone to try; each of you will tackle them with your own imagination and experience. Remember there are no right or wrong solutions, but we have provided links to inspirational projects to get you started if needed.

We suggest that you approach each challenge by:

1. **Understanding its goal:** What does your creation need to do? What are the problems you might encounter?
  2. **Brainstorming ideas:** Talk, write, or draw them if you want, then choose one as your first possible solution.
  3. **Building your prototype:** Make a rough creation that fulfils the challenge. It will likely change as you go.
  4. **Testing it:** Does it work how you thought it would? Can you make it better? Do you want to start over with a new idea?
- Have fun, use your creativity, your critical thinking, and a good dose of perseverance to come up with solutions to our challenges. Send us pictures and videos of your creations on social media at [@SciTechMuseum](#). Feel free to ask us questions!

# STEAM Bingo Card



	Science	Technology	Engineering	Arts	Mathematics
Science	<u>Generate static electricity</u> 1	<u>Make a chain reaction</u> 2	<u>Design a building you might find in a world with no gravity</u> 3	<u>Project a constellation</u> 4	<u>Make an origami pot out of newspaper</u> 5
Technology	<u>Design some people movers</u> 6	<u>Try your hand and mind at coding</u> 7	<u>Design and build a water wheel</u> 8	<u>Create a stop-motion animation</u> 9	<u>Balance differently sized objects</u> 10
Engineering	<u>Build something that flies for at least 3 seconds</u> 11	<u>Build a DIY speaker amplifier for your mobile device</u> 12	<u>Build a launcher that can hurl a soft projectile</u> 13	<u>Create a sculpture, a statue, or a landmark</u> 14	<u>Build a boat that can support weight</u> 15
Arts	<u>Design an optical illusion using a static point of light</u> 16	<u>Build your own musical instrument</u> 17	<u>Create a pop-up card</u> 18	<u>Find a creative, new way to make a painting</u> 19	<u>Draw impossible shapes</u> 20
Mathematics	<u>Eureka! Measure the volume of small objects in your home</u> 21	<u>Make a ruler using an everyday object</u> 22	<u>Build a bridge</u> 23	<u>Create an artful display with tangrams</u> 24	<u>Solve a puzzle using objects in your home</u> 25

# Science/Science

## Challenge: Generate static electricity

Have you ever received a shock after walking on a carpet and touching a doorknob or lightswitch? This is caused by static electricity. See if you can create static electricity. Will you use it to make a balloon stick to the wall, or to make confetti move?

Need some inspiration? Check out our online resource with activity ideas, [Electri-city](#).

**Go further:** Can you use static electricity to bend water?



# Science/Technology

## Challenge: Create a chain reaction

Also known as a Rube Goldberg machine, a chain reaction is a type of obstacle course for objects! The outcome is a very simple task of your choice, such as pressing a button or bringing something closer to you, but achieved in an overly complicated way just for the fun of it!

Energy is transferred from object to object by pushing them, knocking them, or making them roll or fall. The limit is your imagination. Create ramps, line up dominos, balance things precariously, but most of all, experiment! Use toys, marbles, blocks, books, kitchen utensils, sports equipment and more in your contraption. Any object can be included, but err on the side of caution. Make your chain reaction as long or small as you want. Remember, they **very** rarely work on their first go around, so you will have to try...and try again. Also, tape is your friend!

You will find many YouTube videos of this challenge, take a look at [Joseph's Machines](#) or [OK Go music videos](#).

- **Go further:** Film your chain reaction, even the attempts that don't work.
- Edit a quick video of your final results and share it with your family and friends.
- Challenge them to make their own!



# Science/Engineering

**Challenge: Design a building you might find in a world with no gravity.**

Make a plan, a drawing, or a 3D model. Use the tools and materials of your choice to create your design! To help you get started, try answering some of the following questions:

- Would your building have a top and bottom?
- Does it have levels, and if so, how would people move from one to the other?
- What materials would it be made of?
- What would the entrances look like?
- How would people circulate inside?
- Would there be any furniture? How different from your furniture would it be?

**Go further:**

- Design a building you might find in a world made of only water.
- Design a building you might find in a world where people lived underground.



# Science/Arts

**Challenge:** Project a constellation on your wall.

Can you recreate the night sky in your home? All you need is a light source and a solid object that can block the light — an aluminum can works really well!

Find some inspiration — check out our activity that demonstrates the steps to make a [constellation flashlight](#).

**Go further:** Make your own planisphere so you can [discover the stars](#)! See if you can find these constellations in the night sky.



# Science/Mathematics

**Challenge:** Make an origami pot out of newspaper.

Planning on making a garden? Make an affordable and biodegradable origami pot out of recycled newspaper. Add some soil, seeds, water, sunlight and love!

For inspiration, check out these instructions for [biodegradable newspaper pots](#).

**Go further:** Later, you can plant your pot directly in the soil outside!

*FR Link*





# Technology/Science

## Challenge: Design some people movers

Dig into your recycling bin and look for supplies that can be used to design your moving device. Enlist your favourite stuffed animals or figures to test your prototype and be moved from one place to another. It could be a zipline, an elevator, anything you can think of!

Need some inspiration? Check out page 7 of [pulleys and gears](#).

**Go further:** Can you create something that moves in two dimensions? For example, both side to side and up and down?



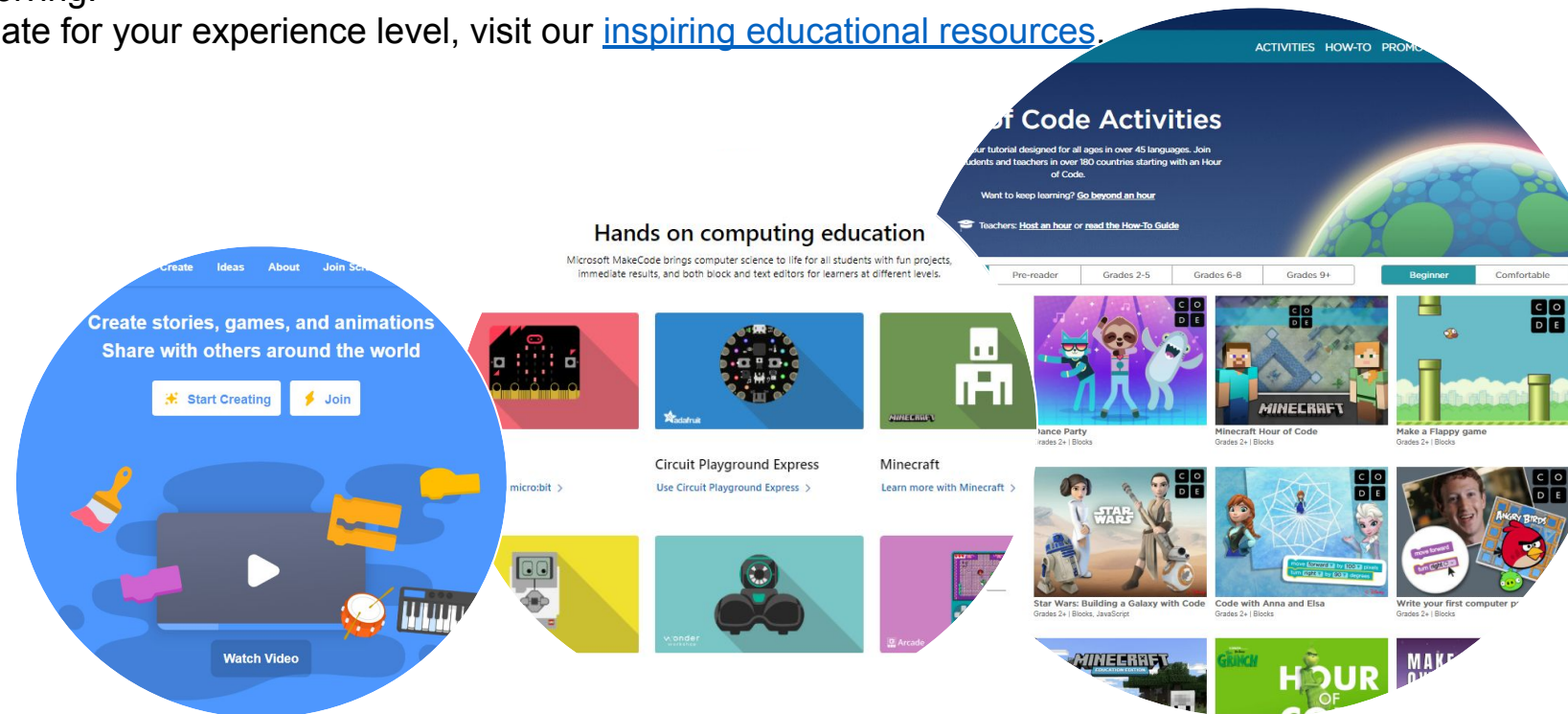
# Technology/Technology

## Challenge: Test your coding capabilities

Coding is a language used to talk to digital objects. It is the way we give instructions to computers so that they can **do** the task requested. Today, so many of our technologies rely on code. That means knowing the fundamentals of coding is very important.

Have fun programming and problem solving!

To choose a coding link that's appropriate for your experience level, visit our [inspiring educational resources](#).



# Technology/Engineering

## Challenge: Design and build a water wheel

Water has been used to power devices for centuries. Try making your own water wheel! All you will need is something circular to act as a wheel, an axle, and something that can scoop water. You can use your kitchen sink or a hose outside to act as a source of running water.

For inspiration and detailed instructions, see our [water wheel](#).

**Go further:** Can you get your water wheel to move something else? What can be attached to your axle?



# Technology/Arts

## Challenge: Create a stop-motion animation!

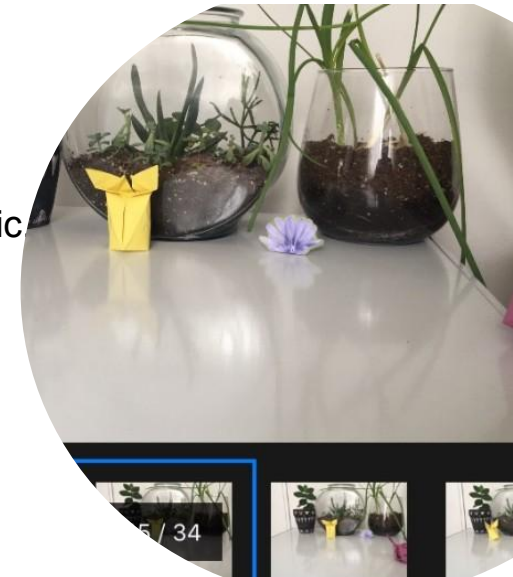
Get creative and animate fun materials in your very own stop-motion movie! Experiment with various techniques to turn static images into a stunning animation and a unique tale. What will you use for your characters? You could give life to your dolls, LEGOs, figurines, or drawings. Have you written down your storyboard of scenes? What will you use as scenery?

You can download an app, such as: [Stop Motion Studio](#) (for IOS, Mac, Android, Windows platforms) or [NFB StopMo Studio](#) (for IOS platform) that will guide you through the animation process.

If you don't have access to a digital device, don't worry — you can create a [flipbook animation](#).

Watch [this tutorial](#) by the National Film Board, and be inspired by this animation example: [A message for Canadian children about these tough times from LEGO Justin Trudeau](#)

**Go further:** Try adding an audio track to your animation, by including voices, sound effects, and music. Or play with the special effect features of your app to make your composition even more grandiose. Can you add a green screen to import a digital background?



# Technology/Mathematics

## Challenge: Balance differently sized objects

Can you balance two different objects? You will need a board for a lever, and a solid object to place beneath it for the fulcrum. You can make it small with a ruler or much bigger if you have some lumber at home. The size will depend on the size of the objects that you are balancing. What do you need to do to get them balanced? Try moving different parts around and see what happens!

For more tips, look up our [lever balancing activity](#).

**Go further:** Can you find two different ways to balance the same two objects? Can you add more objects to your balance?



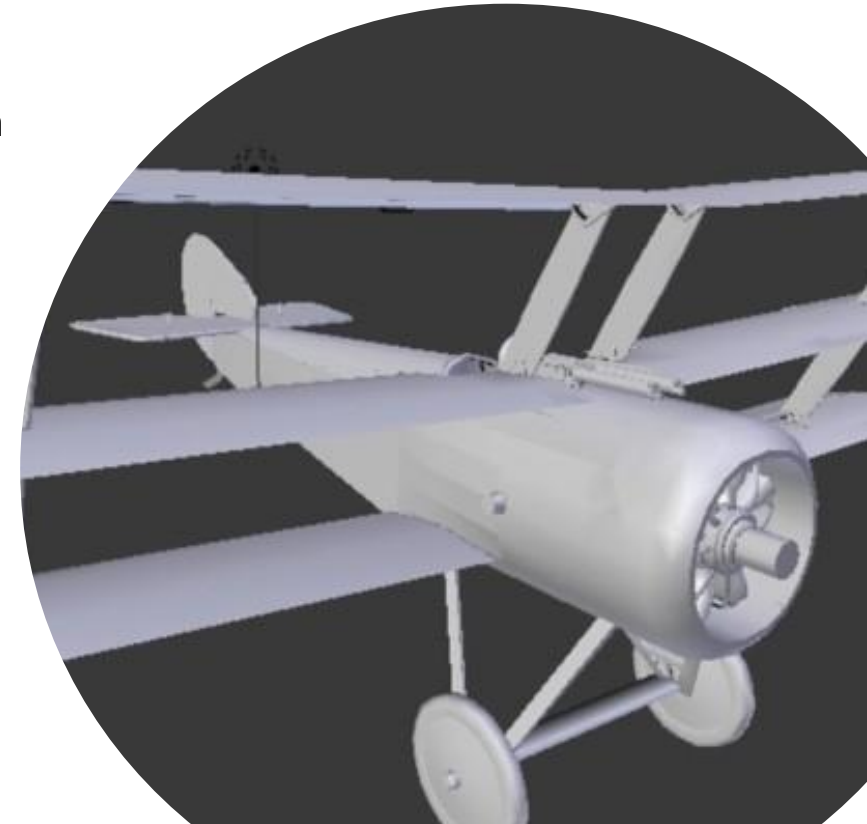
# Engineering/Science

**Challenge:** Build something that flies for at least three seconds

Many different things can fly...from animals like birds, bats, and insects, to human inventions like airplanes, balloons, and rockets. Using the materials you have at home, try inventing something that can stay in the air for at least three seconds.

Find out more about flight in this [Educational Resources — Learn about Flight](#).

**Go further:** Make changes to your design. Try adding, removing, or using different materials, or changing the shape. Does it make your invention fly for longer? How high does your invention fly? How far? Can you improve the design to fly even higher and farther?



# Engineering/Technology

**Challenge:** Build a DIY speaker amplifier for your mobile device.

Have you ever placed your hand in a cone-like shape around your mouth to give your voice a boost and be heard from afar? Use the same principle to increase the volume of your device. You will have to find a way to amplify the sound by sending it into a specific direction. Construct your amplifier from various materials such as paper, styrofoam, cardboard, plastic, or glass. Does it sound the same with different material?

Watch Science Ninja Anthony Morgan create [his version of a DIY speaker](#).

**Go further:** Test various shapes and materials using a decibel app!



# Engineering/Engineering

**Challenge:** Build a launcher that can hurl a soft projectile.

Reach new heights by hurling (soft) projectiles from your very own DIY launcher! Think of various ways you can store enough energy for your launch. Will you use a tension from an taut elastic or twisted rope, a lever action, a falling weight, or something else?

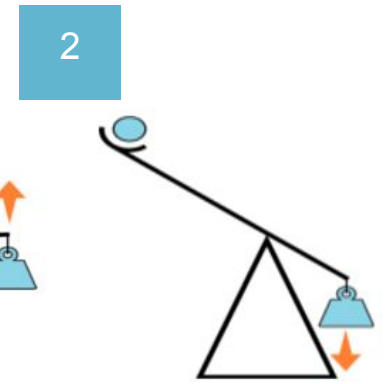
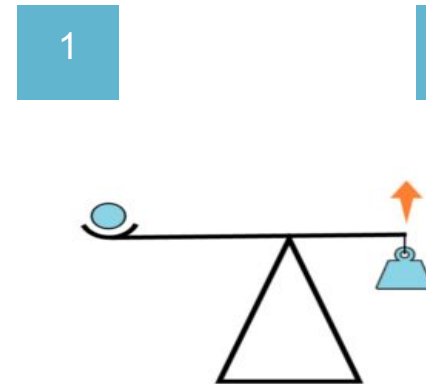
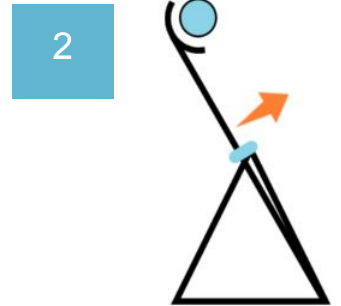
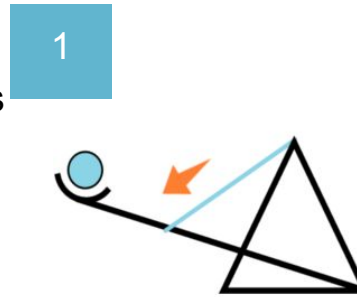
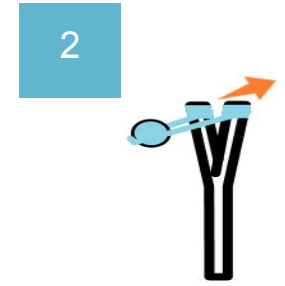
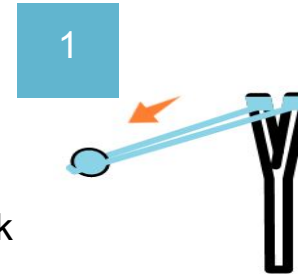
Use a combination of materials that have some bend to them, like popsicle sticks or K'NEX, as well as some that don't, like blocks. Test different combinations of materials and energy storage to maximize the distance and strength of each shot.

Check out the Ingenium Channel to read about our colleague Michelle's experience making her own launcher in [3.2.1. GO: An Exploratek story](#).

**Go further:** Make a target or a boxed wall, then try to reach it!

Store Energy

Launch!





# Engineering/Arts

**Challenge: Create a sculpture, statue, or landmark!**

Use recyclable materials found around your house to create your engineered masterpiece! To help you get started, try answering some of the following questions:

- How big will it be?
- What type of materials will you use?
- What special features will it have?
- What colour(s) will it be?

**Go further:**

- How can you make sure your masterpiece stays upright in the wind?
- How can you make sure your masterpiece stays in one piece during an earthquake?



# Engineering/Mathematics

## Challenge: Build a miniature boat model

Brief description: Build a boat out of material that you can find in your home. Fill up a sink or bathtub with water. Does your boat float? Add coins to your boat to figure out how much **weight** it can hold. Use the values below to help you determine the **capacity** of your boat.

- A penny weighs about 3 grams
- Nickels and quarters each weigh about 4 grams
- A dime weighs about 2 grams
- Loonies and toonies each weigh about 7 grams

**Go further:** Can you make changes to your boat to help it hold more weight? Will you modify the materials, the size, the shape...or all three?



# Arts/Science

**Challenge:** Design an optical illusion using a static point of light.

Have you ever created a hand-shadow puppet of a butterfly or a bunny by placing your hands in front a light? This challenge follows the same idea, but in a slightly more complex way. Create a shadow sculpture — it might not look that pretty as a 3D object, but it will project a crisp shadow of your designed artwork against your wall. Choose a source of light and set it in place (add a piece of tape to indicate where it goes if you are afraid it will move). Project on a wall or a stretched blanket. Decide from which angle your piece will be viewed. When assembling your sculpture, return to this location to see the shadows, Use any kind of materials from your house. The challenge is the art casted by the shadow, not the way you arrange the objects making them.

See examples and read more about [illusions](#).

**Go further:** Can you project a word in shadow? Or, can you do a drawing from the shadow cast by an object?



Artwork by [Vincent Bal](#)



Sculpture by [Diet Wiegman](#)

# Arts/Technology

**Challenge:** Build your own musical instrument using everyday materials.

Instruments make sound through vibrations, which send waves through the air. A percussion instrument is anything that you strike to make noise. A stringed instrument makes sound when its strings vibrate back and forth quickly. A wind instrument makes sound when air causes vibrations inside it. Test these phenomena out for yourself by making your own musical instruments, using materials you can find at home.

Find out about the instruments we invented by following the links below:

1. [Symphony Hack Lab](#)
2. [Make a Kazoo](#)
3. [Tell Me About Sound](#)

**Go further:** Modify the instructions and add personal touches to your instrument. Add parts, change the shape and size, and embellish your instrument. Can you think of other materials that you could use instead of those suggested? Don't be discouraged if your creation doesn't turn out as you imagined on your first try. With each construction, you will discover different ways to make music.



# Arts/Engineering

**Challenge:** Create a pop-up piece of art.

You have likely encountered pop-up art in a card or a book, where a three-dimensional relief would rise up from the pages to bring the story to life. Make your own card or book by adding slits that pop out from the centerfold, gluing tabs to objects that collapse on themselves, or by suspending designs.

Check out this tutorial for a [Hands-on Activity: Engineering Pop-up Books](#).

Be inspired by this video of artists presenting their [A to Z: Marvels in Paper Engineering - Alphabet Pop-Up Collection](#)

**Go further:** Can you think of others ways your paper can pop-out? Can you add pull-out tabs or a wheel that reveals a design element?



# Arts/Arts

**Challenge: Find a creative new way to make a painting.**

Can you paint a picture without using a paintbrush, or your fingers? Channel your creativity to find a new way to bring the colours to your canvas! To help you get started, try answering some of the following questions:

- What new tools could you use to apply paint?
- Will your tool be used to paint directly onto the paper, or will you let the paint fall from your tool to the paper?
- What colours will you use?
- Will you paint a detailed picture or will you make something abstract?

**Go further:**

- Can you give your recyclable materials a second life by transforming them into tools you can use to paint?



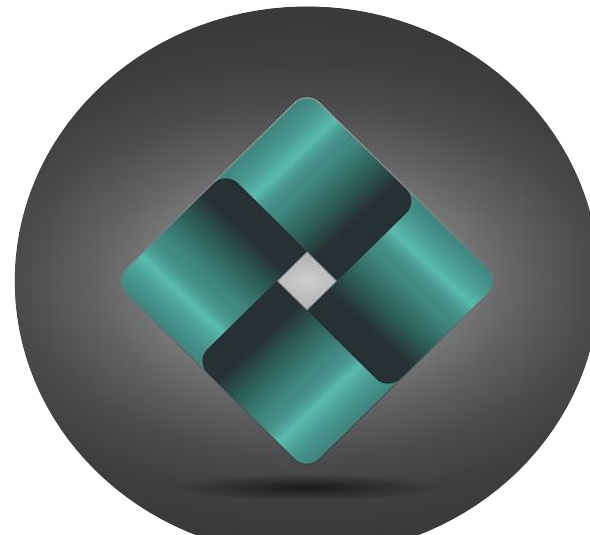
# Arts/Mathematics

**Challenge:** Draw impossible shapes.

Have you ever looked at a drawing and thought, “That can’t be possible!” Make drawings of optical illusion impossible shapes such as a Möbius strip, the Penrose triangle, the impossible cube, or the three-prong illusion.

Learn more about different types of [illusions](#).

**Go further:** Some artists have used these techniques to make some amazing artwork. Look up the work of MC Escher. Do you think you could make something similar?



# Mathematics/Science

**Challenge: Eureka! Measure the volume of small objects in your home.**

Use a measuring cup to measure the **volume** of small objects in your home.

Add enough water to a measuring cup to be able to cover your object. Note the starting volume by reading what measurement the water level is at before you add your object to the water (estimate). Add your object to the measuring cup and note the new volume. The **difference** between the new volume and the starting volume is the volume of the object

$$(\text{New Volume}) - (\text{Starting Volume}) = \text{Volume of Object}$$



Go further: If you have a kitchen scale, you can measure the **density** of the object as well!

$$\text{Mass (weight)} \div \text{Volume} = \text{Density}$$

Often, objects that are larger (more volume) weigh more than smaller objects, but sometimes it's the opposite! This happens when the smaller object has a higher density than the larger object. Think of a bowling ball and a balloon. A balloon can be larger than a bowling ball, but it still weighs less because the air inside it is less dense than the bowling ball. Can you find two objects where the smaller object weighs more than the larger object?



# Mathematics/Technology

**Challenge:** Make a ruler using everyday objects.

Create a new unconventional unit of **measurement**! Figure out the **height** of your someone in your home in books; have them lie down, then line up books along their body and count how many books are required to reach their full height. If you have a pet, you can figure out how many cats or dogs tall your parent or guardian is! Or, instead of measuring your height in feet, try measuring it in hands!

**Fun Fact:** The height of horses is measured in hands!

Get creative and try to think of a unique unit of measurement. Make sure to share your creative measurements with us!

**Go further:** Can you **estimate** the height of a building in your new unit of measurement?



Ellen Morrison  
@EllenMorrison16

Hey @SciTechMuseum! My cat is 9 rolls of colourful tape long when she's resting! #STEAMbingo



# Mathematics/Engineering

**Challenge: Design and build a bridge.**

Build a bridge out of materials that you can find in your home. Test how much weight your bridge can support by placing a cup on it, then adding coins to the cup. Use the values below to help you determine the capacity of your bridge.

- A penny weighs about 3 grams
- Nickels and quarters each weigh about 4 grams
- A dime weighs about 2 grams
- Loonies and toonies each weigh about 7 grams

**Go further:** Can you make changes to your bridge to help it hold more weight?



# Mathematics/Arts

**Challenge:** Create an artful display with tangrams

A tangram is a very old geometry puzzle made of only seven pieces: two large triangles, one square, one parallelogram, one medium triangle, and two small triangles. All of the pieces, side by side, create a square.

Cut out the tangram shapes by [downloading a reversible tangram template](#) or [drawing your own](#). Can you create shapes like a horse, a bunny, or a boat using these seven pieces?

**Go further:** Place your tangram into your desired shape on a blank sheet, then draw the outline only. Ask a family member to solve your puzzle.

**Go even further:** Could you animate your tangram using the stop animation challenge on page 9?



# Mathematics/Mathematics

**Challenge: Solve a puzzle using objects in your home.**

Brief description: Find objects in your home that are different colours and use them to solve these puzzles. In each puzzle, the goal is to line up your objects in a specific order. The clues will help you figure out what the order is supposed to be!

## Level 1

Colours you will need:  
**1 Blue, 1 Green, and 1 Yellow**

Clue #1: **Blue** is at one of the ends.

Clue #2: **Yellow** is not on the left end of the row.

Clue #3: **Green** is next to **Blue**.



## Level 2

Colours you will need:  
**2 Blue, 1 Green, and 1 Yellow**

Clue #1: The **Blues** are not beside each other

Clue #2: **Yellow** is not between the **Blues**.

Clue #3: **Green** is not to the left of **Yellow**.



## Level 3

Colours you will need:  
**1 Blue, 2 Green, 1 Yellow, and 1 Orange**

Clue #1: There are two objects between the **Greens**.

Clue #2: **Blue** is to the right, but not beside, **Yellow**.

Clue #3: **Orange** is in the middle

Clue #4: **Blue** is not on the right end of the row.



Go further: Can you make up your own logic puzzle?

Solutions on final page.

**Showcase how you tackled the challenges. We want to see both your successes and your less successful attempts.**

Twitter: @SciTechMuseum

Facebook: Canada Science and Technology Museum

Instagram: @scitechmuseum

Hashtag: #STEAMbingo

Discuss with us or your family:

- Which was your favourite challenge and why?
- Was it hard or easy, and why?
- What did you learn while doing the challenges?
- If you were to do a challenge again, would you do it the same way or differently?

**Have fun!**



CANADA SCIENCE AND  
TECHNOLOGY MUSEUM  
MUSÉE DES SCIENCES  
ET DE LA TECHNOLOGIE  
DU CANADA

Solutions to **25**

Level 1: blue, green, yellow

Level 2: yellow, blue, green, blue

Level 3: yellow, green, orange, blue, green