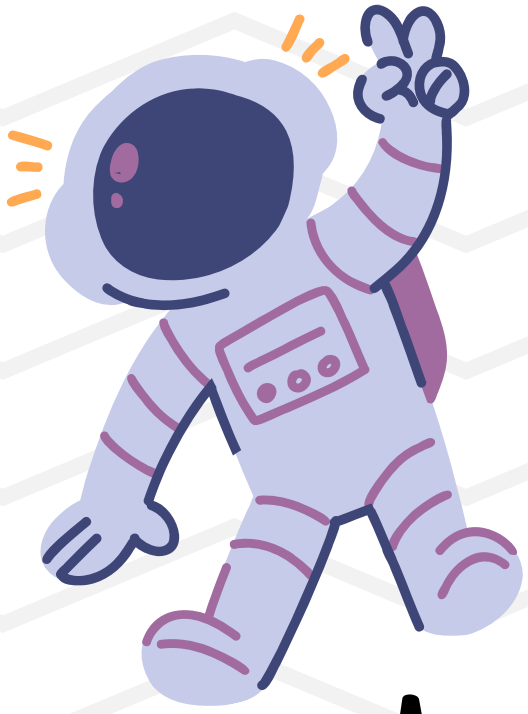
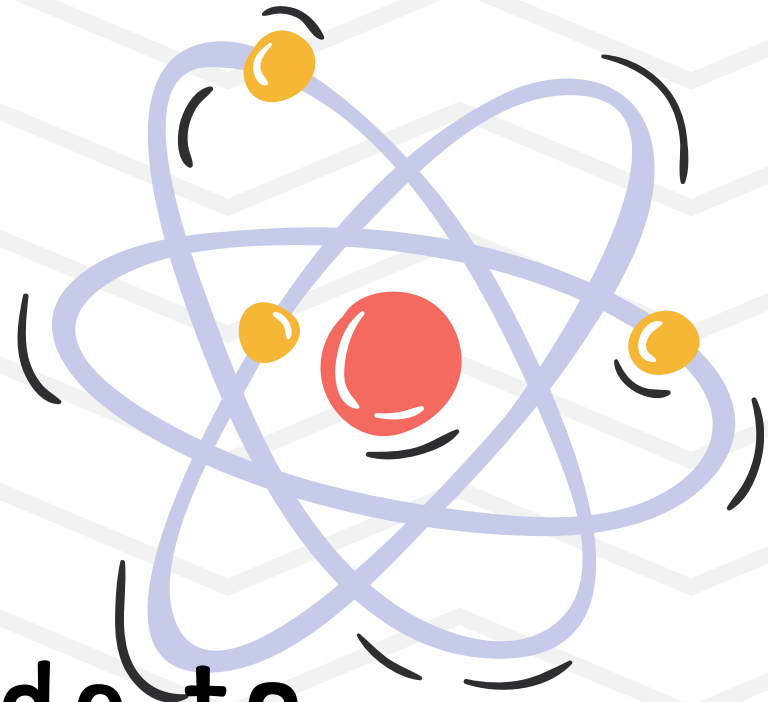
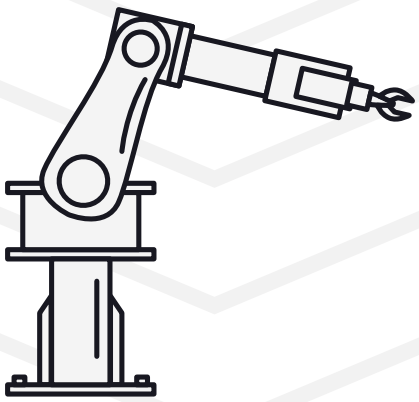




A pocket guide to

STEAM

A practical introduction to
STEAM in your classroom



STEAM

SCIENCE

INQUIRING
PREDICTING
EXPERIMENTING
CONCLUDING

TECHNOLOGY

IDENTIFYING
INNOVATING
DEVELOPING
IMPROVING

ENGINEERING

DESIGNING
PLANNING
CONSTRUCTING
EVALUATING

ARTS

IMAGINING
EXPRESSING
CREATING
APPRAISING

MATHEMATICS

DEFINING
FORMULATING
SOLVING
CHECKING

But wait a minute, have you ever wondered why English didn't make the cut in that acronym?

ENGLISH

STEAM and Language Learning

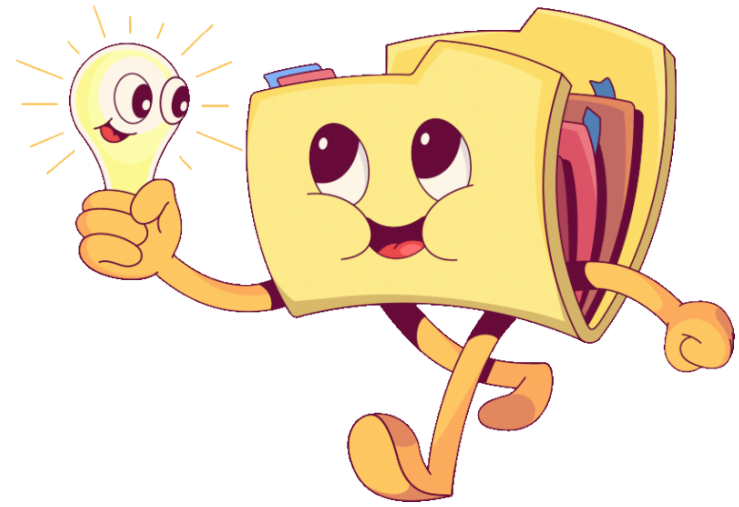
Doing STEAM in the language classroom does not mean that learners will stop engaging with language learning. On the contrary, scientists, engineers, technologists, artists, and mathematicians all need literacy and communication skills. STEAM experiences shouldn't be something separate from what you do already in your lessons – they should be connected. In fact, STEAM and language learning fit very nicely together. It follows a CLIL (Content Language Integrated Learning) approach where students learn language through different subjects.

Skills learnt through STEAM

Example of how to apply STEAM

If you are teaching about houses, learners can be asked to design their own houses. To do this, they will have to use a lot of language in the process:

1. Learners learn new language when doing research about different types of houses online (technology).
2. Learners discuss with others in their group what they have found out, e.g. stability, why people build houses, why people build houses with certain materials (science).
3. Learners plan, sketch their design and build a house made of recyclable materials in groups while they use the vocabulary they know, e.g. "wall, door, window..." (engineering).
4. Learners analyse the shapes they've used or count the number of walls and windows (maths).
5. Learners decorate their house to make it attractive and then describe it to the rest of the class (art and design).



HOW TO USE THIS BOOKLET

This booklet provides a collection of STEAM activities that can be use in elementary and high school classroom. The activities are designed to be engaging and challenging, covering a variety of topics to help students develop critical thinking and problem-solving skills. These skills are essential for success in school and life. To use this booklet, simply choose an activity that is appropriate for your students 'age and interests. Then follow the instructions to complete the activity

ELEMENTARY SCHOOL PROJECTS

Place your bets!

Game Rules:

- Players (or team) tick **FLOAT** or **SINK** boxes and place bets on each line in the **BET** column.
- The minimum bet is 10, the maximum bet is 20.
- To know the correct answer, perform each experiment, use a container of water.
- Players keep track of their total after each line.
- The player with the highest score win.

	Starting capital: 100			
OBJECT	**FLOAT**	**SINK**	**BET**	**TOTAL**
 **Coin**				
 **Pencil**				
 **Cotton ball**				
 **Rubber band**				
 **Wooden Stick**				
 **Lego Toy**				
	Total			

TECHNOLOGY

Stop Motion

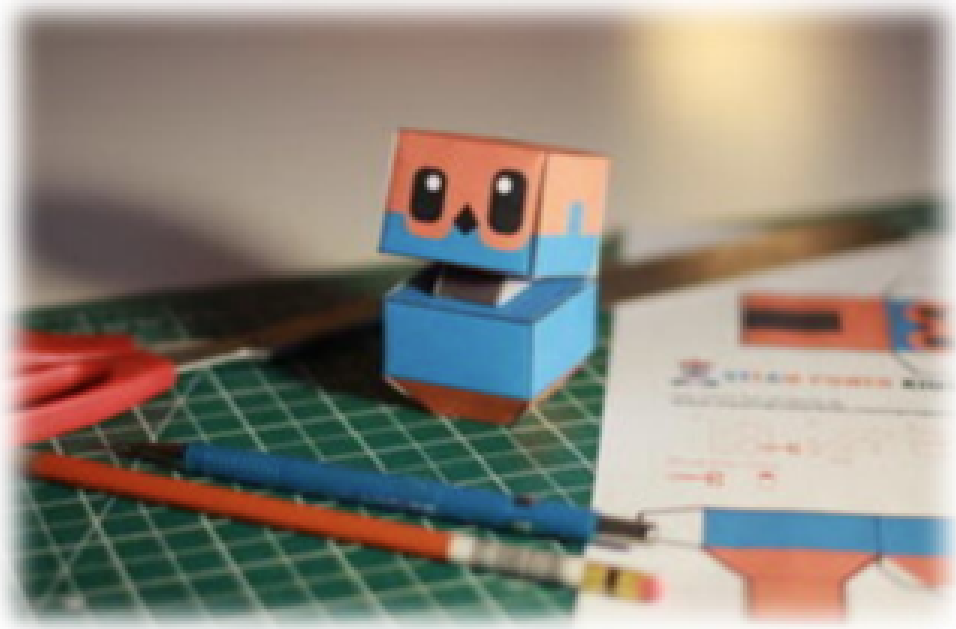
Stop motion is a type of animation that creates the illusion of movement by taking a series of photos and then playing them back quickly, or by recording a video, pausing it to move the characters, and then playing it back to create the illusion of movement.

It is fun and creative way to bring your imagination to life.

Here are the steps on how to make a stop motion video:

1. **Plan your story:** What do you want your video to be about? Once you have a general idea, you can start to think about the specific scenes and actions you want to include.
2. **Gather your materials.** You will need a camera, a tripod, and a subject to animate. You may also want to use other materials, such as props, scenery, and sound effects.
3. **Set up your scene.** Make sure that your subject is in focus and that the lighting is good. You may also want to use a backdrop or other props to create a more interesting scene.
4. ***** Start taking pictures.** Make sure that each picture is slightly different from the previous one. This will create the illusion of movement when the pictures are played back.
5. **Edit your photos.** Once you have taken all your pictures, you will need to edit them together into a video. You can use a video editing software program to do this.
6. **Add sound effects and music.** Sound effects and music can help to add interest and realism to your video.

Paper Robot



Materials:

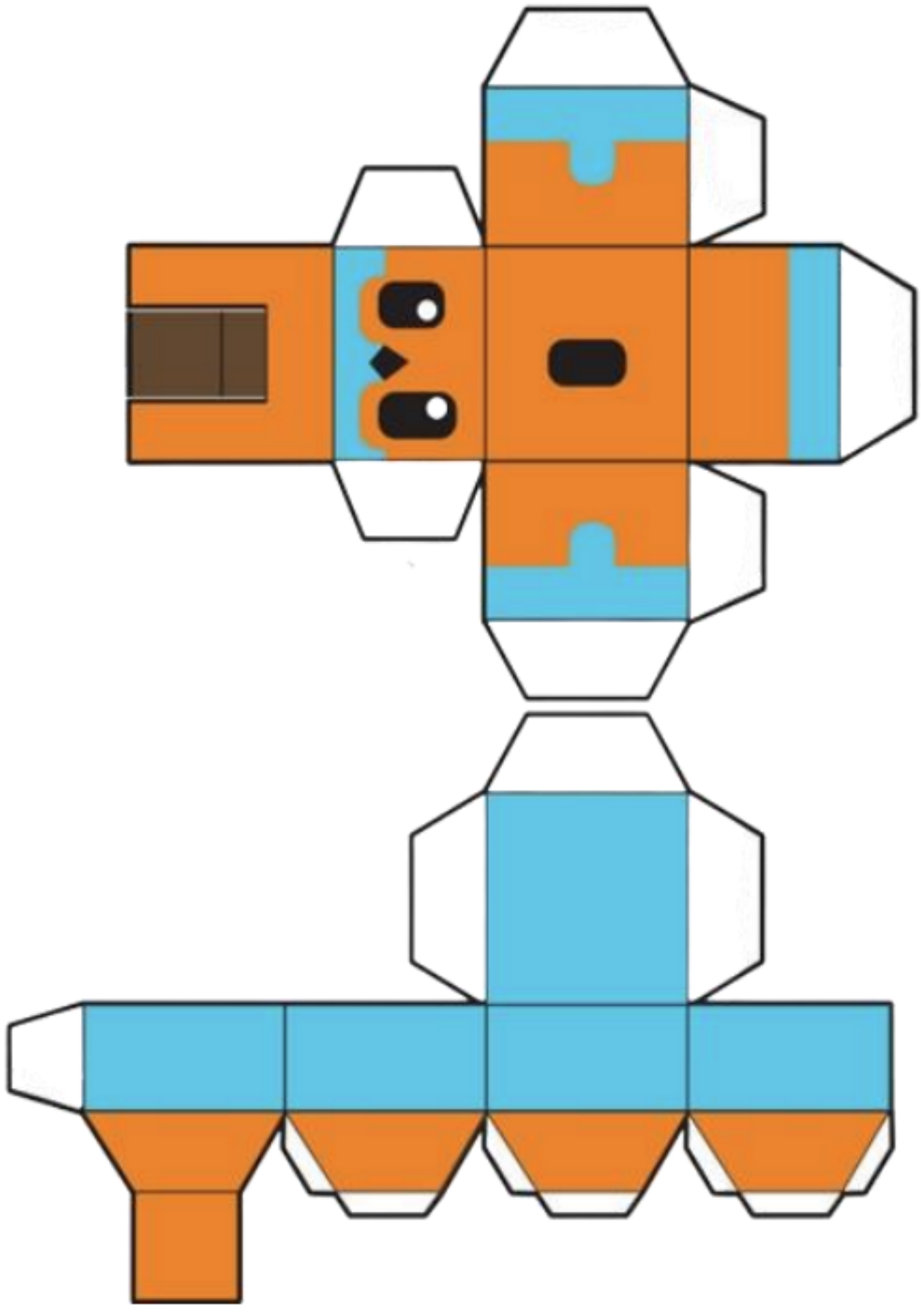
- Robot template
- Glue
- Scissors

Instructions:

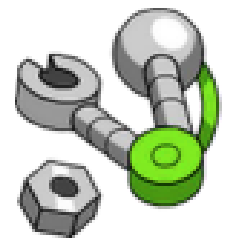
1. Print and Cut: Carefully cut out around the robot template. Remember to be gentle with the smaller parts!

2. Fold all the lines and tab of the template.

3. Apply glue to the blank tabs and assemble the robot.



THE ROBOT CHALLENGE



Objectives:

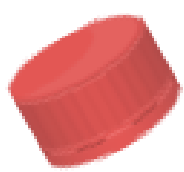
- To foster collaboration and teamwork
- To apply STEAM concepts to real-world problems
- To create a unique and creative robot

Materials:

- Recyclable materials, such as cardboard, paper, plastic bottles, etc.
- Scissors, glue, markers, other art supplies

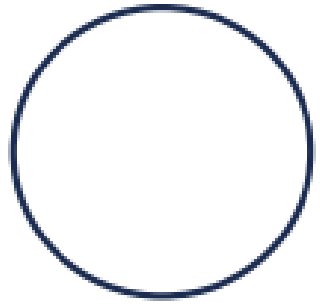
Instructions:

1. Divide students into groups of 3-4.
2. Have each group choose one student to be the "robot."
3. The robot will lie down on a piece of cardboard and the other students will use the cardboard to trace their body.
4. Once the robot's body is traced, the other students will use recyclable materials to create a robot costume for their classmate.
5. The robots should be creative and unique.
6. Once the robots are complete, the groups will present them to the class.



Get Geometric!

Identify the 2D shapes below. After, turn each shape into an object of some sort. For example, you might turn a circle into a beach ball. Be creative and make sure each shape is fully colored.



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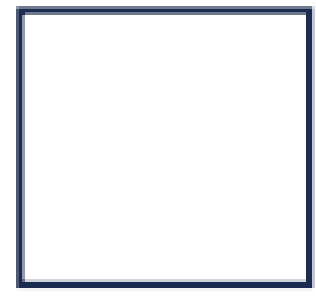

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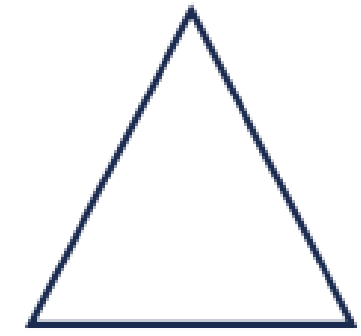

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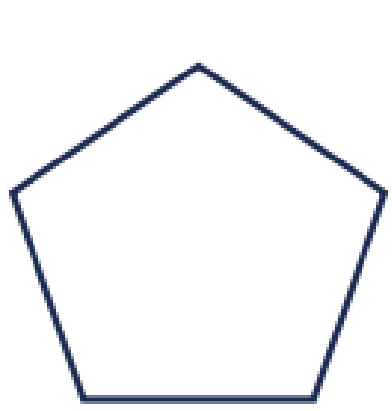

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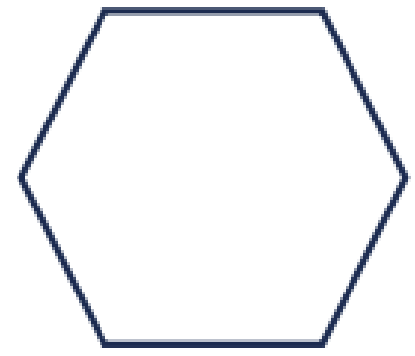

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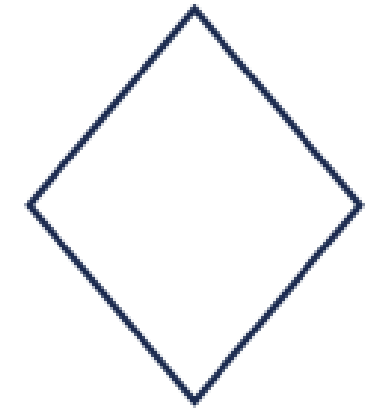

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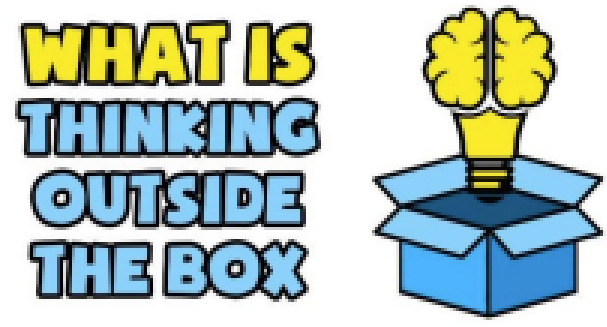
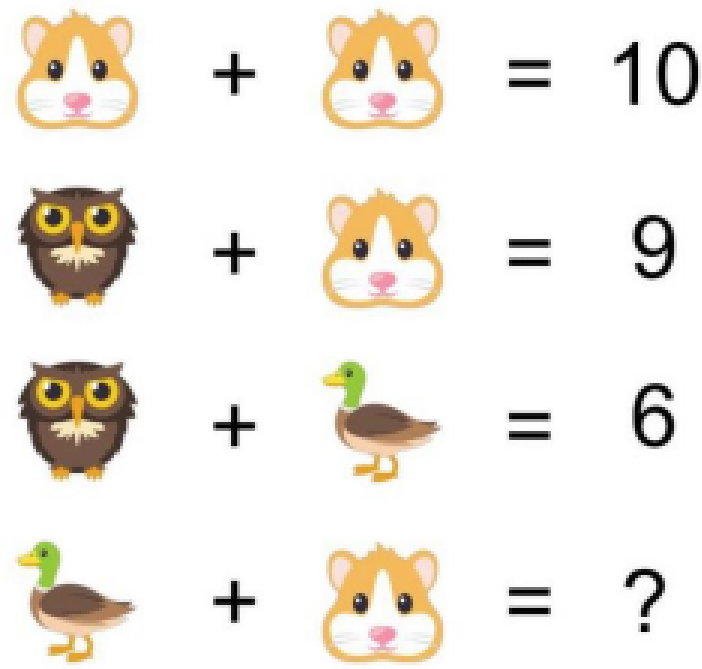


Instructions: How can you flip the star pyramid upside-down by moving only THREE STARS.

Instructions: Use your math skills to find the value of each symbols and the ?



HIGH SCHOOL PROJECTS

An Interview with ...

Watch the video:

Once students have watched an episode, have them identify another career that could be related to that specifc episode. If possible, allow them to schedule an interview with someone to learn about their job and ask the following questions to learn more about how they use STEM each and everyday.

- Does your job use science? If so, how?
- Do you get to use technology while you're at work? If so, what kind?
- Do you ever have to engineer things at work? If so, what have you built, designed, or tested?
- Do you use math to do your job? If so, how do you use it?
- How much money can someone earn doing a job like this?
- What's your favorite part of the job? Do you use any cool tools at work? If so, what tools do you use?
- How long have you been working at this job?
- Did you go to college to learn about this job, or did you go to trade school

Insert a Title

Background

What did you study to be able to do this type of work?

What work experience did you have before working at your current job?

Place a picture of or draw the person you interviewed here.

Coolest part of Job

What do they love most about their job?

What do they enjoy most while at work?

Salary

What can someone entering your career field expect to earn as a salary?

Did you know?

What are some fun facts about this job that I might not know about?

STEM Connections

How is this job connected to Science, Technology, Engineering or Math?

Background

Coolest part of Job

Salary

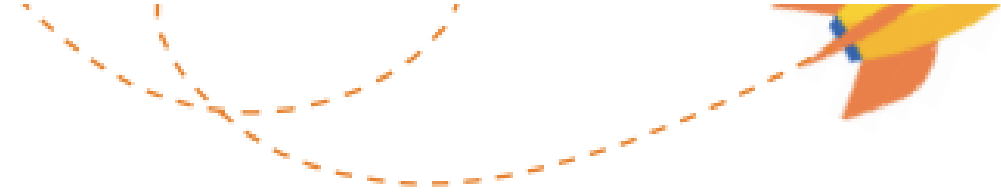
Did you know?

STEM Connections

Engineering

Engineering refers to the process of building and designing something mostly to solve a problem. It involves using materials, designing, creating, building, testing and maybe having to re-design. Complex physics concepts may be explored, like gravity, balance, force, density and stability, but learning by doing helps these concepts become more accessible.

Children can be seen using engineering habits of mind during play from when they are very young: stacking wooden blocks to build a tall tower or standing cushions up to build the walls of a house.



These are the foundations for more complex understanding of engineering concepts and it is important to facilitate this type of thinking so that it is developed and extended.

ENGINEERING TOOLS AND MATERIALS INCLUDE:

- plastic cups
- magnetic tiles
- craft sticks
- cardboard boxes
- toothpicks
- string
- building blocks
- cardboard tubes
- playdough

- toothpicks

Try this

Can you make 3D structures with toothpicks and playdough?

STEAM areas: Engineering (building structures) and Maths (exploring 3D shapes and counting).

Language connections: Shapes and their properties. Counting and writing numbers.

- **Prepare:** Collect objects or pictures of different 3D shapes, e.g. boxes for cubes and rectangular prisms, a tent for a triangular prism, a pyramid for a square-based pyramid, a ball for a sphere, a small drum for a cylinder, an ice-cream cone for a cone, some toothpicks and playdough.
- **Demonstrate:** Show the objects/pictures. Choose one of them and explain that the challenge is to create these 3D shapes with the materials provided. Draw a sketch of one of the shapes on the board using a different colour for each side or a toothpick so that each one can be easily identified. E.g. if you draw a cube, use red for the first "toothpick" you draw, then green for the next, blue for the following and black for the last one to complete the base. Ask learners how many toothpicks they need for that shape. Count them together and talk about the properties of shapes: flat or curved surfaces, edges, and vertices.
- **Plan:** Learners write down the number of toothpicks they think they will need to create each shape.
- **Explore:** Learners build the shapes.
- **Record:** Learners count the number of toothpicks they finally used and write those new numbers (or the same if they were correct) in a different colour next to their predictions.
- **Reflect:** Was it easy or hard to build 3D shapes with these materials? How much playdough did you need to keep the toothpicks in place? (learners will find if they use too little it won't hold the toothpicks in place, but if they use too much, it makes the toothpicks too heavy and they fall down). What would make better materials for this challenge? Were the numbers you predicted similar to those you finally used? Was there any shape that you weren't able to build with toothpicks? Why? (Although it is possible, a sphere can be difficult to build with these materials because of its properties: curved surface, no flat surfaces, no edges, no vertices.)
- **Re-design:** Learners explore building 3D shapes using other materials, e.g. replace toothpicks with straws and craft sticks, replace playdough with gumdrops or jelly beans.

Art and Design

A narrow view of art refers to visual arts alone. It is more useful, though, to interpret it through its broader definition of artistic types: painting, design, drawing, pottery, sculpture, murals, origami, photography, vocal and instrumental music, computer-generated art and music, dance, drama, mime, puppetry, and film.

The Arts perform a very special role due to the creative element they bring to STEAM. Creativity is key during the process of inquiry, experimenting and designing solutions as well as in the communication of ideas and final results. Many concepts that are explored via STEAM can be quite abstract and the use of Art and Design can help them become more tangible.

ART AND DESIGN SUPPLIES:

- drawing paper
- construction paper
- cardboard
- crayons
- markers
- colored pencils
- chalk
- permanent markers
- paint
- pipe cleaners
- watercolours
- feathers
- beads
- ribbon
- bottle tops

Try this

Make a face out of everyday items.

STEAM areas: Art and Design (using unconventional items to create ephemeral art, taking photographs) and Technology (using digital tools).

Language connections: Parts of the face. Everyday items. It has.

- **Prepare:** Collect everyday items like hair brushes, combs, forks, spoons, scissors, glue sticks, pencils, crayons, markers, erasers, toothbrushes, small plastic bowls, small plastic cups, cups, small balls, coins, paper clips, small toys, rubber bands, hair clips, clothes pegs, and cork.
- **Demonstrate:** Show images of Giuseppe Arcimboldo's art. Ask learners to identify the objects in his paintings: fruit, vegetables, flowers, fish, kitchen utensils and books. Use a digital camera, smartphone or tablet to take a photograph of one of the works of art and explain how you keep the artwork centred and the camera stable. Show what a good photograph and a bad photograph look like.
- **Plan:** Learners, in groups, discuss what objects they will use and sketch the face they plan to create collaboratively considering the shape and size of the objects.
- **Explore:** Learners create their faces. Allow the use of other objects they find around the room.
- **Record:** Learners take a photograph of their face. They then take their face apart and put the items back to create new ones and take photographs of them.
- **Reflect:** Learners present their photographs and describe their faces. Was your final product similar or different to your sketch? Were you able to sketch out the items you used considering their shapes and size? Are your photographs centered? Are they good photographs? Which is your best face? Why? Which is your best photograph? Why?

Maths

Maths refers to the process of understanding patterns, numbers, spatial relationships, size and shapes – another process that begins at a very young age, e.g. exploring the shape of objects with the hands and mouth, or building walls of the same height for a house made of blocks. Children explore these discoveries naturally through play and adults can support this intentionally by maintaining this hands-on and learning-by-doing spirit as children grow older. Thus, abstract concepts in maths become concrete and comprehensible.

MATHS TOOLS:

- cards
- building blocks
- paperclips
- coins
- play money
- counters
- dice
- ruler
- tape measure
- scales
- grid paper
- sorting trays
- hula hoops
- magnetic shapes

Try this

How can you build a strong bridge that holds 20 coins?

STEAM areas: Maths (and counting to 20) and Engineering (building a strong bridge.)

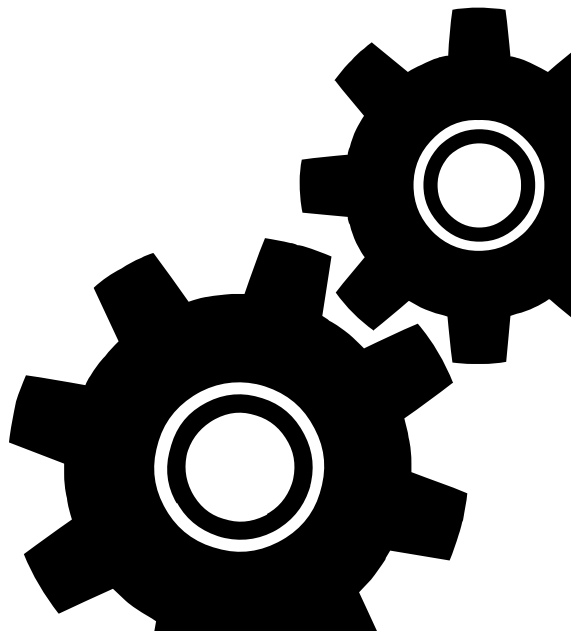
Language connections: Cities. Counting and writing numbers.

- **Prepare:** Collect building materials, e.g. cardboard tubes, boxes, string, pieces of cardboard, craft sticks, paper cups, construction paper, paperclips, masking tape, glue, scissors, etc. Place different items in non see-through bags.
- **Demonstrate:** Research different types of bridges (truss bridge, suspension bridge, and arch bridge). Explain the challenge and show the difference between a strong bridge and a weak bridge. Demonstrate placing and practise counting the coins one by one.
- **Plan:** Learners choose a bag randomly. They reveal the materials in it and sketch their bridges.
- **Create:** Learners build their bridges.
- **Record:** Learners place coins on the bridge one by one and record how many it holds.
- **Reflect:** Is your bridge strong enough to hold 20 coins? How many coins does it hold? How can you make your bridge stronger?
- **Re-design:** Learners re-design their bridge adding new material to make it stronger and test again.
- **Reflect:** What materials made your bridge stronger?

Examples of investigation stations are:

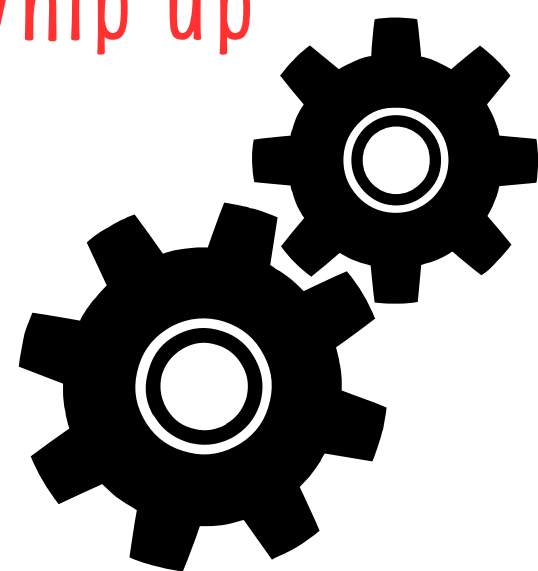
- **Science station:** containers, sand, water, plastic and rubber items that sink or float, natural material, magnifying glass. meat thermometers, egg beaters, mixing bowls, measuring cups, salt, baking soda...
- **Engineering station:** a set of challenge cards, building blocks, toothpicks, playdough, plastic cups, cardboard tubes...
- **Research station:** iPads, books, maps, encyclopaedias, tablets, computers, fiction and non-fiction books...
- **Art and design station:** paint, shaving foam, cardboard, tablet for photography and filming, clay, playdough, scissors, masking tape, glue, costumes...
- **Maths station:** a set of challenge cards, rulers, measuring tape, calculators, items of non-standard units of measurement (paper clips, rubbers, building blocks)...
- **Recording station:** a set of challenge cards, grid paper, pencils, sketch paper and recording sheets...
- If you have nothing specifically set up for STEAM activities, you will only need some containers, baskets, bowls, bags or boxes to present materials activity in an inviting way.

English serves as the main language of science, technology, engineering, and mathematics, acting as a crucial medium of communication, collaboration, and knowledge dissemination within these fields.



Integrating English into STEAM Education goes beyond simply teaching grammar and vocabulary, it's about fostering a deep understanding of the language as a powerful tool for communication, critical thinking, and collaboration.

Let your creativity run wild and whip up your very own projects!



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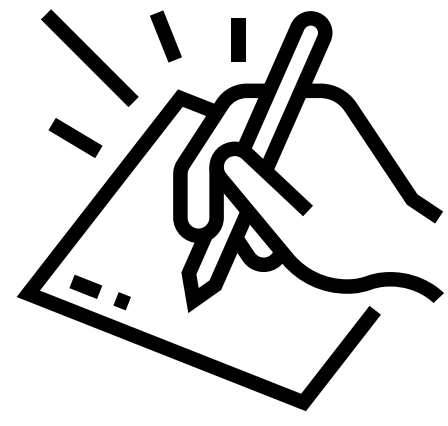

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