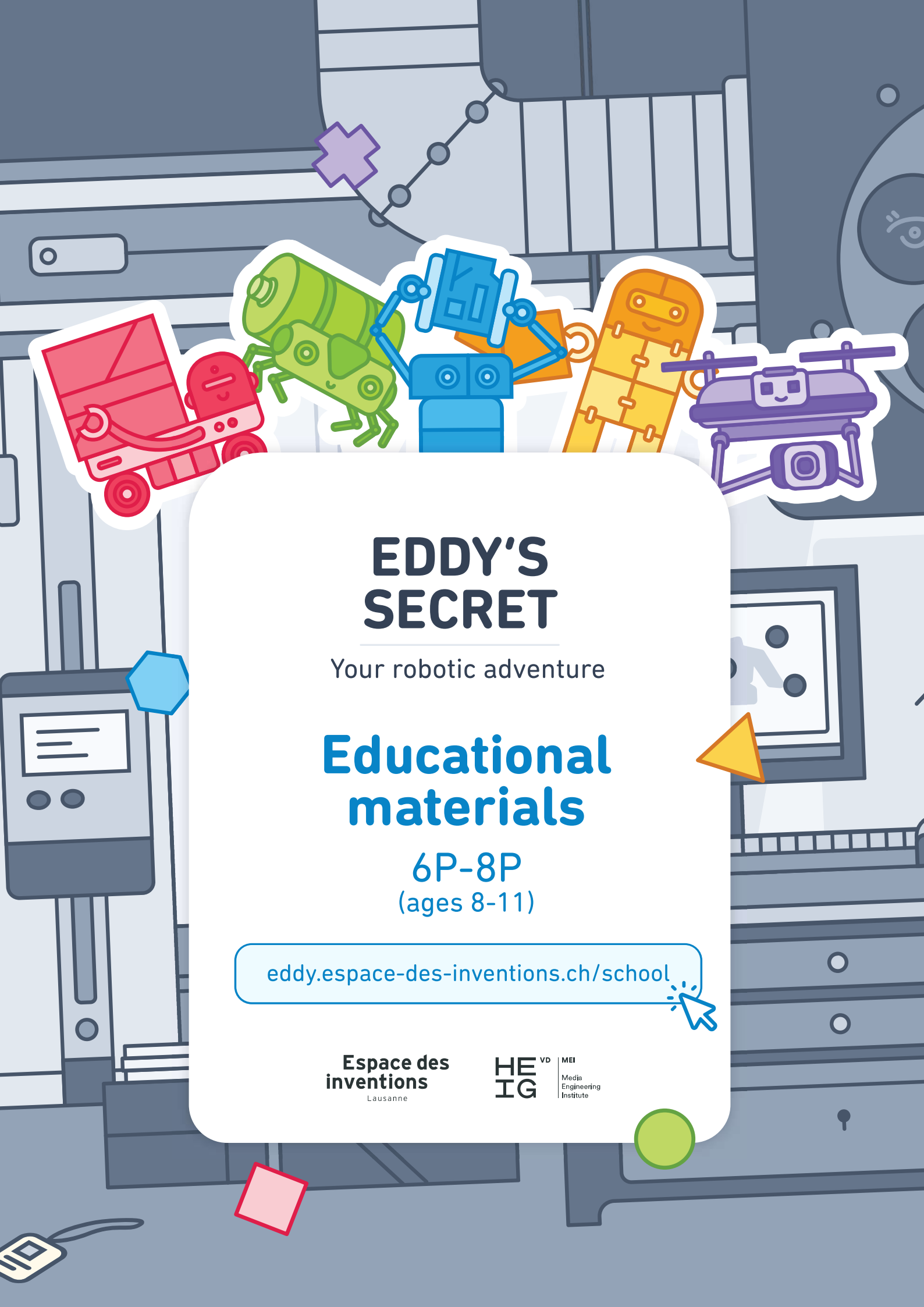


EDDY'S SECRET

Your robotic adventure

Educational materials

6P-8P
(ages 8-11)

eddy.espace-des-inventions.ch/school

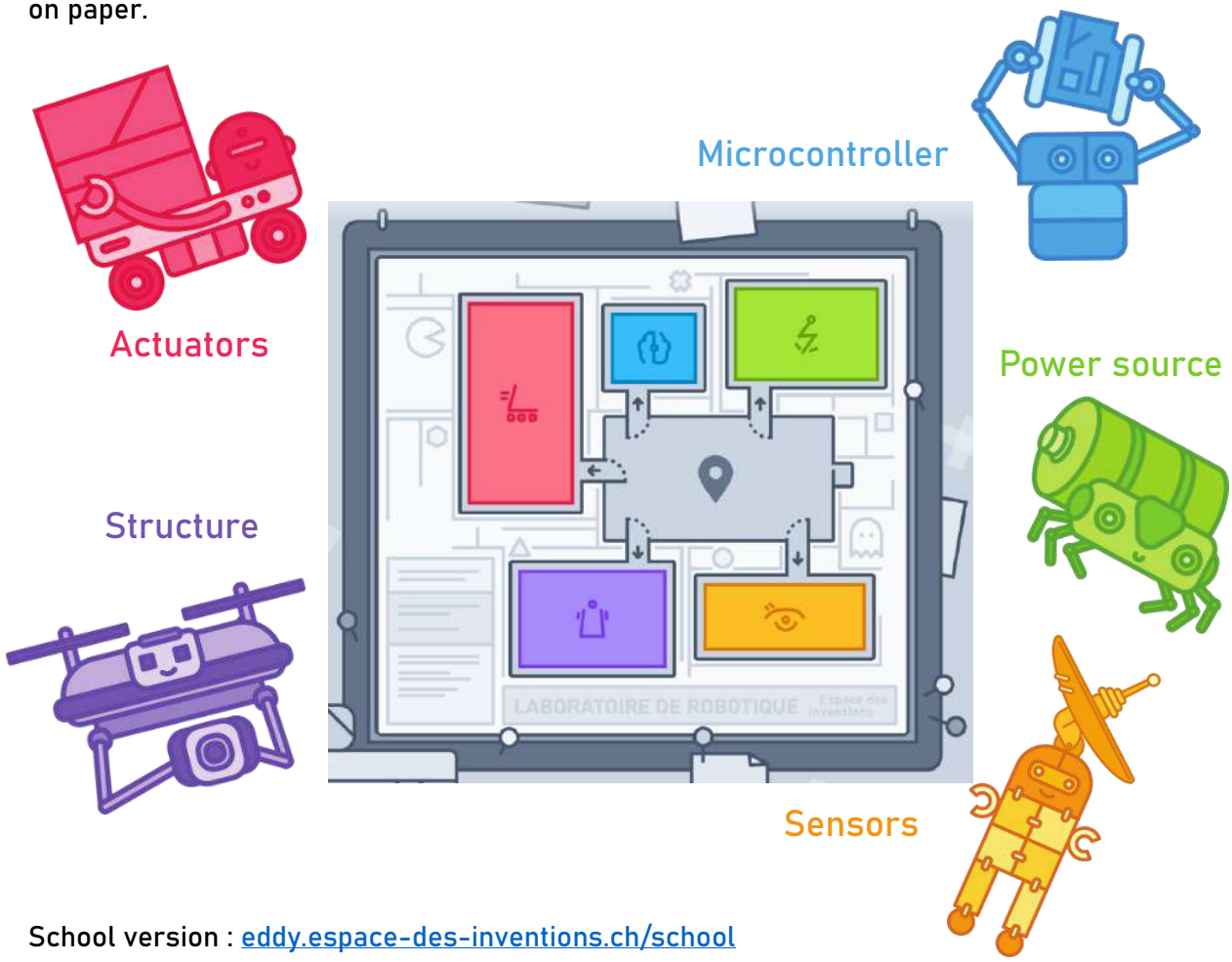
Espace des inventions
Lausanne

HEIG VD MEI
Media Engineering Institute

1. Introduction

This game is a story that combines two elements: 1) you are the hero and 2) an escape game. It is the result of a collaboration between the Espace des Inventions, a museum in Lausanne and the MEI (Media Engineering institute) of the HEIG-VD, in Yverdon (Switzerland). The game has been designed for children 8 and up as an introduction to the world of robotics. This education material is designed for classes from 6P to 8P

After entering a virtual robotics lab, the game covers five topics: sensors, actuators, microcontroller, power source and robot structure. For each topic, students explore a game room accessible from the main lab and solve a puzzle, with the aim of gaining the five elements needed to build a robot that will allow them to escape from the lab. Following or in parallel with the online game, each theme can be consolidated with three additional puzzles on paper.



School version : eddy.espace-des-inventions.ch/school

- ➔ Teachers' page : eddy.espace-des-inventions.ch/teachers
- ➔ Pupils' page eddy.espace-des-inventions.ch/pupils.

Public (individual) version : eddy.espace-des-inventions.ch

Links with PER objectives (for Cycle II) : MSN24, MSN25, MSN26, EN22, EN23

Contact for questions and comments : eddy@espace-des-inventions.ch

Eddy's secret – Educational materials

2. How it works in the classroom

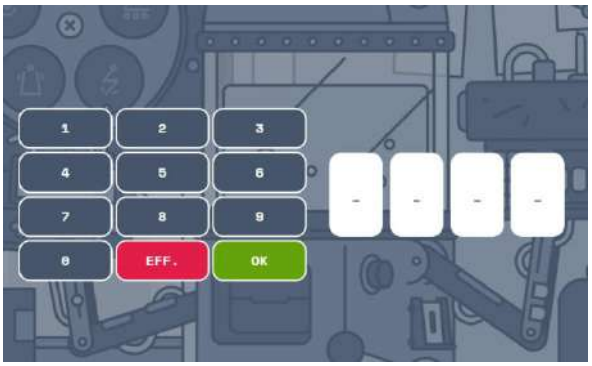
The school version of the game has an asymmetrical structure allowing the teacher to manage the overall progress of the game in front of the class while the students explore the themes and solve the puzzles on individual computers (or in pairs).

1. Online game

Teacher In front of the class → Teacher's page (/teachers)	Pupils Individually or by pairs → Pupil's page (/pupils)	
Introduction video	…	
…	Explore the room	For each of the 5 rooms
…	Solve the puzzle	
…	Write the code on the roadmap	
Enter the code in the machine	…	
Activate the robot element	…	
Conclusion video	…	

Introduction video (/teachers)

Room map in the pupils' page (/pupils)



Machine in the main laboratory (/teachers)

Sensors page(/pupils)

2. Puzzles on paper

- ➔ 3 supplementary puzzles of games per theme to consolidate knowledge of the online game.
- ➔ Possibility to alternate between 2 groups between the online game and the puzzles on paper, if the number of computers available is low.
- ➔ The codes obtained are entered on the roadmap for the final puzzle
- ➔ Summarizing activity « invent your robot » for the end of the sequence

Proposed sequences

- ➔ 2 periods
  - Online game only
  - Intro video – Exploration of the 5 rooms – Activation of the 5 elements of the robot – final video
- ➔ 5 periods
  - One period per theme / room explored
  - Online game + supplementary puzzles on paper, following each other or in parallel
  - If the teacher stays on the same computer, the game progression is saved from one period to another on the /teachers page
- ➔ 6 periods
  - Similar to the « 5 periods » version, adding an extra period for the wrap-up activity "invent your robot"
  - Creation of robots with a card game, then by drawing it or building it with legos or recycled materials
  - Possibility to use this as a starting point for another sequence in educational robotics or programming

3. Materials needed

Online game

- Computer with projection system or TBI and sound system
- One computer for two pupils (or more, if available)

Puzzles on paper

- Scissors, pencils, brads
- Riddles from the educational material printed on paper (some on thick paper or cardboard, as indicated). A black-and-white print is possible.

4. Summary of the puzzles and codes

1. Online puzzles (/pupils)

Room	Color	Code	Where do I find it?
Power source	Green	1859	
Actuators	Red	2331	
Microcontroller	Blue	1971	
Structure	Purple	1618	
Sensors	Orange	3241	

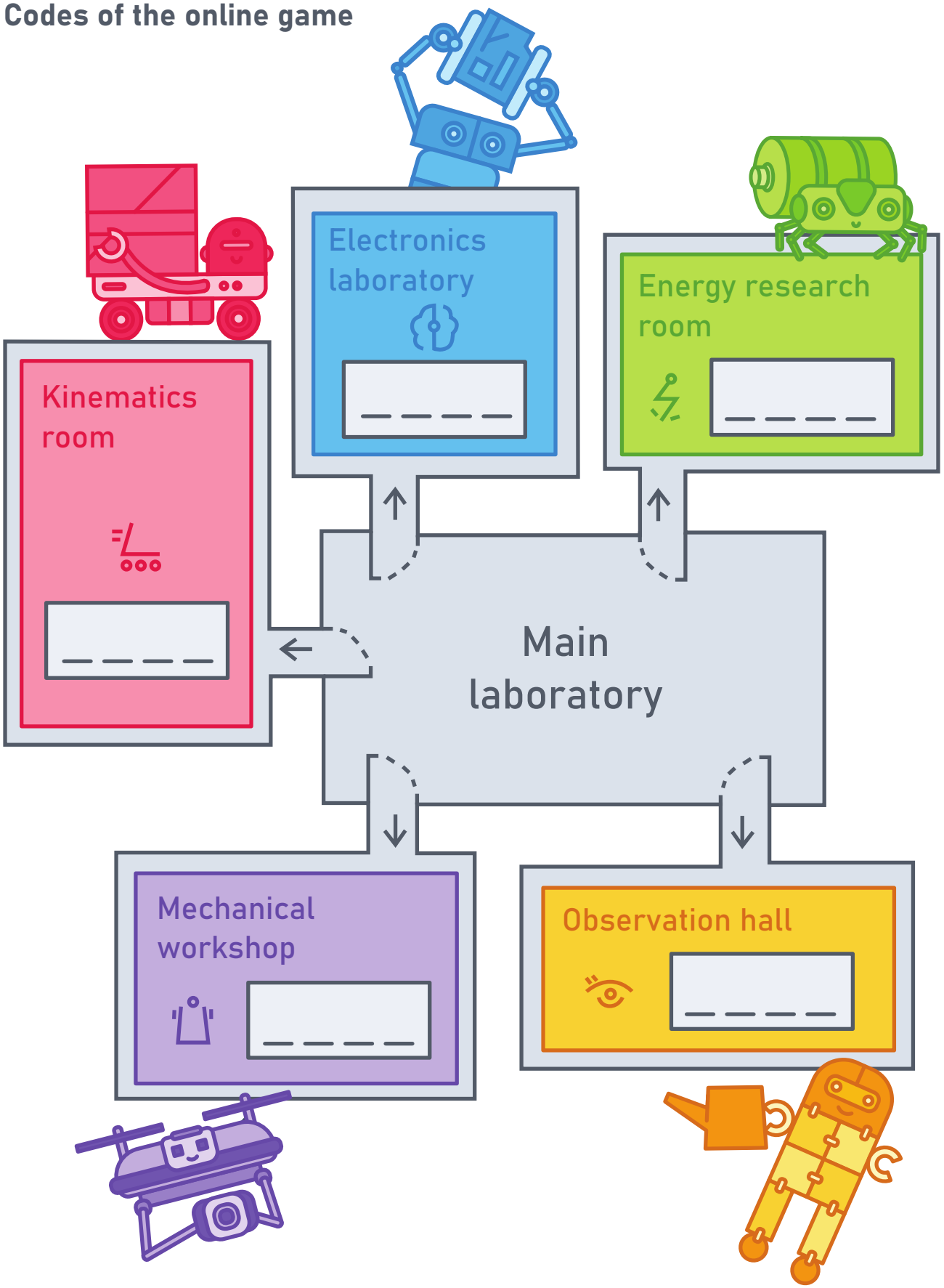
2. Puzzles on paper

Puzzle / Game	Theme	Level	Code	Material	Where do I find it?	On which paper ?
Electrical quiz	Power source	★★☆	Red planet	/	Eddy-power.pdf	Normal
Transfor-mations	Power source	★★★	Gadgets	Scissors	Eddy-power.pdf	Normal
Who consumes what ? - Game	Power source	★☆☆	/	Scissors	Eddy-power.pdf	Thick
Trajectories	Actuators	★☆☆	Heart	/	Eddy-actuators.pdf	Normal
The chocolate machine	Actuators	★★★	ArTiCuLaTiOn	Brads Scissors	Eddy-actuators.pdf	Thick
Tangram	Actuators	★★☆	848	Scissors	Eddy-actuators.pdf	Normal
Binary table	Micro-controller	★★★	35	/	Eddy-mcu.pdf	Normal
The carpets	Micro-controller	★☆☆	Sun	/	Eddy-mcu.pdf	Normal
The secret message	Micro-controller	★★☆	Are robots able to make jokes ?	/	Eddy-mcu.pdf	Normal
The maze	Structure	★★☆	42	/	Eddy-structure.pdf	Normal
Robotic jigsaw	Structure	★★★	4123	Scissors	Eddy-structure.pdf	Normal
Chimera game	Structure	★★☆	/	Scissors	Eddy-structure.pdf	Thick
Sensor crossword	Sensors	★★★	Intelligence	/	Eddy-sensors.pdf	Normal
Which sensors for which robot?	Sensors	★☆☆	843	Scissors	Eddy-sensors.pdf	Normal
Sensors and the five senses	Sensors	★★☆	471	/	Eddy-sensors.pdf	Normal
Final puzzle	All		ENG1N33R OR CRE47OR		Last page of this document	Normal
Invent your robot	Wrap-up		/	Scissors	Eddy-invent.pdf	Normal or Thick

5. Roadmaps for students (Online / paper-based puzzles)

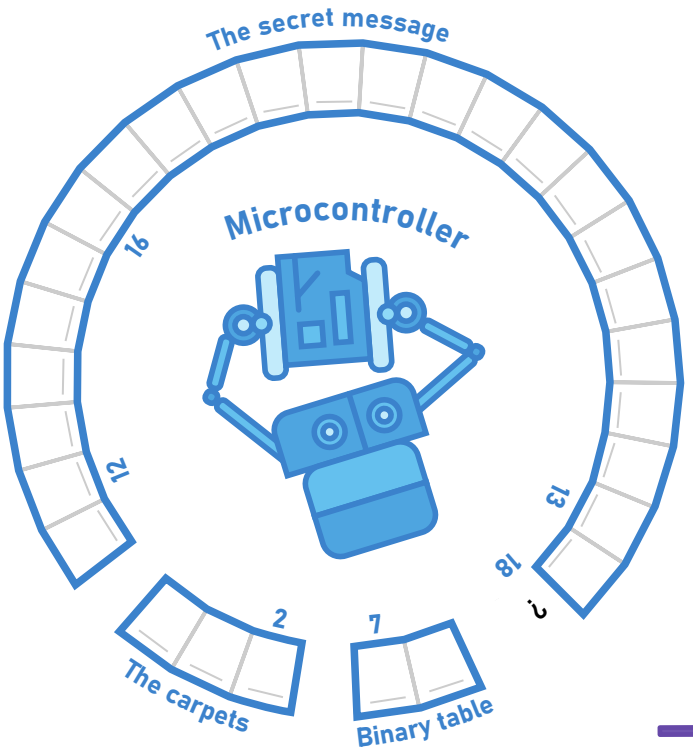
Eddy's Secret

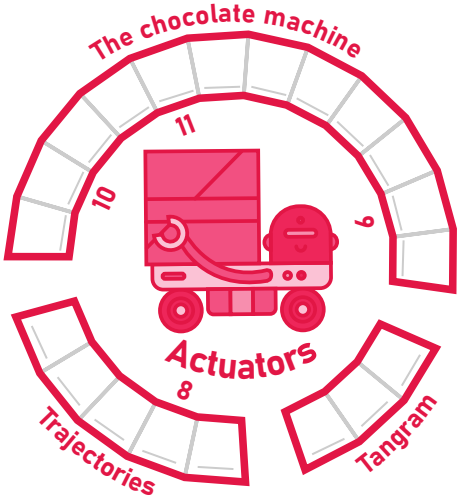
Codes of the online game

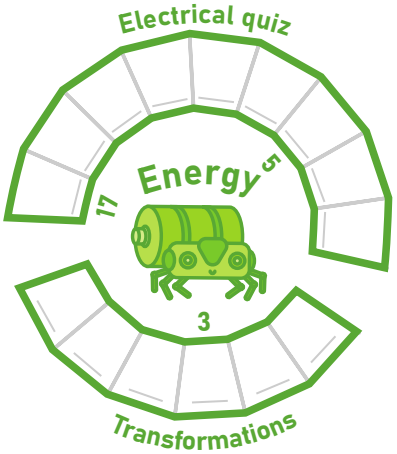


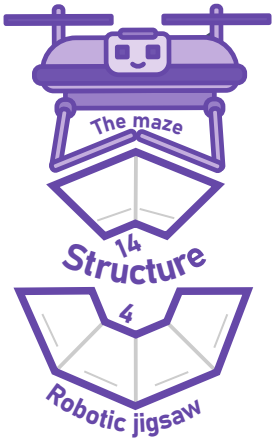
Eddy's Secret: final puzzle

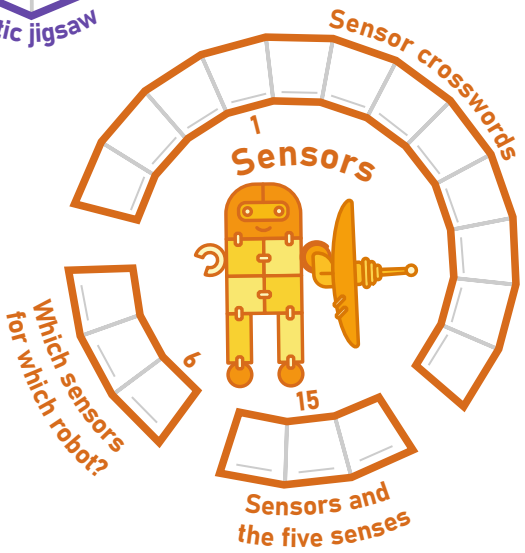
Using the codes of the puzzles on paper

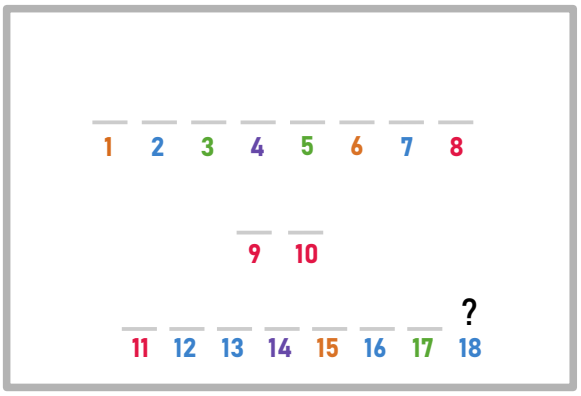








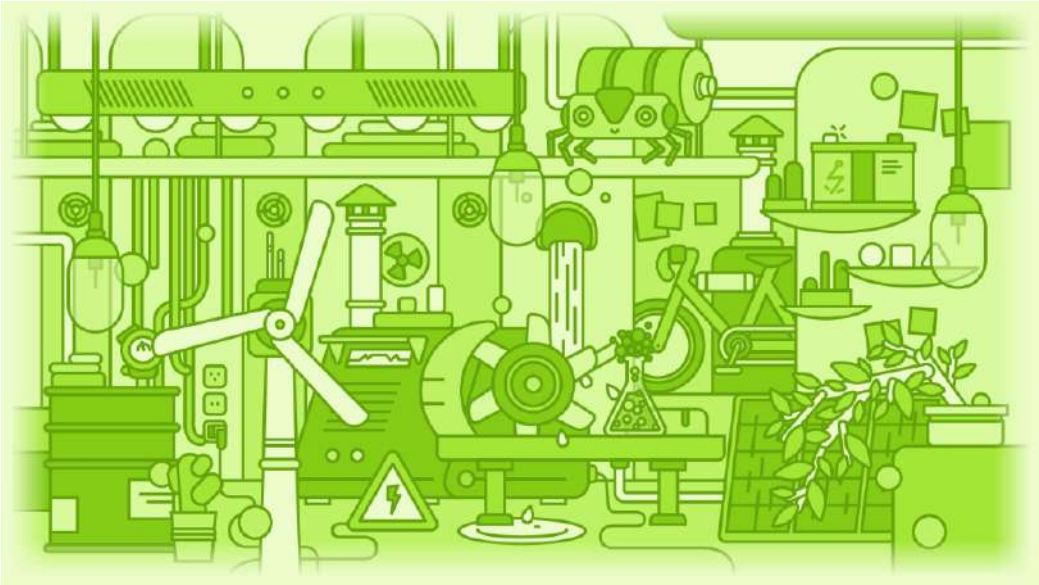




Eddy's Secret : Power source

1. Online game : room contents

The robot needs a source of electrical energy but this must come from somewhere. What ways are electricity made, and how can it be stored? Explore this here!



The different clickable elements as well as the text displayed in the game:

This socket delivers electricity. It does not generate electricity and can only carry it. Don't ever put your fingers in it!

The wind causes the turbine to turn. Wind can be a source of energy, for example when flying a kite or to turn the rotor blades of a wind turbine to generate electricity.

This plant is entirely green. It uses the energy of the sun. It uses the sun's rays to produce its own food through photosynthesis. Humans use solar panels to generate electricity.

Chemical reactions can also produce energy. This is how batteries work! The energy stored in batteries is released little by little through a chemical reaction.

To generate electricity, we can use oil or coal which have been buried in the ground for millions of years. Unfortunately, they are highly polluting and reserves are finite!

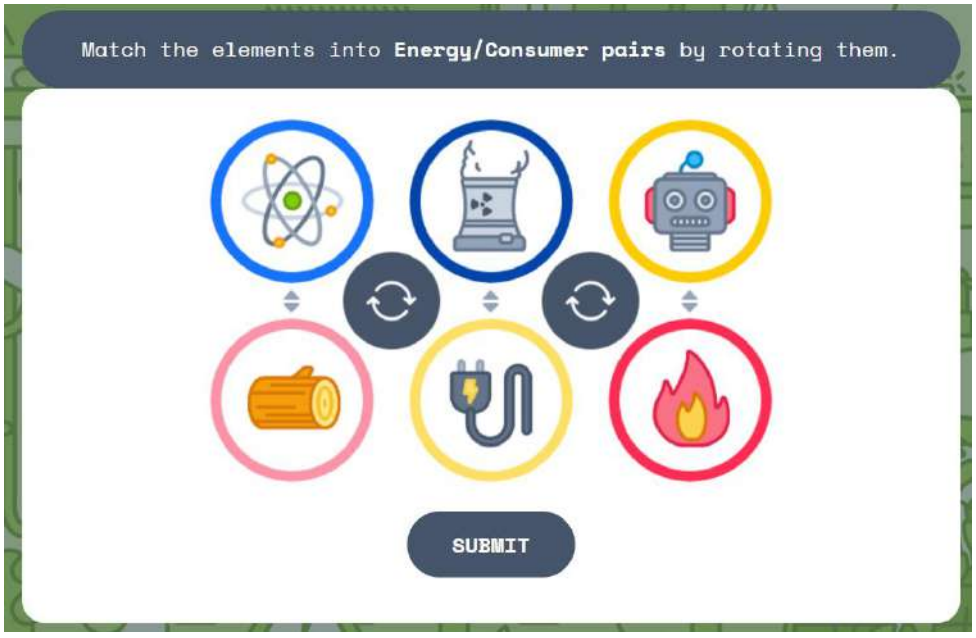
Electricity can be generated using the enormous energy contained in the nucleus of atoms and this is called nuclear energy. However, extracting it can be dangerous!

This is a turbine. Turbines are used in dams and generate electricity using water pressure. Turbines are environmentally friendly and water resources are renewable thanks to the rain and snow!

Pedalling a bicycle is a pollution-free source of energy! But it does not produce electricity… Generating electricity with the least possible pollution is extremely important to protect our planet. We can already do it, but it is not yet efficient enough, and many researchers continue to work on it!

The main puzzle starts when you click on the large battery containing the room symbol.

In this puzzle, you have to associate each type of energy with the one that consumes it. By pressing the arrows, the elements are rotated in relation to each other. The aim is to put the right pairs back in the right order. The code to find is 1859.



2. Additional puzzles on paper

Activity 1: Electrical quiz

Difficulty: ★★☆

Fill in the missing words in the cloze sentences based on the main concepts seen in the exploration of the room (different types of energy and ways of making electricity). When all the words are found, use the letters to find the secret code.

Objectives: Recognise some ways to make electricity
Recall information from the online game

Activity 2: Transformations

Difficulty: ★★★

In our daily lives, we often see transformations from one type of energy to another between: electrical, mechanical (movement), chemical (reactions between molecules), radiant (light radiation) and thermal (heat) energy. Cut out the different elements that transform energy, and then place them below with the correct starting and ending energy. Then you will find the letters of the secret code.

Objectives: Understand energy can be transformed from one type to another
Recognise different types of energy

Material : Scissors

Activity 3: Who consumes what? - GAME (no code)

Difficulty: ★☆☆

Energy occurs in many different contexts and can take many different forms. In this memorisation game, you will discover different elements that consume energy, and what form this energy takes, i.e. what fuel these elements consume. Cut out the cards and play the game like a classic memory game with a friend. It is up to you to find the right pairs with the help of the drawings!

Objectives: Understand energy can take different forms, and to know some of them
Correlate each element with its fuel

Material: Scissors

3. Answer to the additional puzzles

Electrical quiz

The force of the wind is used by _wind turbines_ (1) to make electricity and by _kites_ (2) to fly.

I eat different things every day to get energy. Plants, however, are satisfied with the same menu every day : _sunlight_ (3). Moreover, they make the _oxygen_(4) that we breathe.

Many researchers are trying to develop hydrogen-powered car engines, to replace petrol made from _oil_ (5). This would be much less polluting.

Can an electric _plug_ (6) make electricity? No, only transmit it!

In Switzerland, many dams have been built in the mountains to produce electricity thanks to the power of the _water_ (7): This is hydroelectric energy.

If we could store the huge amount of electricity contained in lightning during thunderstorms in a _battery_ (8), we would not need to find other ways to make electricity!

Huge power plants with large chimneys that use the energy contained in the atoms, that is _nuclear_(9) energy.

(1) W I N D T U R B I N E S

(2) K I T E S

(3) S U N L I G H T

(4) O X Y G E N

(5) O I L

(6) P L U G

(7) W A T E R

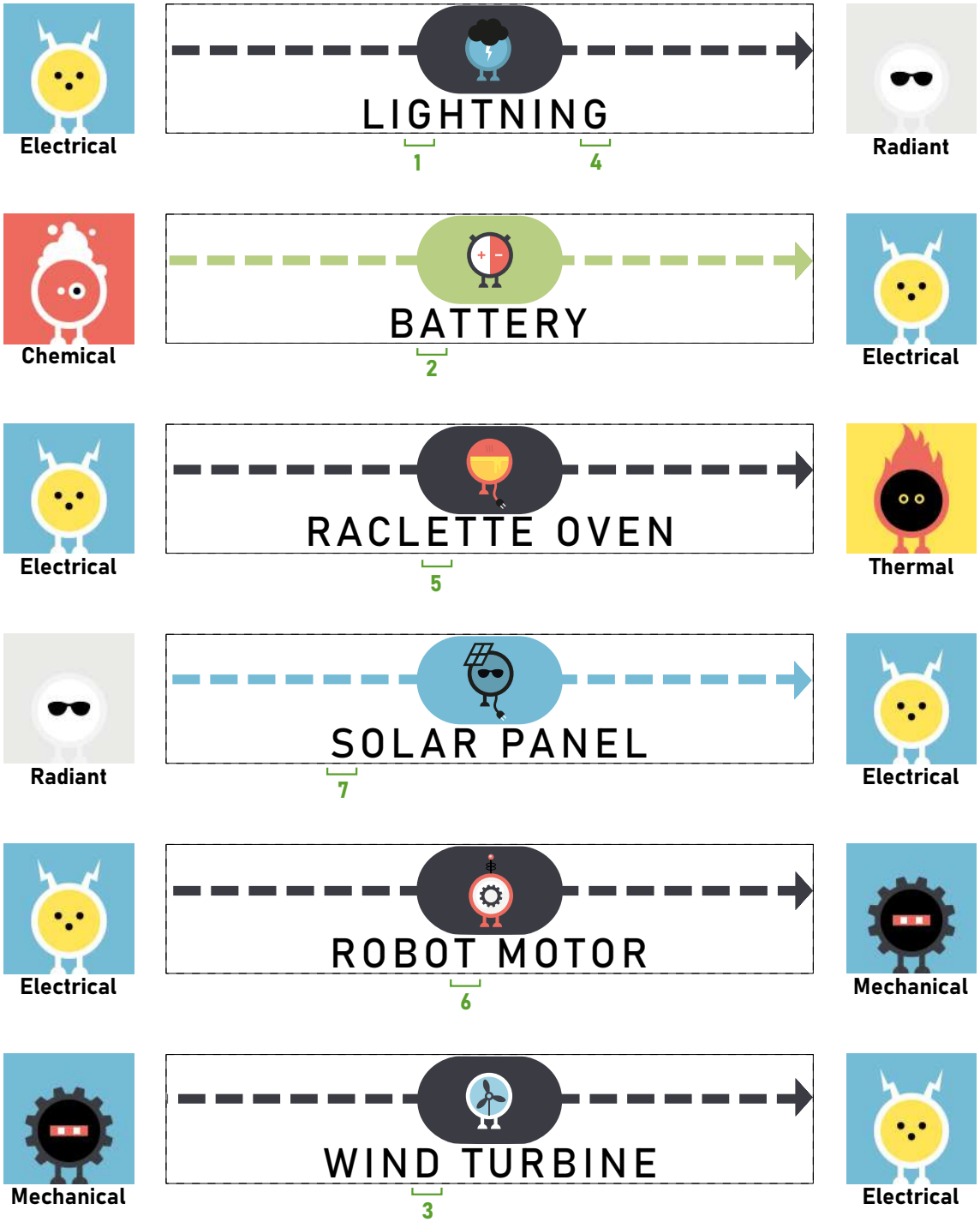
(8) B A T T E R Y

(9) N U C L E A R

Secret code: R E D P L A N E T

Transformations

In our daily lives, we often see transformations from one type of energy to another between: electrical, mechanical (movement), chemical (reactions between molecules), radiant (light radiation) and thermal (heat) energy. Cut out the different elements that transform energy, and then place them below with the correct starting and ending energy. Then you will find the letters of the secret code.



Secret code: G A D G E T S

Electrical quiz

The force of the wind is used by _____ (1) to make electricity and by _____ (2) to fly.

I eat different things every day to get energy. Plants, however, are satisfied with the same menu every day: _____ (3). Moreover, they make the _____(4) that we breathe.

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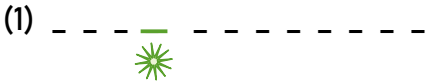
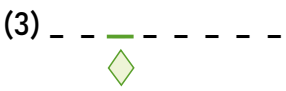
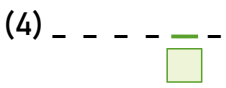
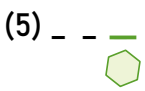
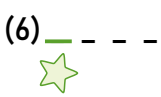
(1) 

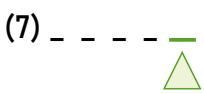
(2)

(3) 

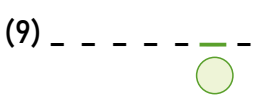
(4) 

(5) 

(6) 

(7) 

(8)

(9) 

Secret code:

Transformations

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Electrical

1 4

Radiant

Chemical

2

Electrical

Electrical

5

Thermal

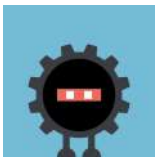
Radiant

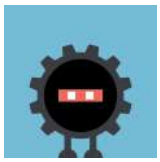
7

Electrical

Electrical

6

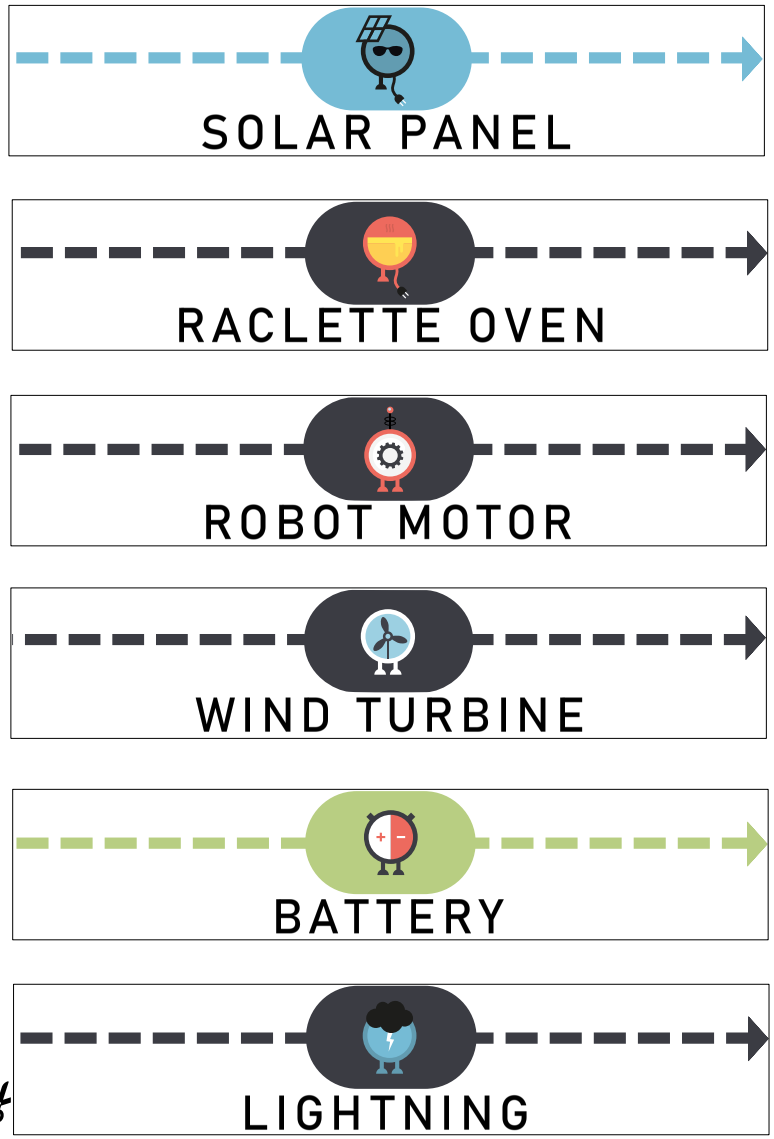

Mechanical


Mechanical

3

Electrical

Secret code: _ _ _ _ _ _ _


SOLAR PANEL
RACLETTE OVEN
ROBOT MOTOR
WIND TURBINE
BATTERY
LIGHTNING

Who consumes what ?

Energy occurs in many different contexts and can take many different forms. In this memorisation game, you will discover different elements that consume energy, and what form this energy takes, i.e. what fuel these elements consume.
Cut out the cards and play the game like a classic memory game with a friend. It is up to you to find the right pairs with the help of the drawings!

Qui consomme quoi?

Fire

consumes...

Espace des inventions

Qui consomme quoi?

... sunlight

Espace des inventions

Qui consomme quoi?

Plants

consume...

Espace des inventions

Qui consomme quoi?

Hot air balloons

consume...

Espace des inventions

Qui consomme quoi?

... gas

Espace des inventions

Qui consomme quoi?

... wood

Espace des inventions

Qui consomme quoi?

... uranium

Espace des inventions

Qui consomme quoi?

Cars

consume...

Espace des inventions

Qui consomme quoi?

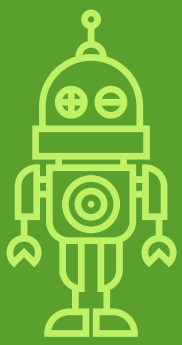
... oil

Espace des inventions

Qui consomme quoi?

Robots

consume...



Espace des inventions

Qui consomme quoi?

... electricity

Espace des inventions

Qui consomme quoi?

Kites

consume...

Espace des inventions

Qui consomme quoi?

Human beings

consume...

Espace des inventions

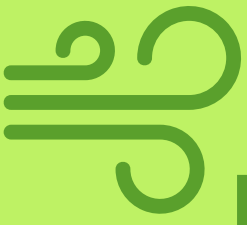
Qui consomme quoi?

... cake

Espace des inventions

Qui consomme quoi?

... wind



Espace des inventions

Qui consomme quoi?

Nuclear reactors

consume...

Espace des inventions

Qui consomme quoi?

... human energy (muscles)

Espace des inventions

Qui consomme quoi?

Bicycles

consume...

Espace des inventions

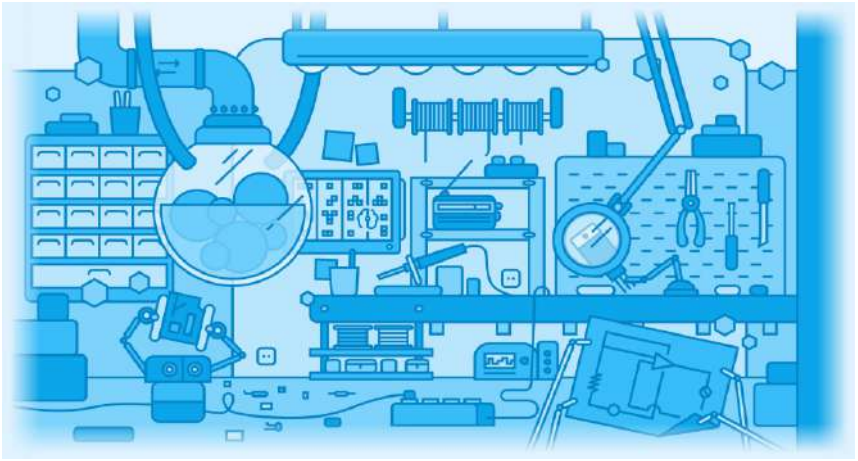
Eddy's Secret : Microcontroller

1. Online game : room contents

The microcontroller is the central element of each robot. It receives information from the sensors, calculates what the robot should do according to the program in its memory, and then sends its instructions to the actuators. It is in a way the "brain" of the robot.

It is connected to the different parts of the robot (e.g. sensors, motors, energy source) via inputs and outputs, and also contains a memory, in which the programme and the recorded data are stored, as well as a processor, which can perform the necessary calculations.

All signals that pass through the microcontroller are in binary language (0 or 1). This is because the processor is made up of thousands of transistors (mini-switches) which can be in state 1 (electricity flows) or 0 (it does not). They are combined together to form logic gates (and, or, inverter) which are the subject of the puzzle in this room. In turn, combinations of logic gates allow the processor to perform complex calculations.



Here are the different clickable elements, as well as the text displayed in the game:

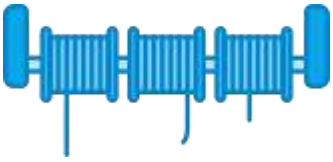
This looks like the schematic of a microcontroller. The microcontroller is like the brain of the robot. It receives information from the sensors, calculates what the robot should do according to its program, and sends commands to the motors. A microcontroller is an electronic chip that includes several components: Processor, which does complex calculations. Memory, which stores information (called data). Connections, which allow communication with other parts of the robot.

Here is a transistor! It is very small behind this magnifying glass. A transistor is a small switch used in electronic circuits. A microcontroller can contain thousands of transistors, so they must be tiny!

It looks like a microcontroller! But it is too old! This is a replica of the very first microcontroller invented in America by a calculator company. Ours must be more powerful, so this is not the right one for us!

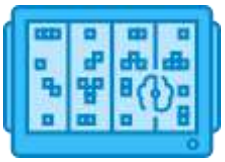
This radio surely contains a microcontroller! These days you can find them in almost any electronic device.

A rack of electronic components filled to the brim! Resistors, fuses, diodes, indeed there is almost everything here but no microcontroller.

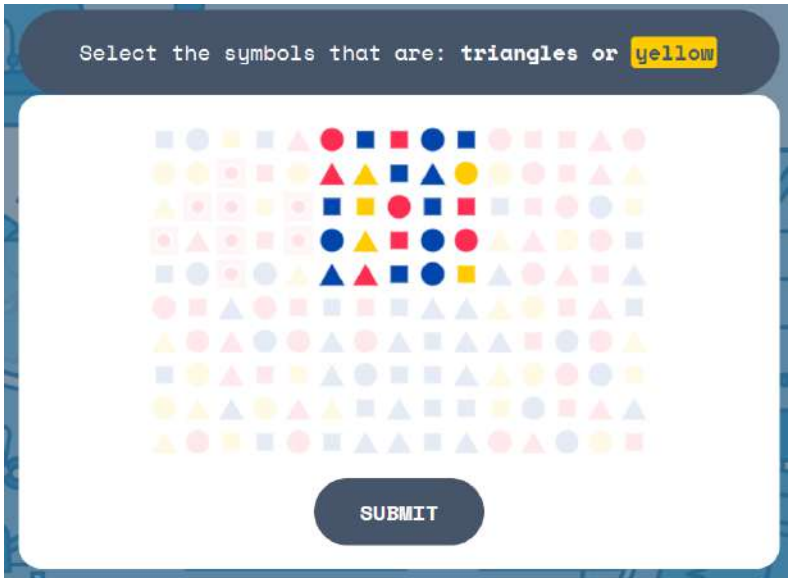


Small spools of thin cable. Useful for soldering. Soldering is used to connect electronic components together. Today they are so small that we almost always solder them with machines, not by hand!

Click on the light panel containing the room symbol to start the main puzzle.



In this puzzle, light up the correct pixels in each part of the screen by following the clues. Play the role of the microcontroller! Each pixel contains a triangle, square or round symbol, red, yellow or blue, and the clues are logical indications of these symbols. For example, select all the triangles or blue, square and red symbols, etc. The code to find is 1971.



2. Additional puzzles on paper

Activity 1: Binary table

Difficulty: ★★★

These numbers in computer language (0 and 1) code a black and white picture, line by line. The 0 corresponds to a black cell, and the 1 to a white cell. It is up to you to find the image by colouring the correct pixels in the grid in black and white. You will then see the secret code number appear.

Objectives : Apply the principle of coding an image by pixel with 0s and 1s
Recognise robots and computers use binary language

Activity 2: The carpet

Difficulty: ★☆☆

Play the role of the microcontroller for your robot and decide where it moves according to the colour of the carpet it is on, and following the instructions of the program. Start on the yellow mat at the bottom left and follow the instructions in the program until you reach a blue mat. The pattern of the blue mat you arrive on gives you the secret code.

Objectives: Recognise the role of the microcontroller in a robot
Practise how to follow a list of conditional instructions

Activity 3: The secret message

Difficulty: ★★☆

Computers and robots use 0's and 1's to communicate: this is the binary language. In order to encode a lot of information, sequences of 0s and 1s are used. For example, each letter of the alphabet is coded with a sequence of several 0's or 1's. This is called the ASCII code. Can you understand the language of robots and decode the following message using the alphabet available?

Objectives: Apply the principle of coding in binary language
Implement a letter-by-letter replacement code

3. Answer to the additional puzzles

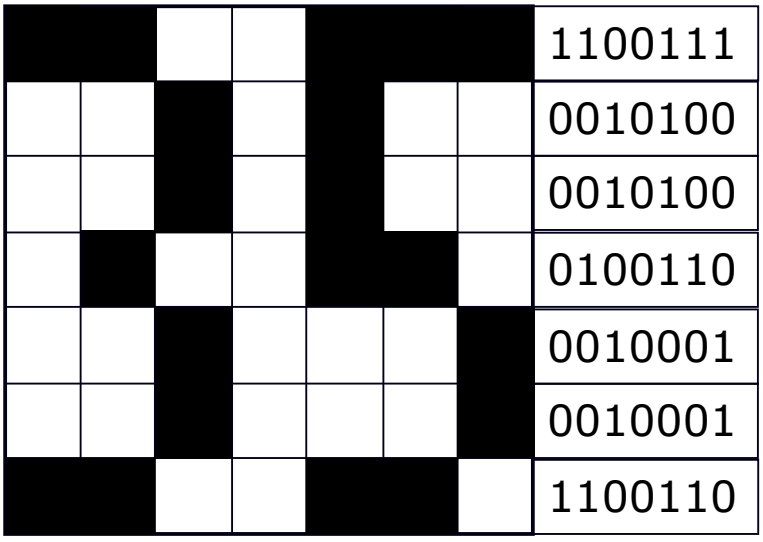
Binary table

These numbers in computer language (0 and 1) code a black and white picture, line by line. The 0 corresponds to a black cell, and the 1 to a white cell.

It is up to you to find the image by colouring the correct pixels in the grid in black and white. You will then see the secret code number appear.

1100111	0010100	0010100	0100110

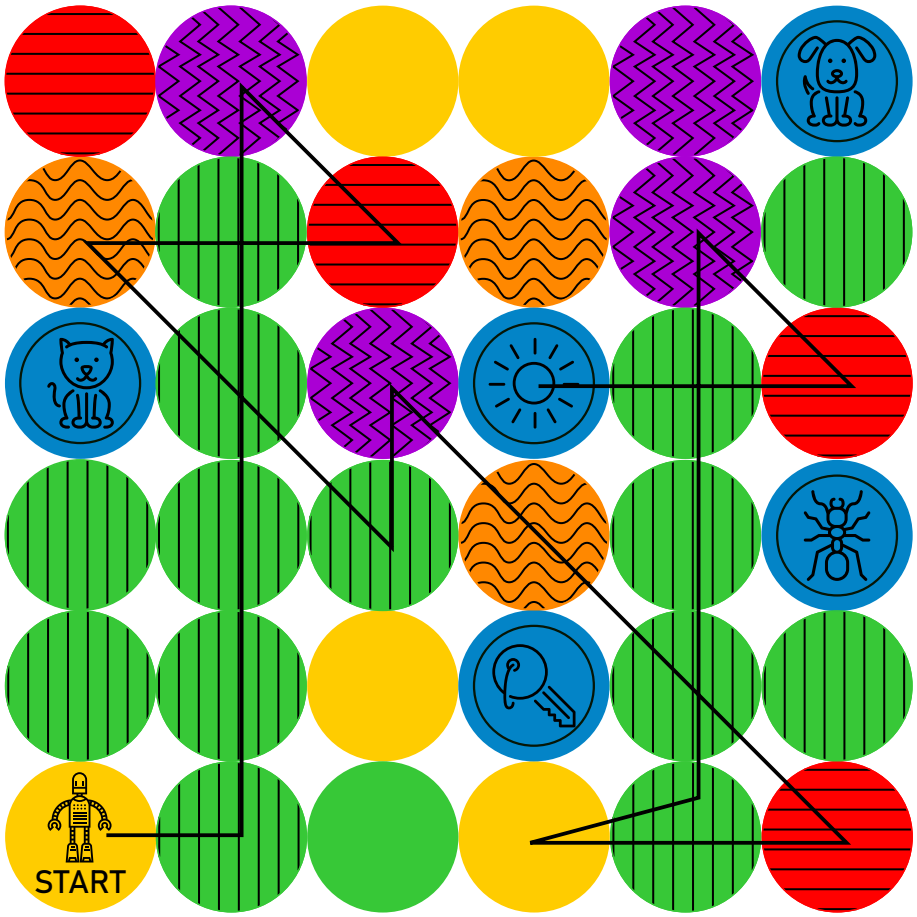
0010001	0010001	1100110

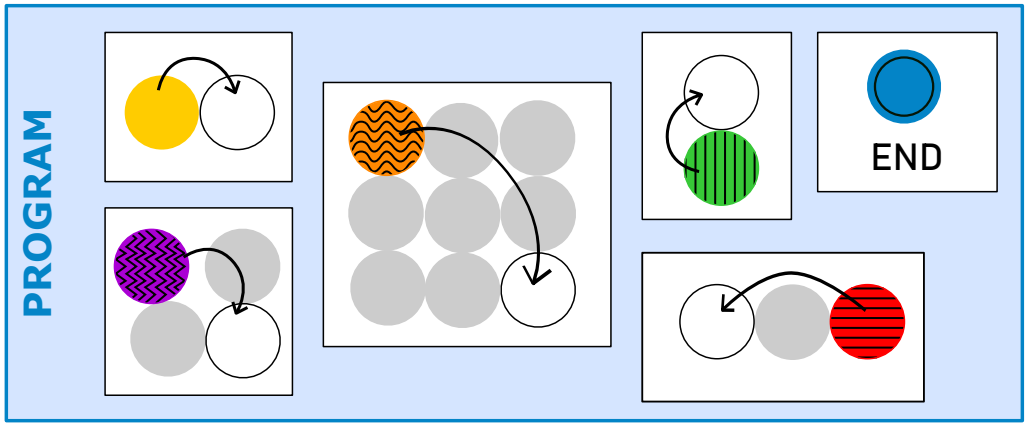


Secret code: 35

The carpets

Play the role of the microcontroller for your robot and decide where it moves according to the colour of the carpet it is on, and following the instructions of the program.
Start on the yellow mat at the bottom left and follow the instructions in the program until you reach a blue mat. The pattern of the blue mat you arrive on gives you the secret code.





Secret code: S U N

The secret message

Computers and robots use 0's and 1's to communicate: this is the binary language. In order to encode a lot of information, sequences of 0s and 1s are used. For example, each letter of the alphabet is coded with a sequence of several 0's or 1's. This is called the ASCII code.
Can you understand the language of robots and decode the following message using the alphabet available?

1000001 1010010 1000101 / 1010010 1001111

A R E / R O

1000010 1001111 1010100 1010011 /

B O T S /

1000001 1000010 1001100 1000101 / 1010100

A B L E / T

1001111 / 1001101 1000001 1001011 1000101

O / M A K E

1001010 1001111 1001011 1000101 1010011 ?

J O K E S ?

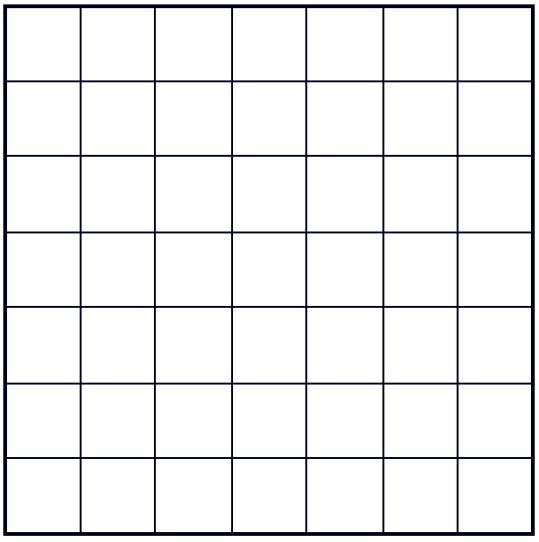
Binary table

These numbers in computer language (0 and 1) code a black and white picture, line by line. The 0 corresponds to a black cell, and the 1 to a white cell.

It is up to you to find the image by colouring the correct pixels in the grid in black and white. You will then see the secret code number appear.

1100111	0010100	0010100	0100110

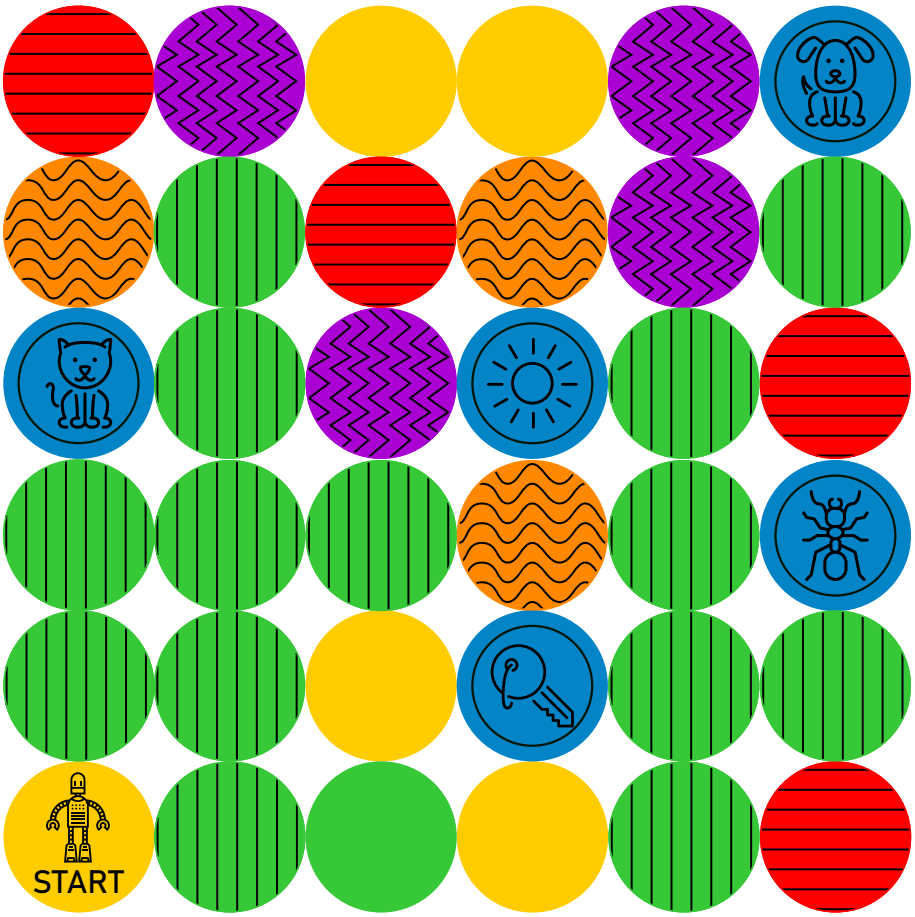
0010001	0010001	1100110

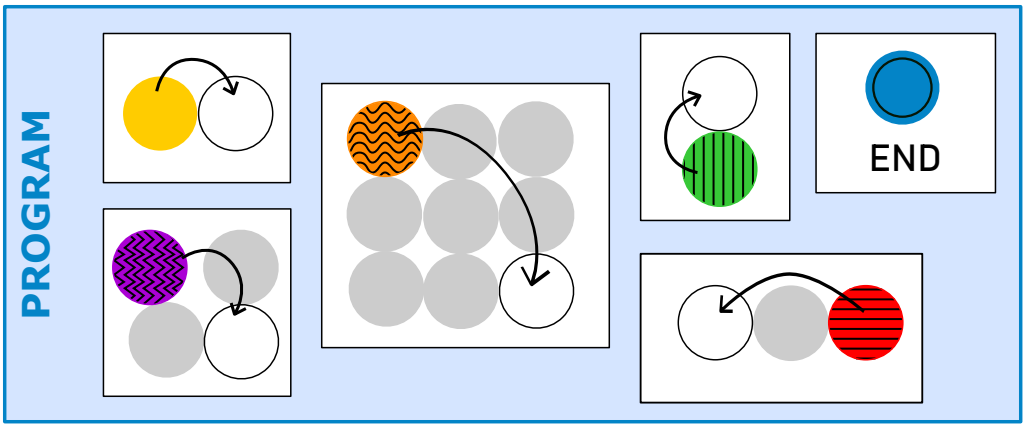


Secret code:

The carpets

Play the role of the microcontroller for your robot and decide where it moves according to the colour of the carpet it is on, and following the instructions of the program.
Start on the yellow mat at the bottom left and follow the instructions in the program until you reach a blue mat. The pattern of the blue mat you arrive on gives you the secret code.





Secret code: _ _ _

The secret message

Computers and robots use 0's and 1's to communicate: this is the binary language. In order to encode a lot of information, sequences of 0s and 1s are used. For example, each letter of the alphabet is coded with a sequence of several 0's or 1's. This is called the ASCII code.
Can you understand the language of robots and decode the following message using the alphabet available?

1000001 1010010 1000101 / 1010010 1001111

1000010 1001111 1010100 1010011 /

1000001 1000010 1001100 1000101 / 1010100

1001111 / 1001101 1000001 1001011 1000101

1001010 1001111 1001011 1000101 1010011 ?

?

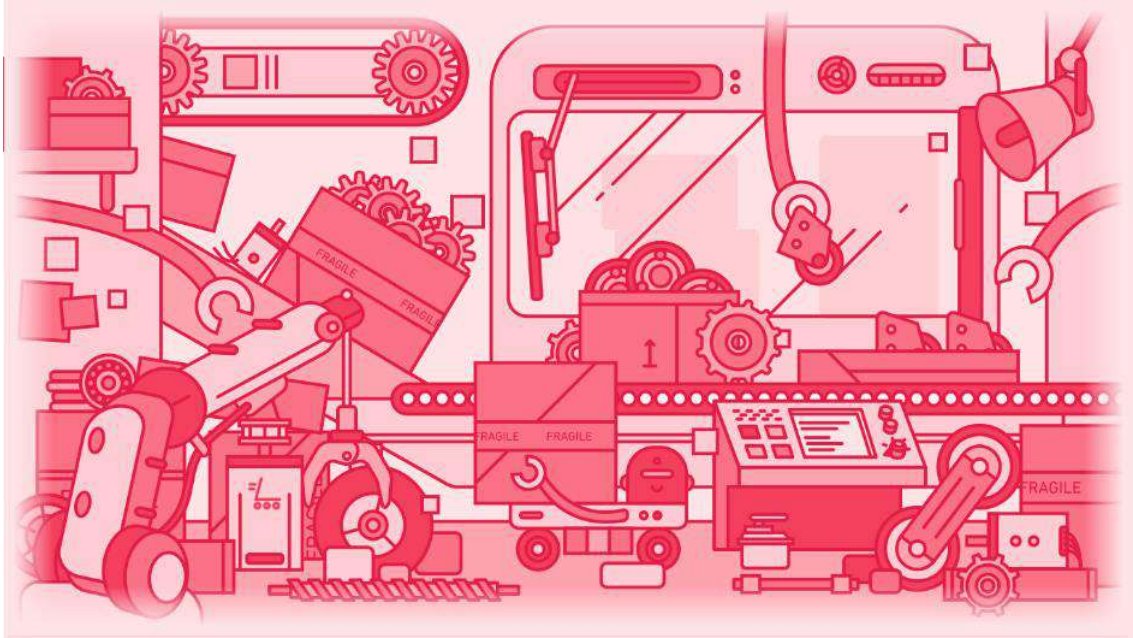
A 1000001	B 1000010	C 1000011	D 1000100	E 1000101
F 1000110	G 1000111	H 1001000	I 1001001	J 1001010
K 1001011	L 1001100	M 1001101	N 1001110	O 1001111
P 1010000	Q 1010001	R 1010010	S 1010011	T 1010100
U 1010101	V 1010110	W 1010111	X 1011000	Y 1011001
		Z 1011010		

ASCII code

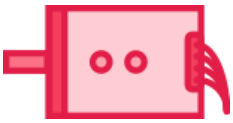
Eddy's Secret : Actuators

1. Online game : room contents

Actuators are all elements that can modify the behaviour of the robot. This modification can be made by: motors moving, LEDs emitting light, loudspeakers emitting sound or with Wifi or radio waves.



Here are the different clickable elements, as well as the text displayed in the game:



This motor is too small. Did you know that this is also an actuator? An actuator is anything that converts one type of energy into another, e.g., turning electricity into motion or light.

Gears and pulleys are widely used to convey motion, or even to speed up or slow down motion, as needed.

By combining motors moving in different directions, we can create very complex movements, e.g., some robotic arms.

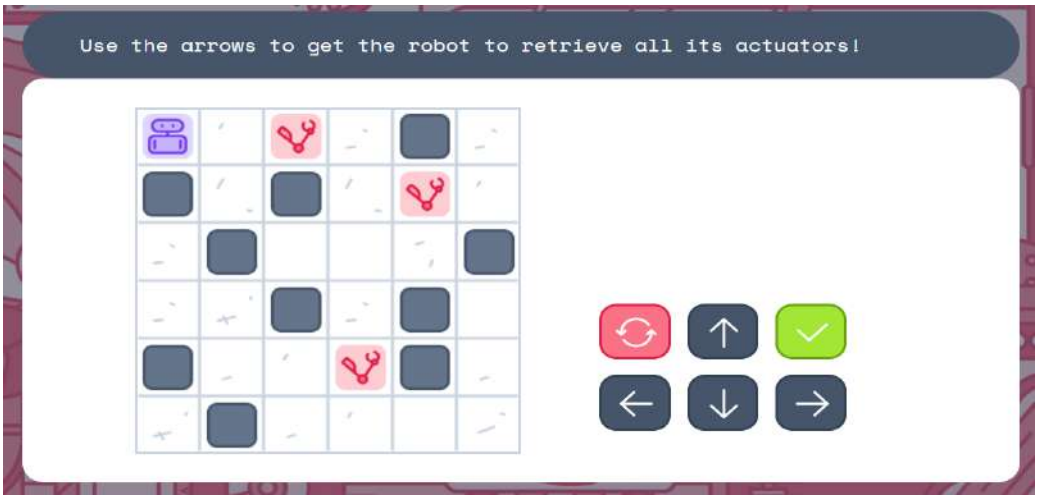
Not every actuator is a motor! It can also refer to a source of sound, for example, just like with this loudspeaker.

Not every actuator is a motor! It can also refer to a source of light, for example, the multi-coloured LEDs in this light panel. That's right! By combining the light of red, green and blue LEDs, any colour can be emitted. This is what happens inside every pixel on a computer screen.

The motors in a robot depend on how it works. Will the motors drive wheels, robotic arms or rotor blades? This one has to lift objects with its arms and move using its wheels!

The main puzzle starts when you click on the large engine containing the room symbol.

In this puzzle you have to collect all the necessary actuators from a grid: motors for the articulated arm and for the tracks, coloured LEDs and a loudspeaker. To do this, you have to plan the robot's path on the grid, with a sequence of arrows, avoiding obstacles. The code to find is 2331.



2. Additional puzzles on paper

Activity 1: Trajectories

Difficulty: ★☆☆

A drawing has been coded with arrows. You have to draw the trajectory to decode it, starting from the coloured square. The secret code is the name of the drawing you get.

Objective: Carry out a series of instructions

Activity 2: The chocolate machine

Difficulty: ★★★

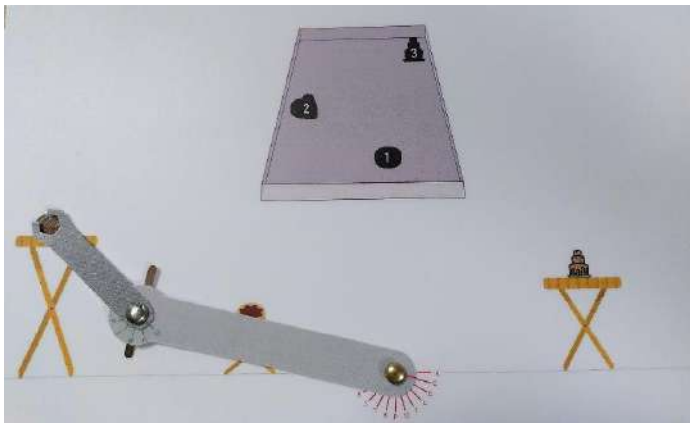
You are an engineer and you have to program the robotic arm of a machine that places chocolates in their boxes. Start by cutting out the machine and the two parts of the robot arm. Cut small holes in the black circles and join them together with two brads. Pay attention to the colours: the red lines must be together, and the green lines too. To program the position of the arm, you have to find a code with an uppercase letter (position of the big arm, in red) and a lowercase letter (position of the small arm, in green). For example, the code for the chocolate heart is Cu. Your task is to program the robot to grab each item from its table, and place it on its black silhouette in the box, in the order indicated by the numbers.

If you program the right sequence of movements, the secret code will appear.

Objectives: Plan a series of instructions
Understand and utilise a new positional coding system

Materials: Two brads
Scissors

It is advisable to print the material on thick paper or cardboard



Activity 3: Tangram

Difficulty: ★★☆

You have built a beautiful robot, covered with LEDs to colour its surface. Unfortunately, the LEDs have gone out and the colours are no longer visible! You have to cut out the coloured pieces and put them back in the right place on the robot's silhouette to fix it. When the robot has all its colours, you will see a 3-digit secret code appear. Attention: the number 0 is not part of the secret code!

Objectives: Understand that LEDs are also actuators
Reconstruct a silhouette from simple shapes

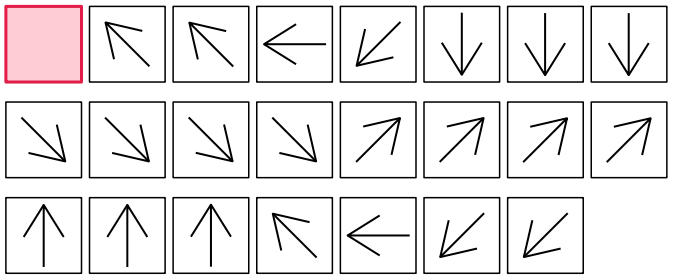
Material: Scissors

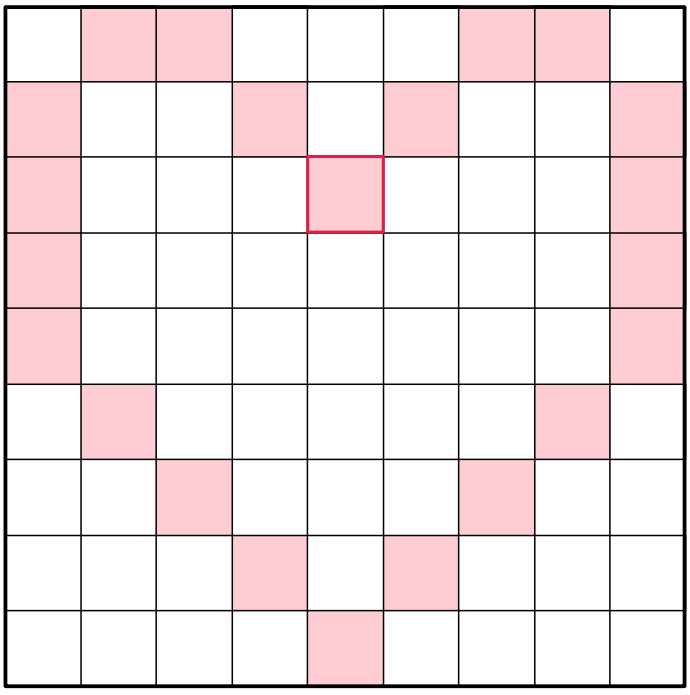
3. Answer to the additional puzzles

Eddy's secret – Actuators

Trajectories

A drawing has been coded with arrows. You have to draw the trajectory to decode it, starting from the coloured square. The secret code is the name of the drawing you get.





Secret code: H E A R T

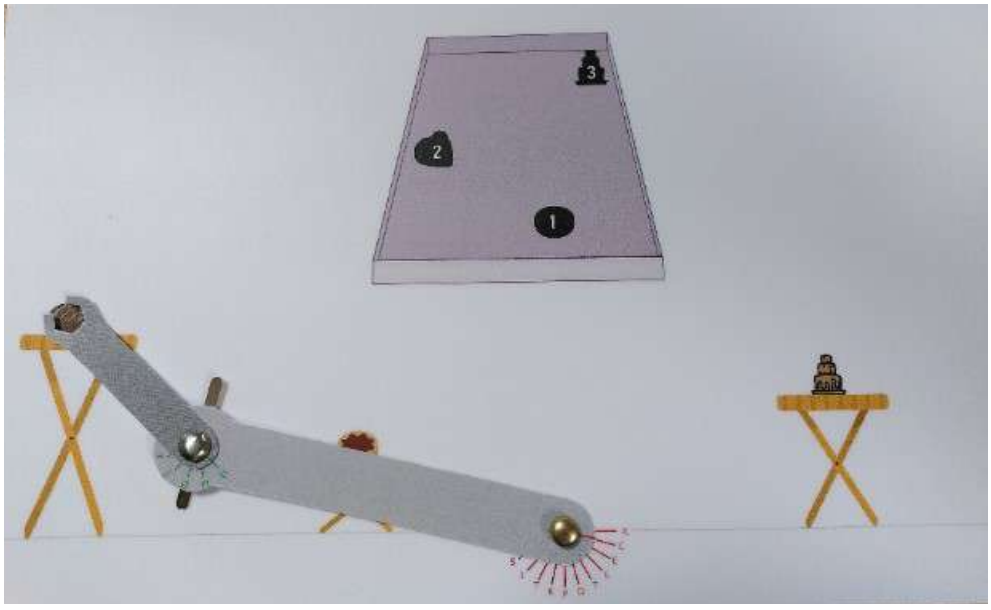
The chocolate machine

You are an engineer and you have to program the robotic arm of a machine that places chocolates in their boxes.

Start by cutting out the machine and the two parts of the robot arm. Cut small holes in the black circles and join them together with two brads. Pay attention to the colours: the red lines must be together, and the green lines too.

To program the position of the arm, you have to find a code with an uppercase letter (position of the big arm, in red) and a lowercase letter (position of the small arm, in green). For example, the code for the chocolate heart is Cu.

Your task is to program the robot to grab each item from its table, and place it on its black silhouette in the box, in the order indicated by the numbers.



Secret code: A r T i C u L a T i O n

Tangram

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Unfortunately, the LEDs have gone out and the colours are no longer visible!

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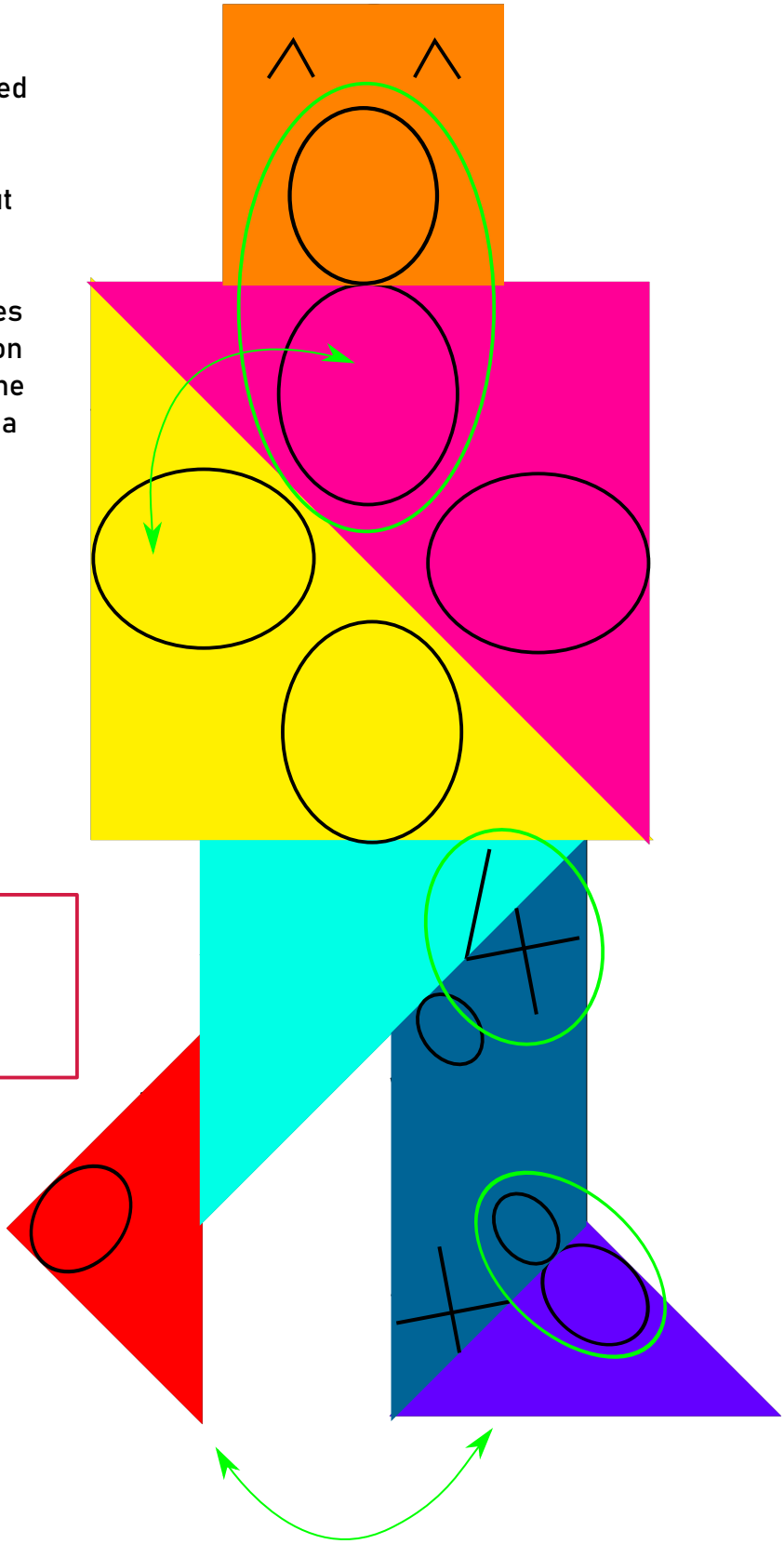
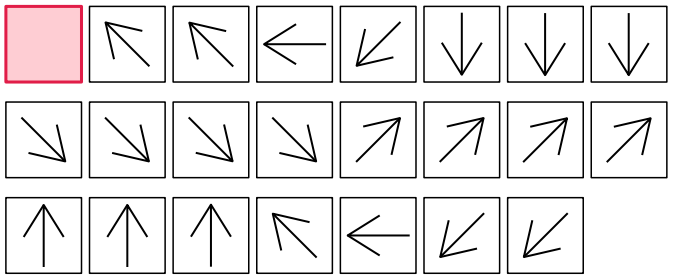
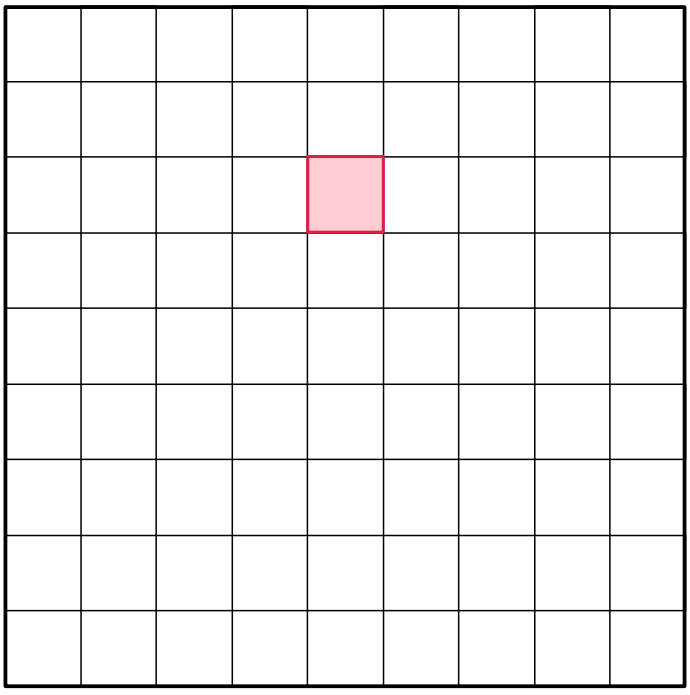


Secret code: 8 4 8

Trajectories

A drawing has been coded with arrows. You have to draw the trajectory to decode it, starting from the coloured square. The secret code is the name of the drawing you get.





Secret code: _ _ _ _ _

The chocolate machine

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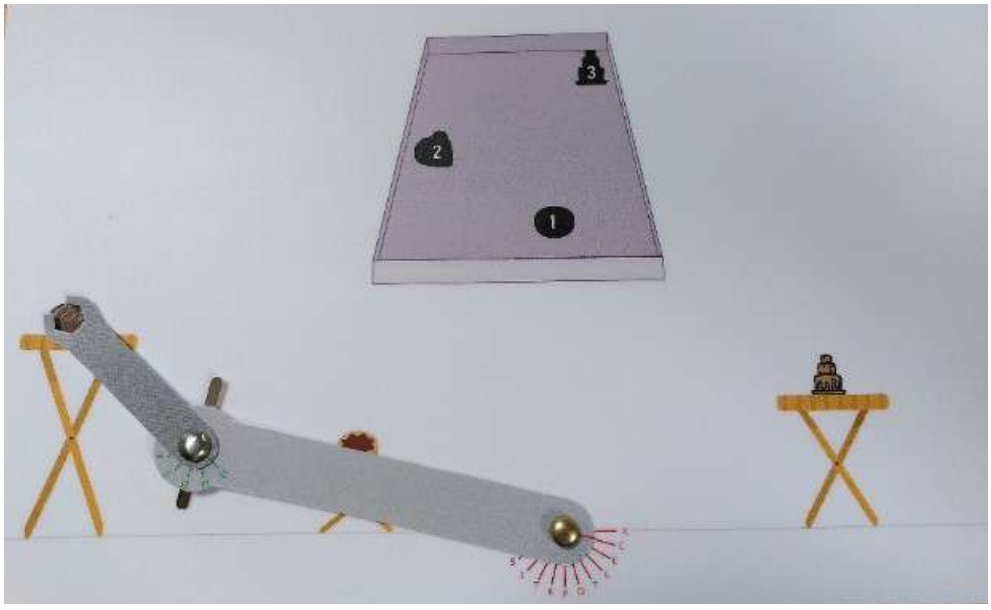
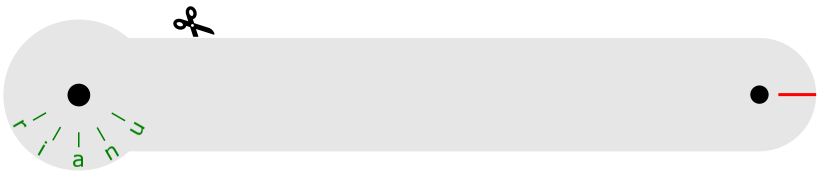
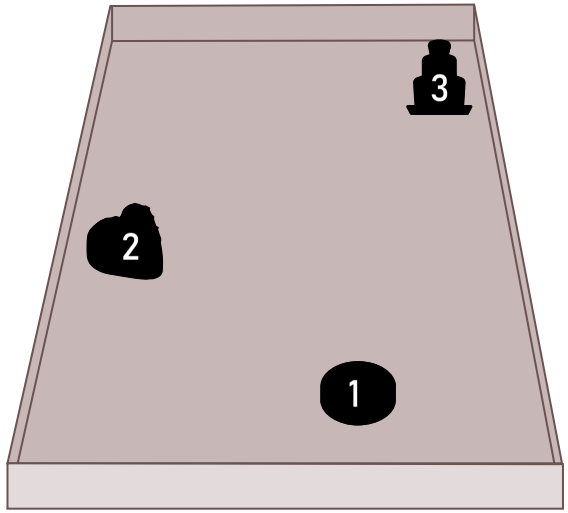
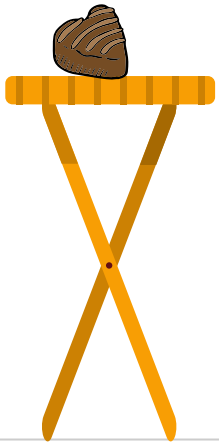
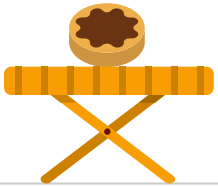


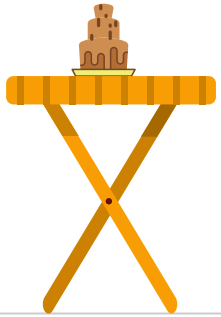
Secret code: _ _ _ _ _ _ _ _ _ _ _ _




3
2
1







Tangram

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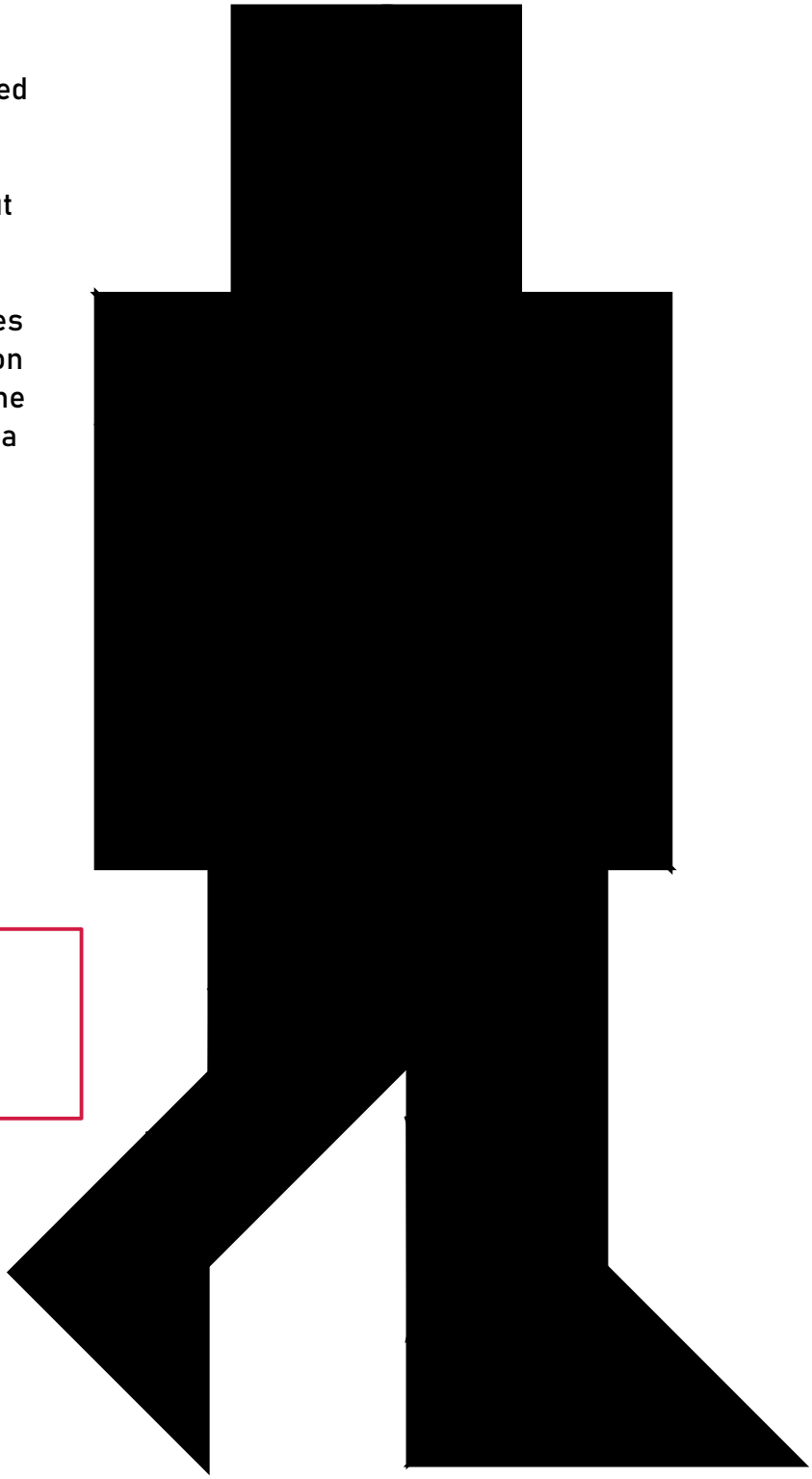
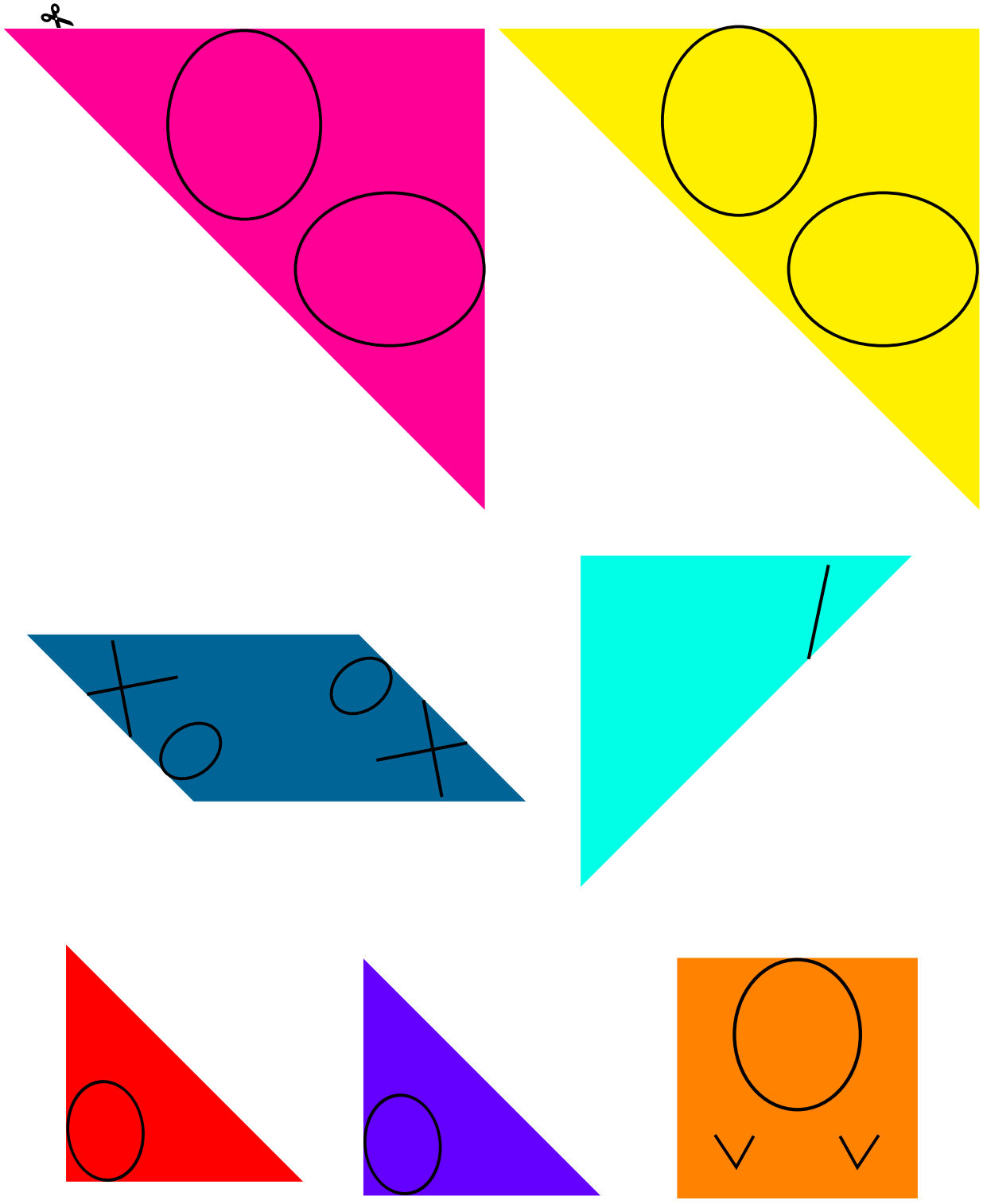


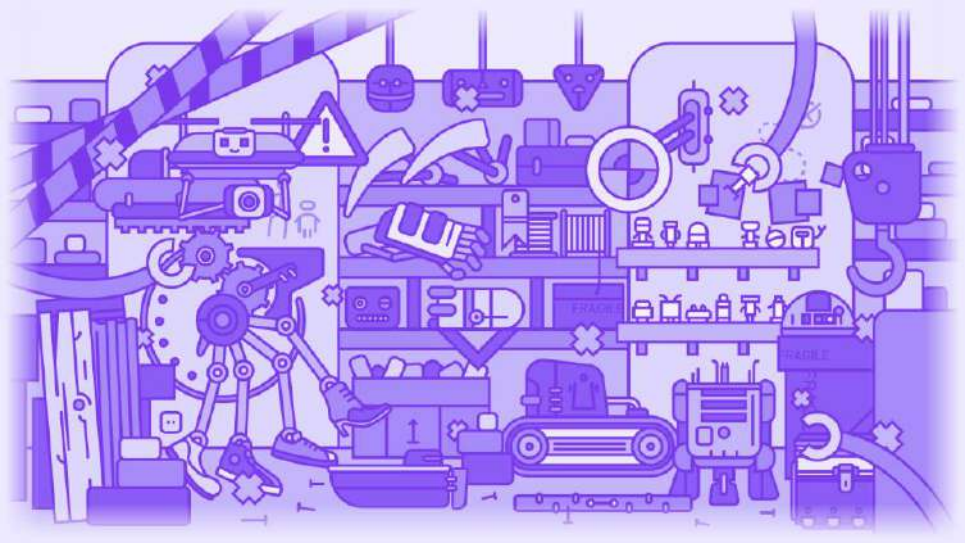
Secret code: _ _ _



Eddy's Secret : Structure

1. Online game : room contents

The robot needs a basic structure that gives it its shape and strength. This can be a skeleton, for example, for humanoid robots, or a chassis for wheeled or tracked robots. The right materials should be chosen according to the function of the robot: should it be light enough to fly, very strong, or resistant to humidity? Should it be able to float, be very manoeuvrable or be extremely precise in its movements?



Here are the different clickable elements, as well as the text displayed in the game:

Wood, plastic, metal. The choice of construction material is very important to ensure that the robot is the right weight and strength.

This robot looks familiar! However it does not look very good without its head!

To mimic the complexity of the human body's muscles, a robotic arm needs a large number of motors.

There are a great many types of robots. The general shape of the robot depends on its use. Does it need to walk like a spider, drive like a car, fly like an insect, or be impact resistant?

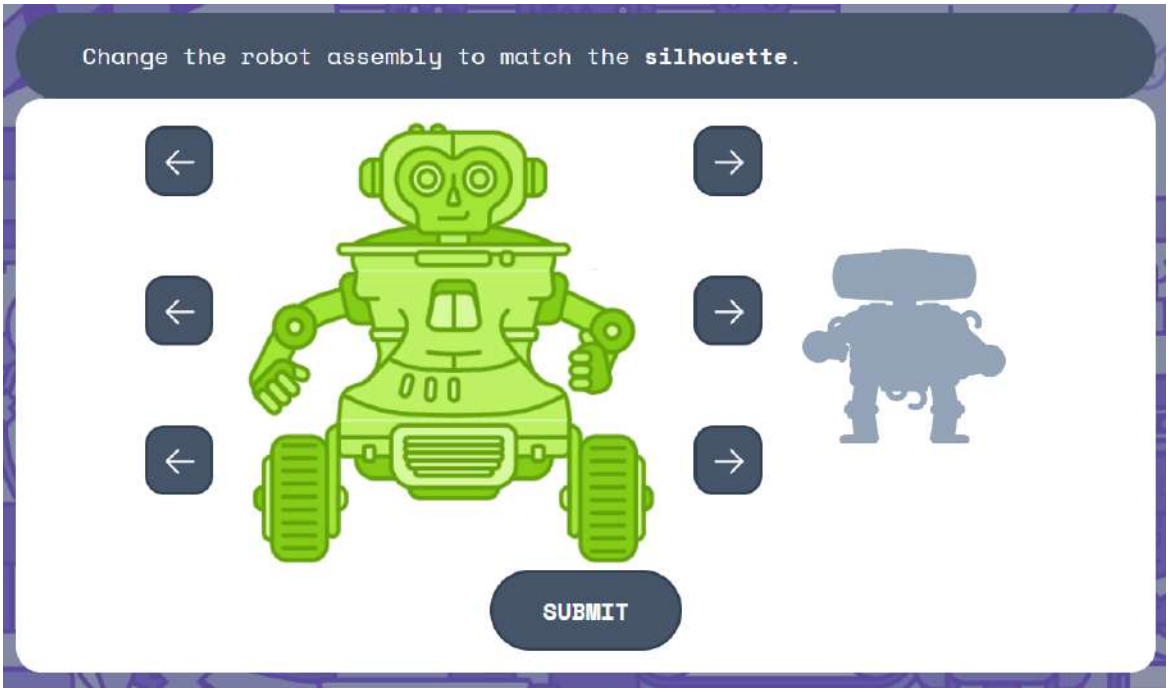
The chassis for this drone is very light. Even with its rotor blades and small motors, it is still light enough to fly!

Some robots can go in water. They have a chassis that looks like a boat hull.

Humanoid robots have a skeleton that is similar to that of humans. They have a head, arms, legs, etc. and are very complex robots!

The main puzzle starts when you click on the room symbol and it is a chassis with linked metal tracks which the road wheels run along.

In this puzzle, find the right parts of each robot and assemble them so that the robot matches its silhouette. The code to find is 1618.



2. Additional puzzles on paper

Activity 1: The maze

Difficulty: ★★☆

Find your way through this maze by finding the correct lock. At each intersection, answer the question to choose the correct path! Are you ready? Yes? Then enter the maze at the arrow. Good luck!

Objectives: Associate the link between a robot and its use
Identify the questions to ask when designing a robot
Pracise the logical notion of "if... then"

Activity 2: Robotic jigsaw

Difficulty: ★★★

You are a robotics engineer and you have to build 4 robots that have a specific function. Using the descriptions and the silhouettes, find and assemble the correct elements: sensors, actuators, structure and power source in order to find the secret code.

Objectives: Find the link between the structure and function of a robot
Recognise the elements necessary for a robot to function

Material: Scissors

Activity 3: Chimera Game - GAME (no code to find)

Difficulty: ★★☆

In this game of observation and strategy, each player has to reconstruct the robots from their silhouette through collecting the correct pieces that make them up. Pay attention to the small details and avoid the traps set by the other players!

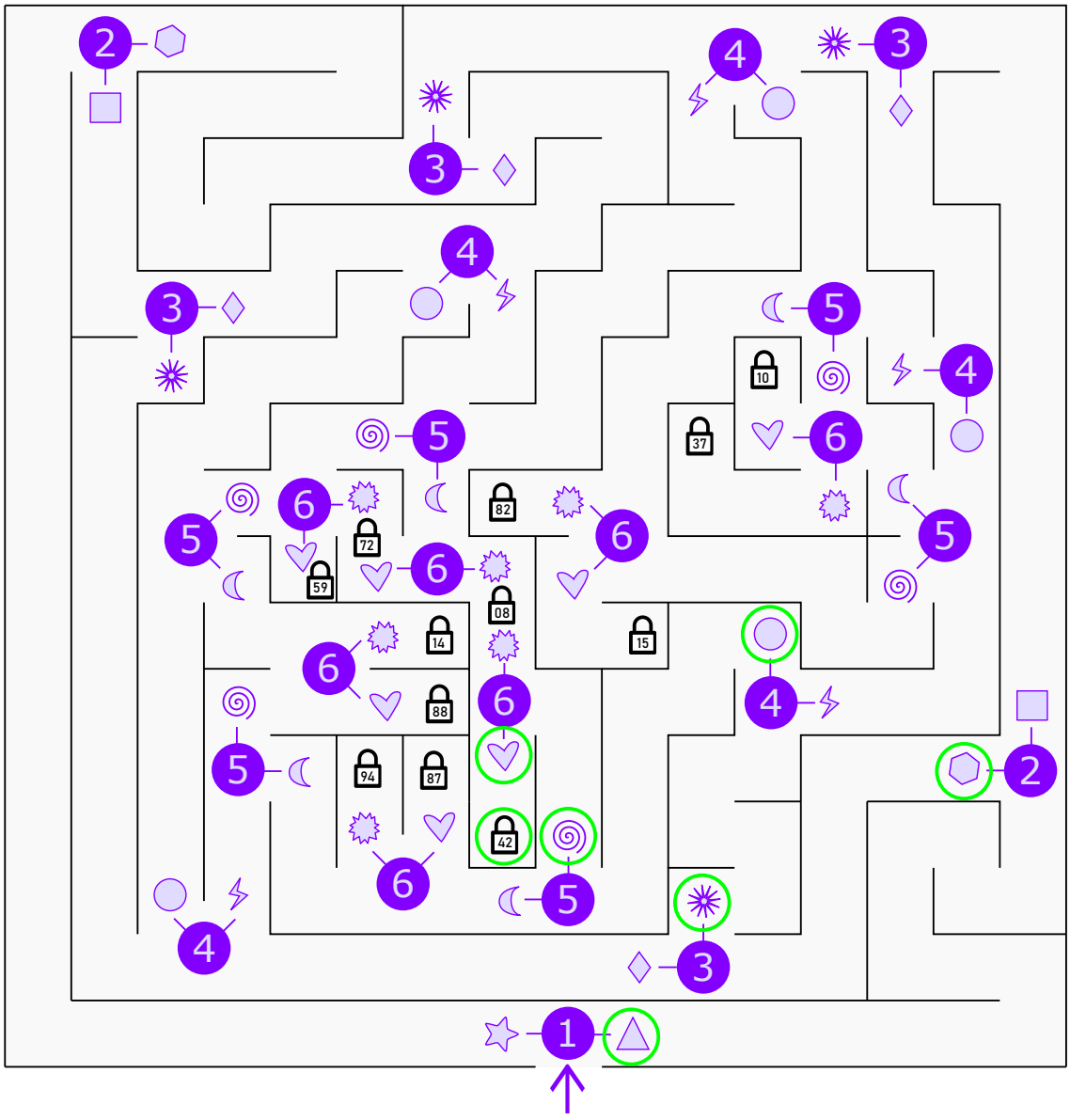
Objective: Locate the parts of a robot from its silhouette

Material : Scissors

3. Answer to the additional puzzles

The maze

Find your way through this maze by finding the correct lock. At each intersection, answer the question to choose the correct path!
Are you ready? Yes? Then enter the maze at the arrow. Good luck!



1 Is it more important for a drone to be :

light or large ?

2 Is it more important for an autonomous car to be :

fast or safe ?

3 Is it more important for a lawnmower robot to be :

moisture resistant or heavy ?

4 Is it more important for a Mars exploration robot to be :

energy self-sufficient or bendy ?

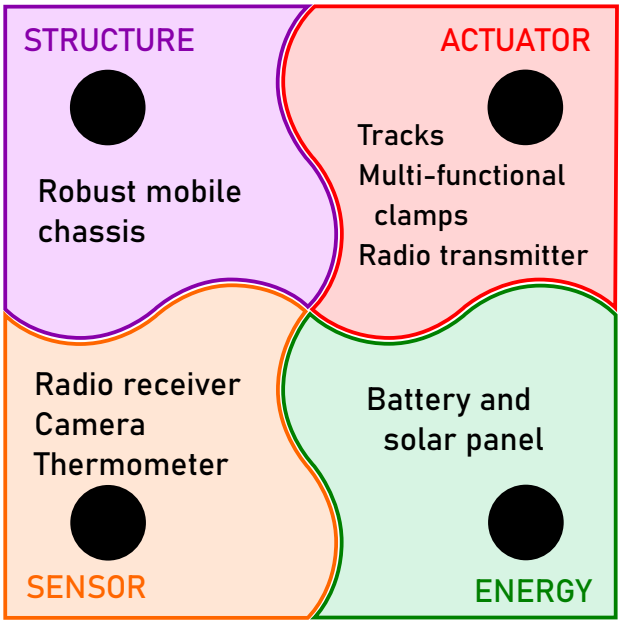
5 Is it more important for a surgical robot to be :

portable or reliable ?

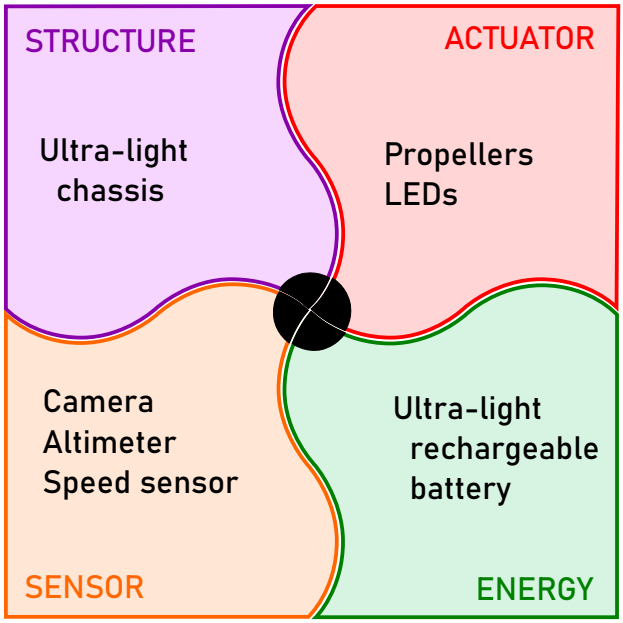
6 Is it more important for an industrial robot arm to be :

accurate or all-terrain ?

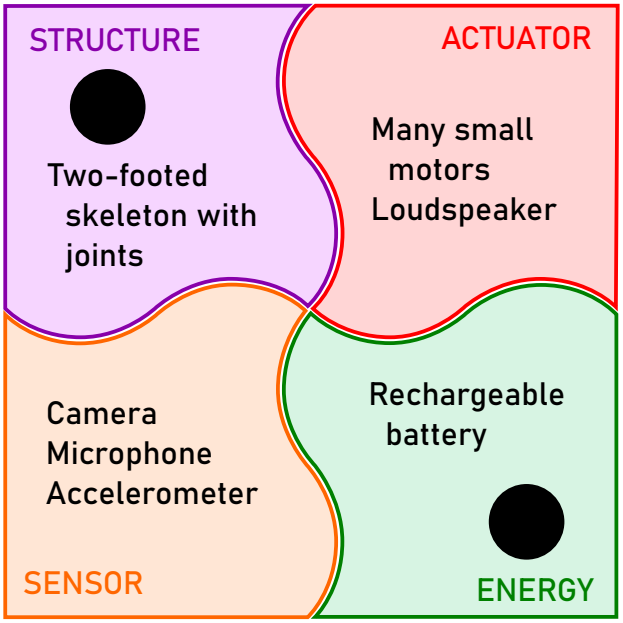
A **Explorer robot**



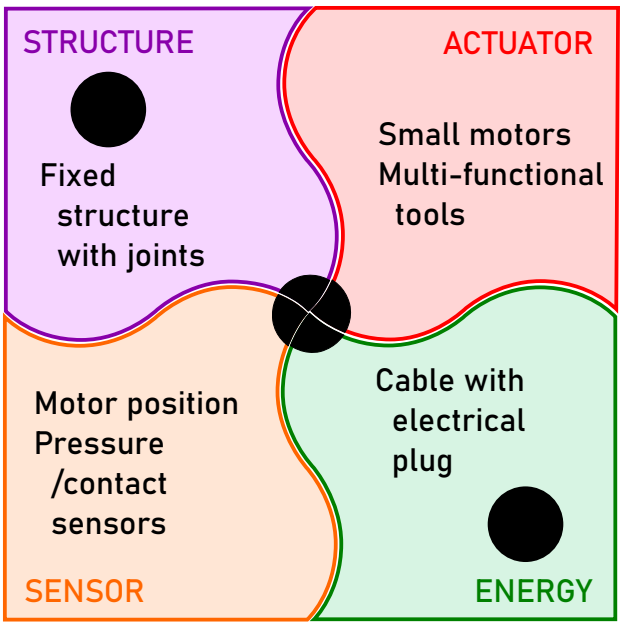
B **Bio-inspired robot**



C **Humanoid robot**



D **Robotic arm**



Secret code: 4 1 2 3

A B C D

Chimera Game

In this game of observation and strategy, each player must reconstruct the robots from their silhouette, by collecting the correct pieces that make them up. You have to pay attention to the small details and avoid the traps set by the other players!

1. Each player takes a large card of each colour, and places a robot silhouette of the corresponding colour on top. The aim of the game is to find the three pieces corresponding to each silhouette and rebuild the robots.

2. A pile is made up of all the "robot" cards (striped back). Each player starts the game with 3 cards in their hand.

3. On his turn, each player draws two cards from the pile, then can choose between: drawing a card at random from another player's hand, or taking the card on top of the discard pile.
Then he must lay down cards until he has exactly 3 in his hand. He can:
- build a piece of his robot by placing the corresponding card in front of him
- play an action card (to another player or to himself)
- discard one or more cards by placing them face up in the discard pile.

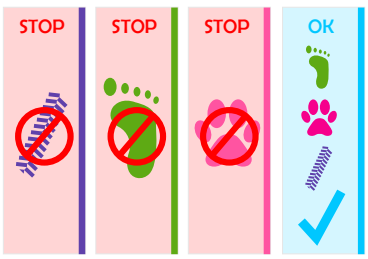
4. The first player to finish all his robots wins.

Variation

The game can be simplified by removing the rover robots (purple) from the game, along with all the corresponding cards and silhouettes. In this case, the action cards "lost lab key", "new key" and "change of plan" are also removed.

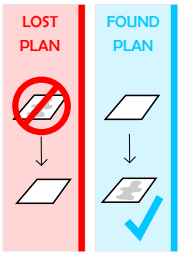
Action cards:

STOP and OK:



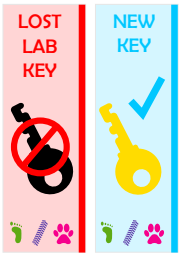
When a STOP card is placed to the left of the robot of the corresponding colour, the construction of this robot is stopped (the player cannot place any more cards) until he places an OK card on top.

LOST PLAN and FOUND PLAN



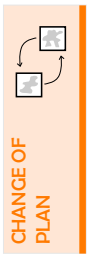
When a LOST PLAN card is placed to the left of a robot, the construction of this robot is stopped (the player cannot place any more cards) and the silhouette card is turned face down. When a FOUND PLAN card is placed on top, the silhouette is face up and construction can resume.

LOST LAB KEY and NEW KEY



When a LOST LAB KEY card is placed to the left of a robot, the construction of all the robots of this player is stopped (the player cannot place any more cards). When a NEW KEY card is placed on top, construction can resume.

CHANGE OF PLAN



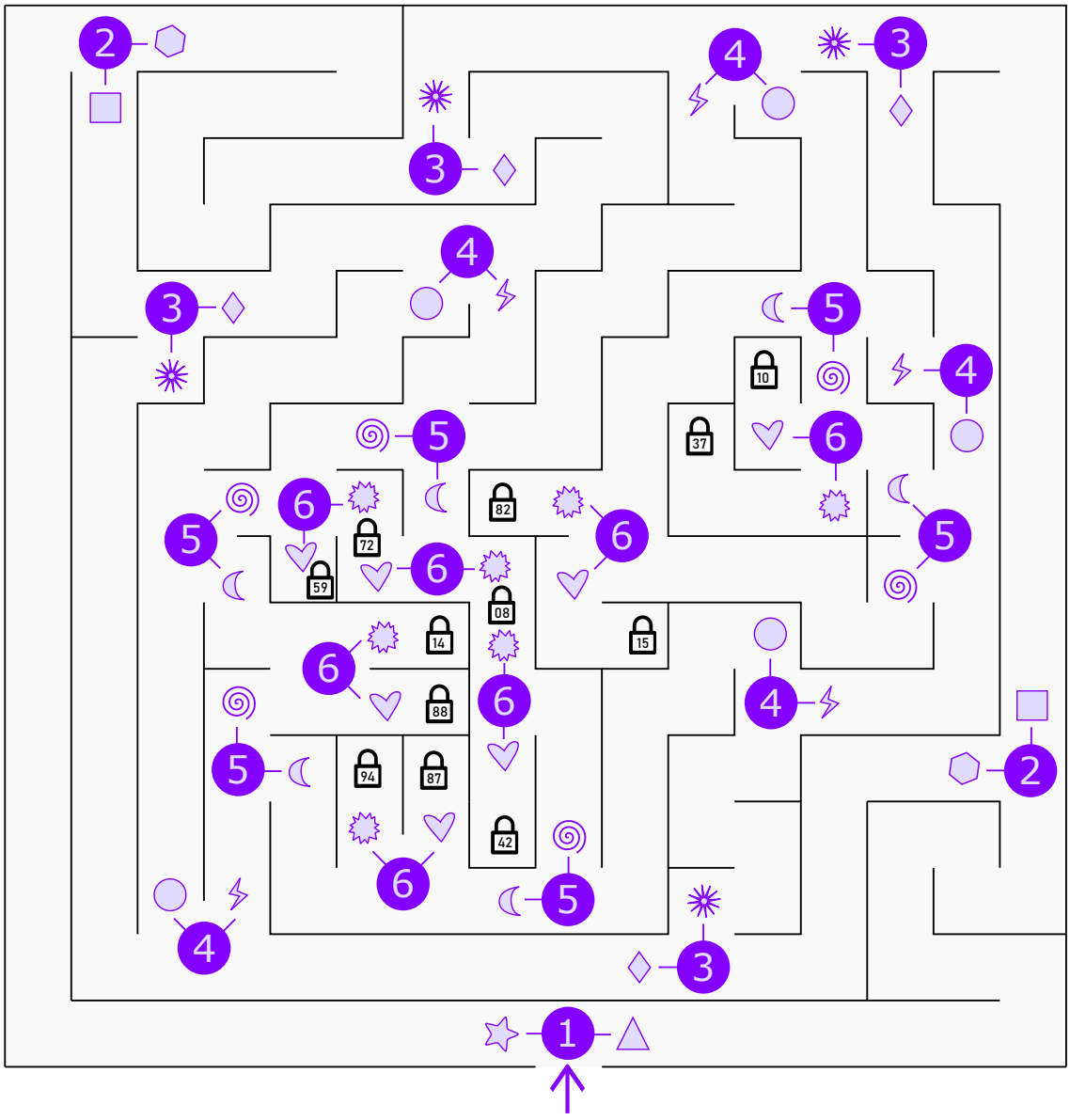
When a player plays a CHANGE OF PLAN card, he may exchange the silhouette of one of his or another player's robots with an unused silhouette of the same color.

CHOOSE FROM THE DISCARD PILE

When a player plays a CHOOSE FROM THE DISCARD PILE card, they may look at all the cards in the discard pile and choose one to put into their hand.

The maze

Find your way through this maze by finding the correct lock. At each intersection, answer the question to choose the correct path!
Are you ready? Yes? Then enter the maze at the arrow. Good luck!



1 Is it more important for a drone to be :

light or large ?

2 Is it more important for an autonomous car to be :

fast or safe ?

3 Is it more important for a lawnmower robot to be :

moisture resistant or heavy ?

4 Is it more important for a Mars exploration robot to be :

energy self-sufficient or bendy ?

5 Is it more important for a surgical robot to be :

portable or reliable ?

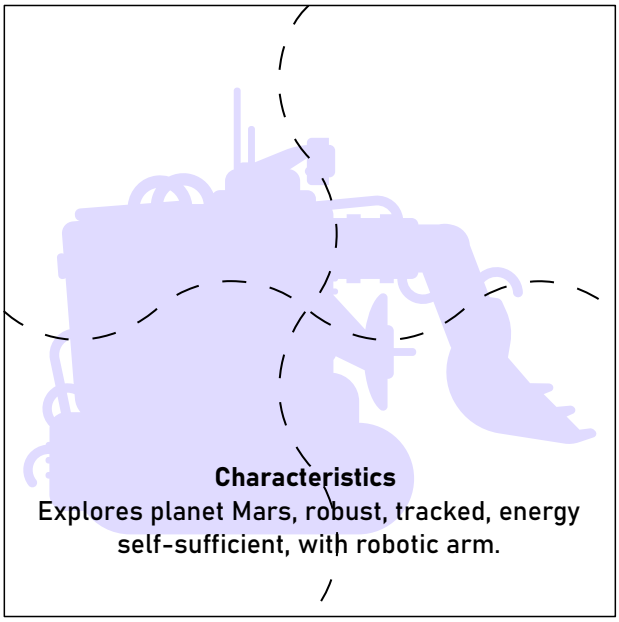
6 Is it more important for an industrial robot arm to be :

accurate or all-terrain ?

Robotic jigsaw

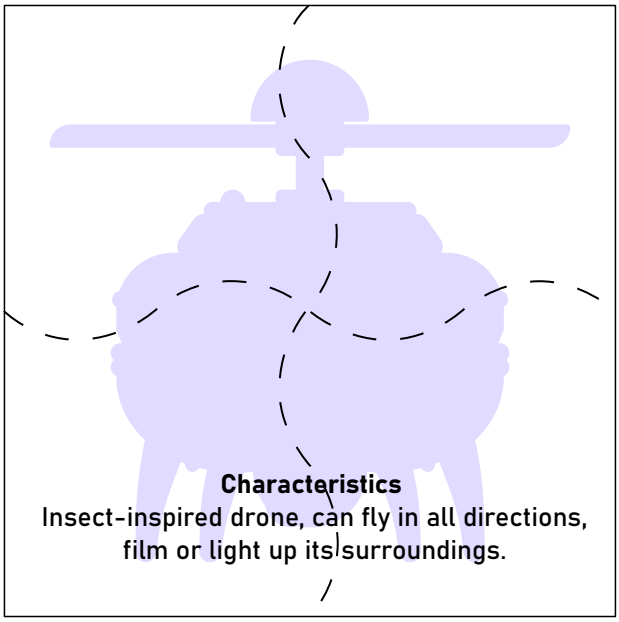
You are a robotics engineer and you have to build 4 robots that have a specific function. Using the descriptions and the silhouettes, find and assemble the correct elements: sensors, actuators, structure and power source in order to find the secret code.

A Explorer robot



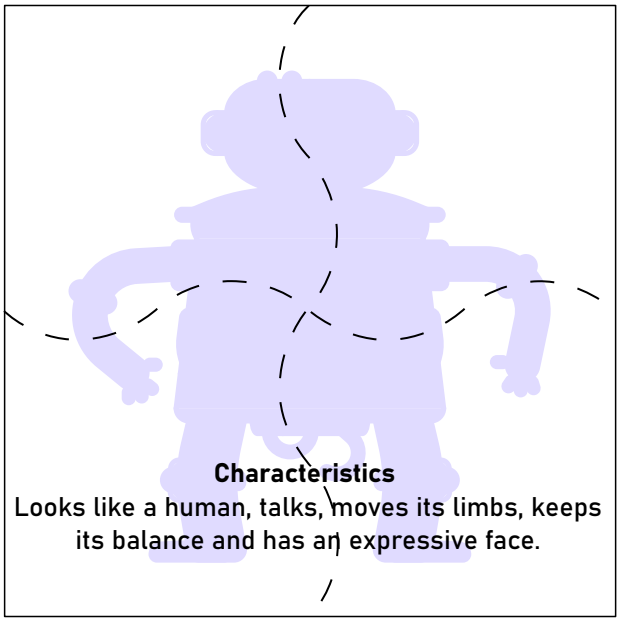
Characteristics
Explores planet Mars, robust, tracked, energy self-sufficient, with robotic arm.

B Bio-inspired robot



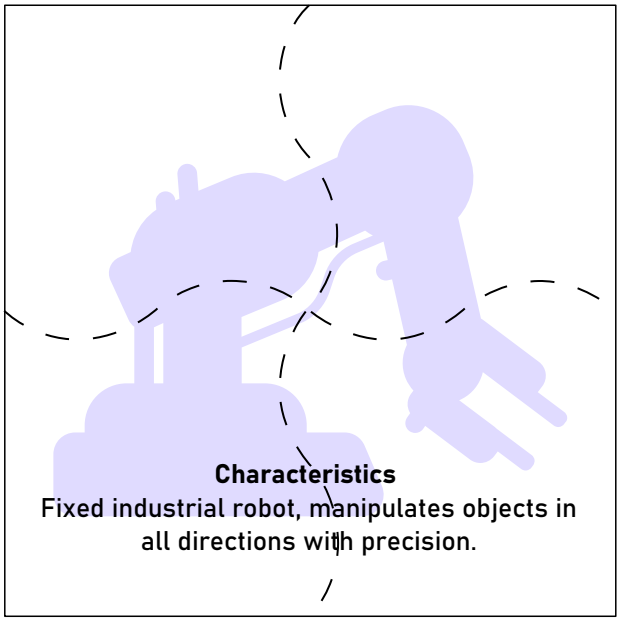
Characteristics
Insect-inspired drone, can fly in all directions, film or light up its surroundings.

C Humanoid robot



Characteristics
Looks like a human, talks, moves its limbs, keeps its balance and has an expressive face.

D Robotic arm



Characteristics
Fixed industrial robot, manipulates objects in all directions with precision.

Secret code: __ __ __ __

A B C D

STRUCTURE

Robust mobile chassis

STRUCTURE

Fixed structure with joints

STRUCTURE

Two-footed skeleton with joints

STRUCTURE

Ultra-light chassis

ACTUATOR

Many small motors
Loudspeaker

ACTUATOR

Small motors
Multi-functional tools

ACTUATOR

Propellers
LEDs

ACTUATOR

Tracks
Multi-functional clamps
Radio transmitter

Radio receiver
Camera
Thermometer

SENSOR

Camera
Altimeter
Speed sensor

SENSOR

Camera
Microphone
Accelerometer

SENSOR

Motor position
Pressure /contact sensors

SENSOR

Cable with electrical plug

ENERGY

Battery and solar panel

ENERGY

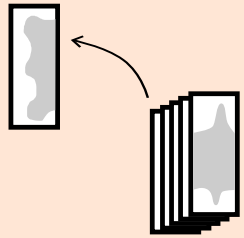
Ultra-light rechargeable battery

ENERGY

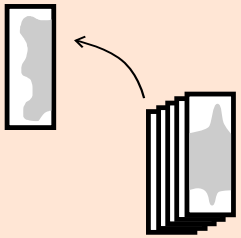
Rechargeable battery

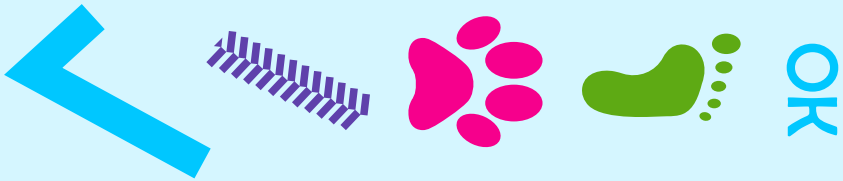
ENERGY

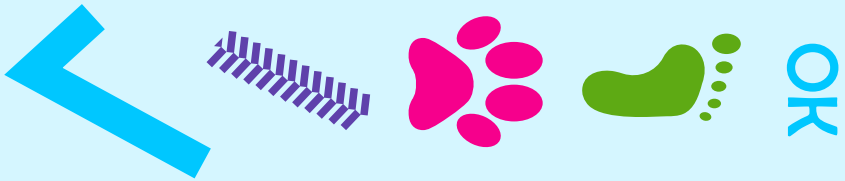
CHOOSE FROM THE DISCARD PILE

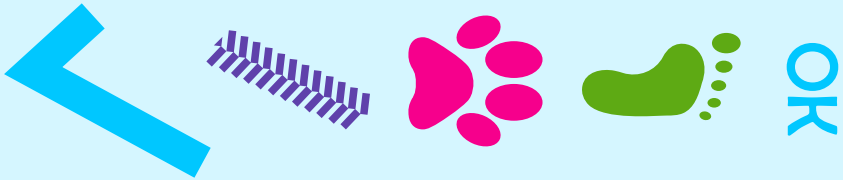


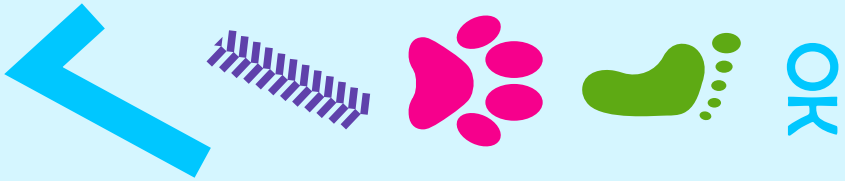
CHOOSE FROM THE DISCARD PILE



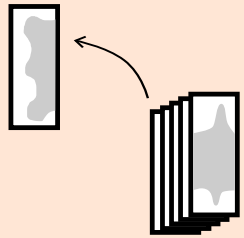




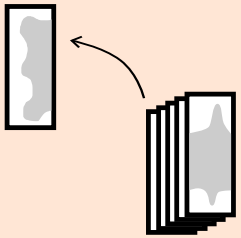




CHOOSE FROM THE DISCARD PILE

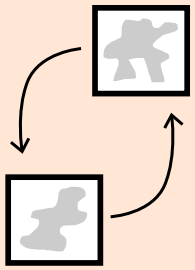


CHOOSE FROM THE DISCARD PILE

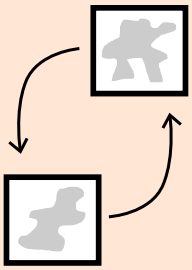


NEW KEY

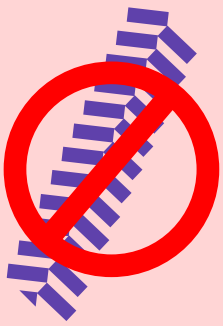
CHANGE OF PLAN



CHANGE OF PLAN



STOP

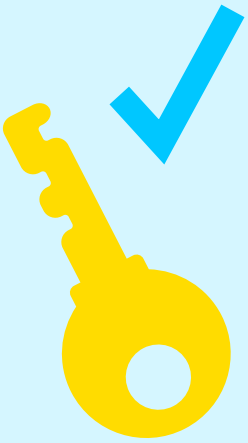


STOP

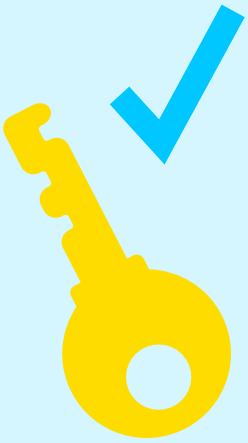
STOP

LOST LAB KEY

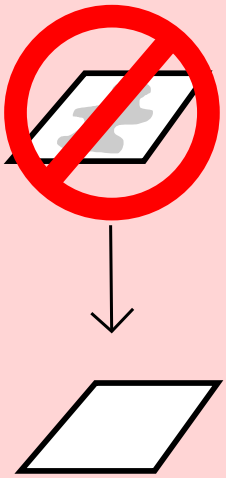
NEW KEY



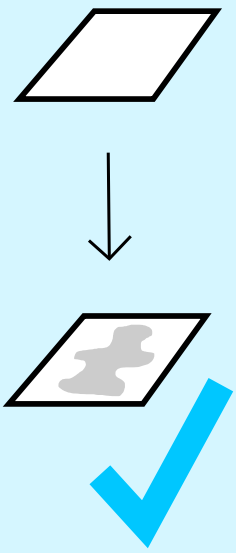
NEW KEY



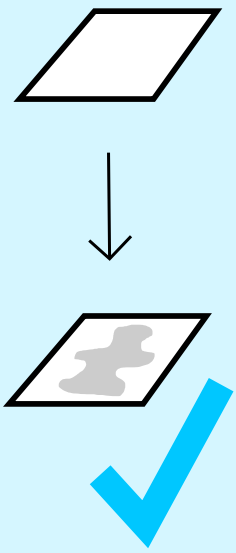
LOST PLAN

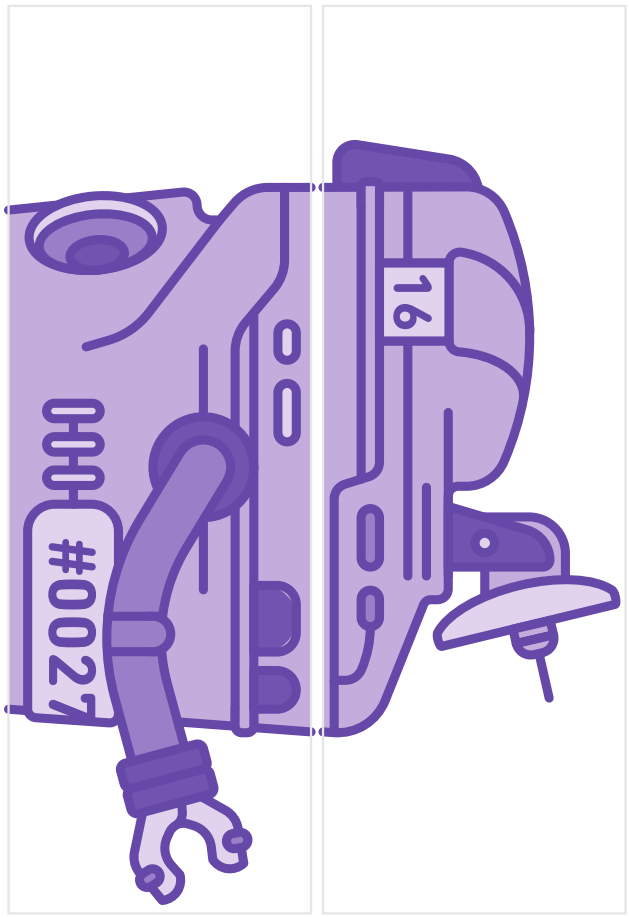


FOUND PLAN



FOUND PLAN

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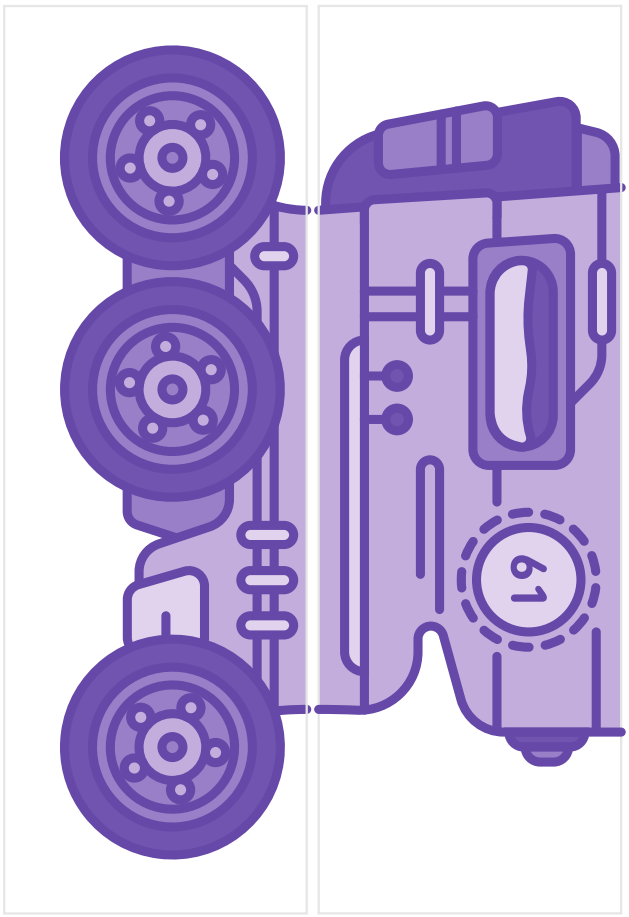
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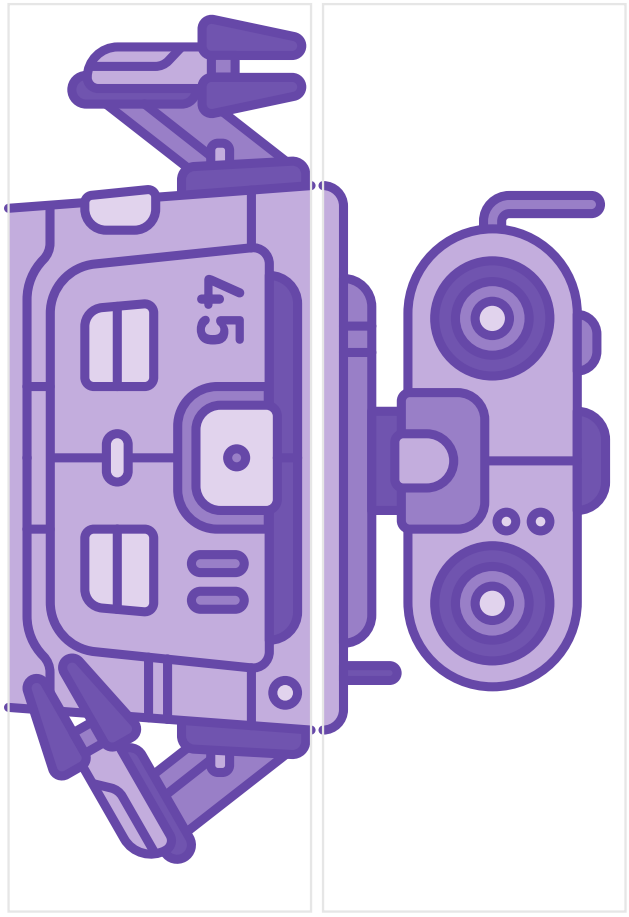
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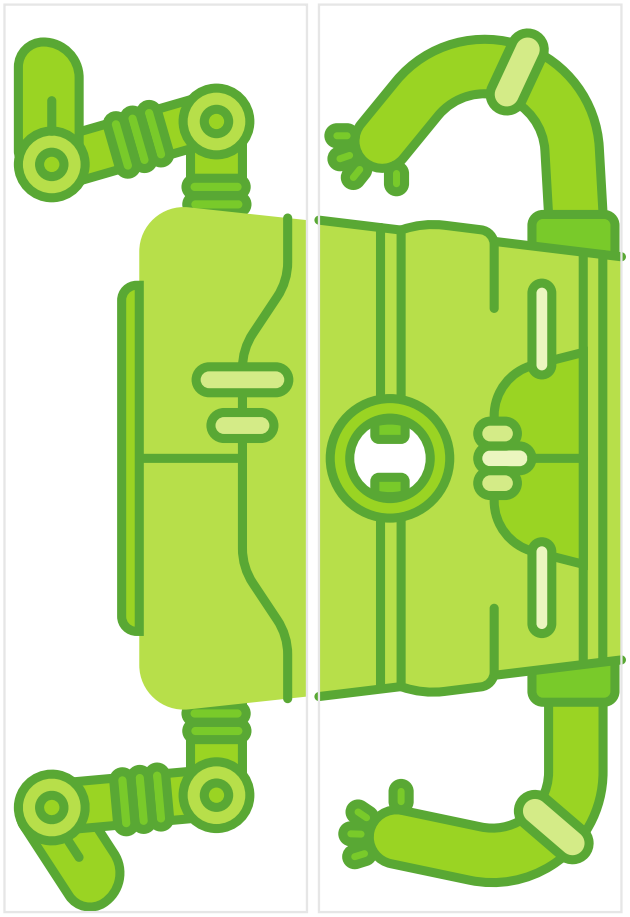

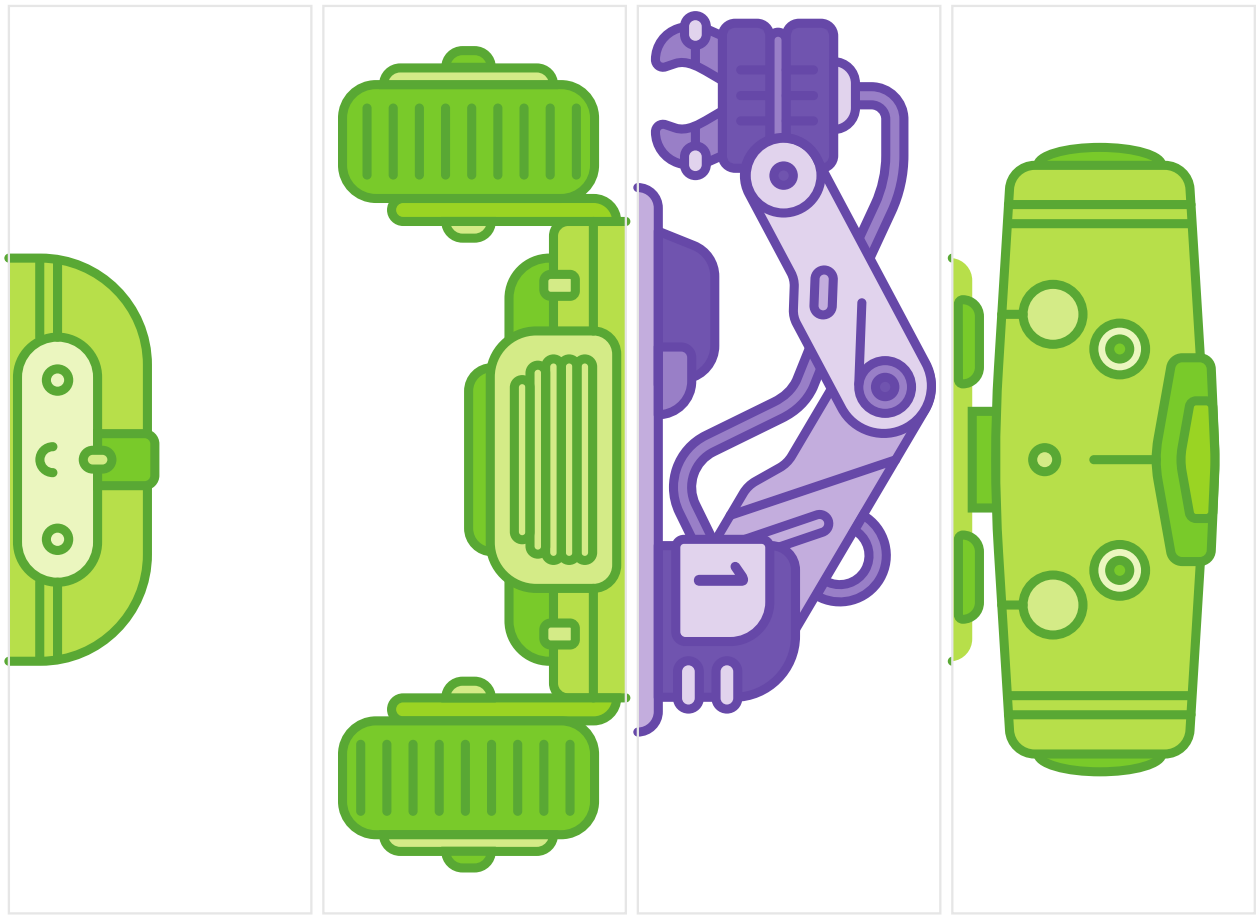

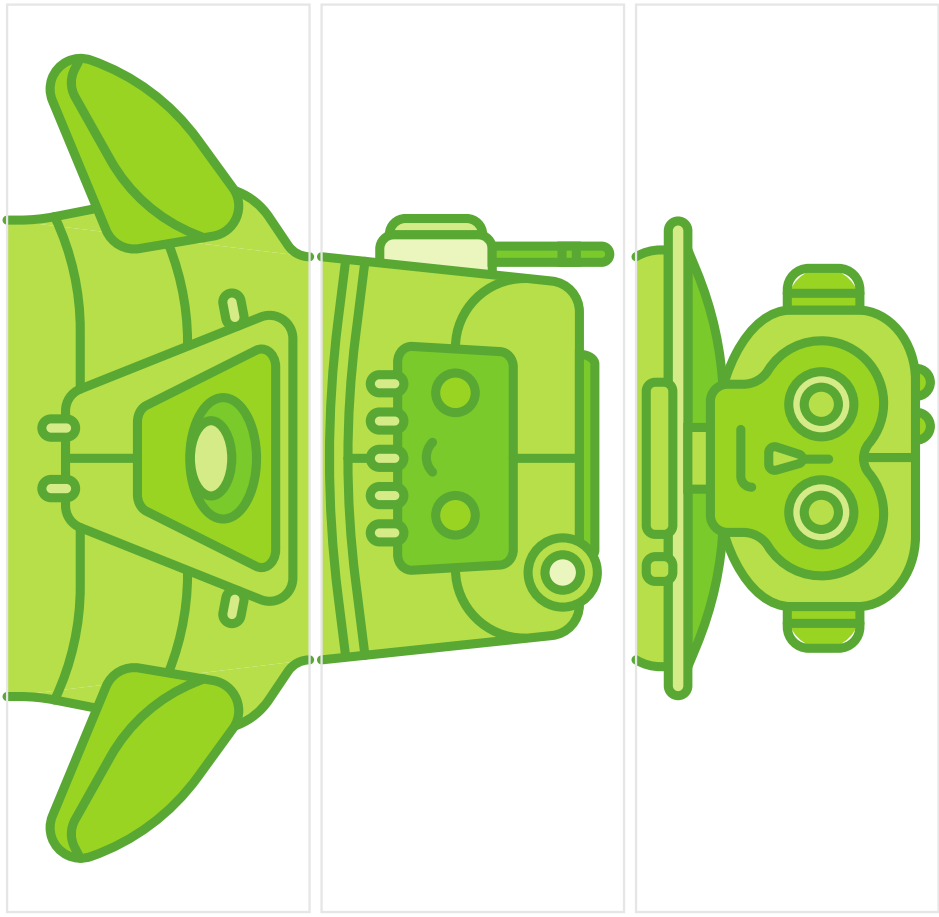

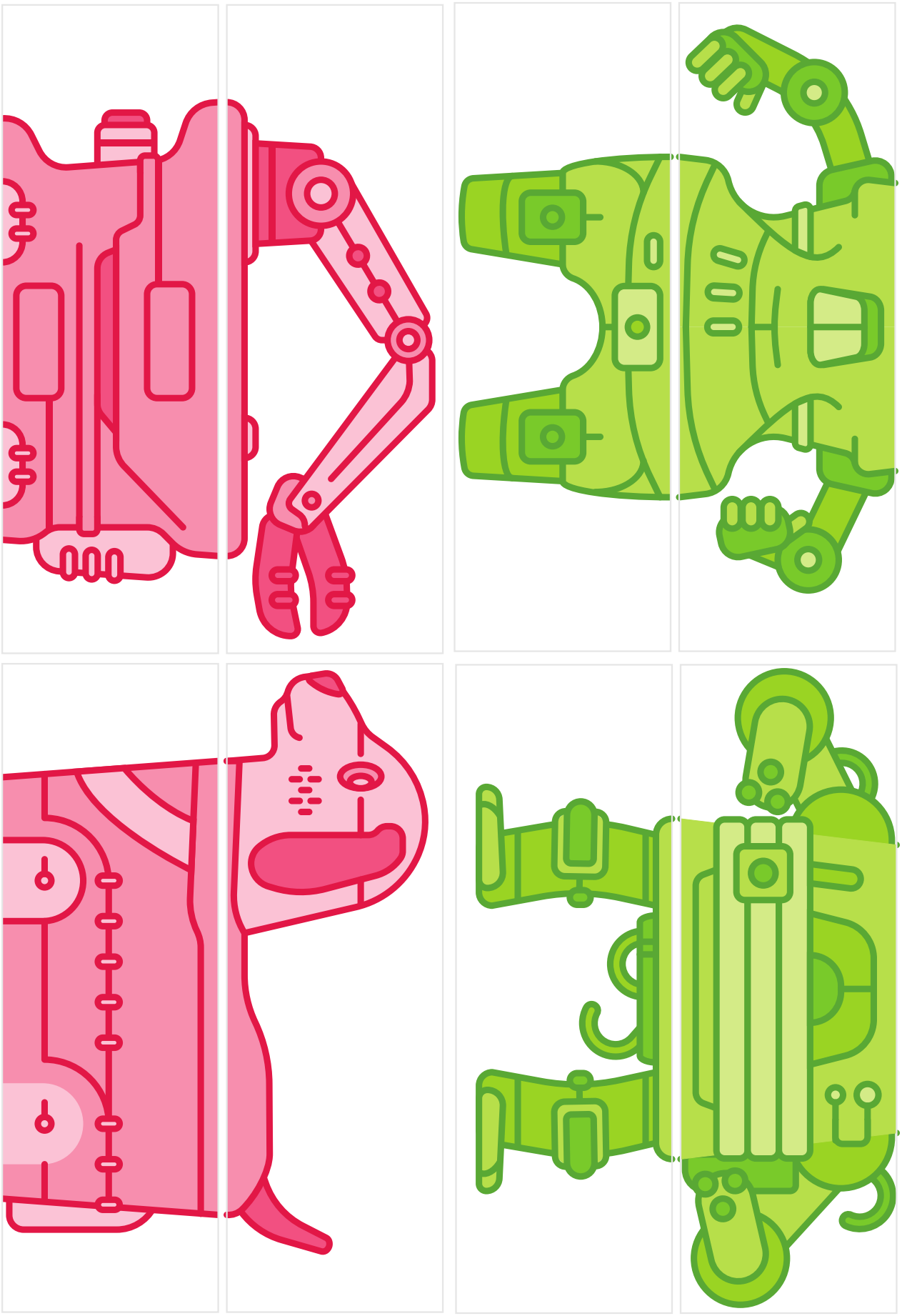

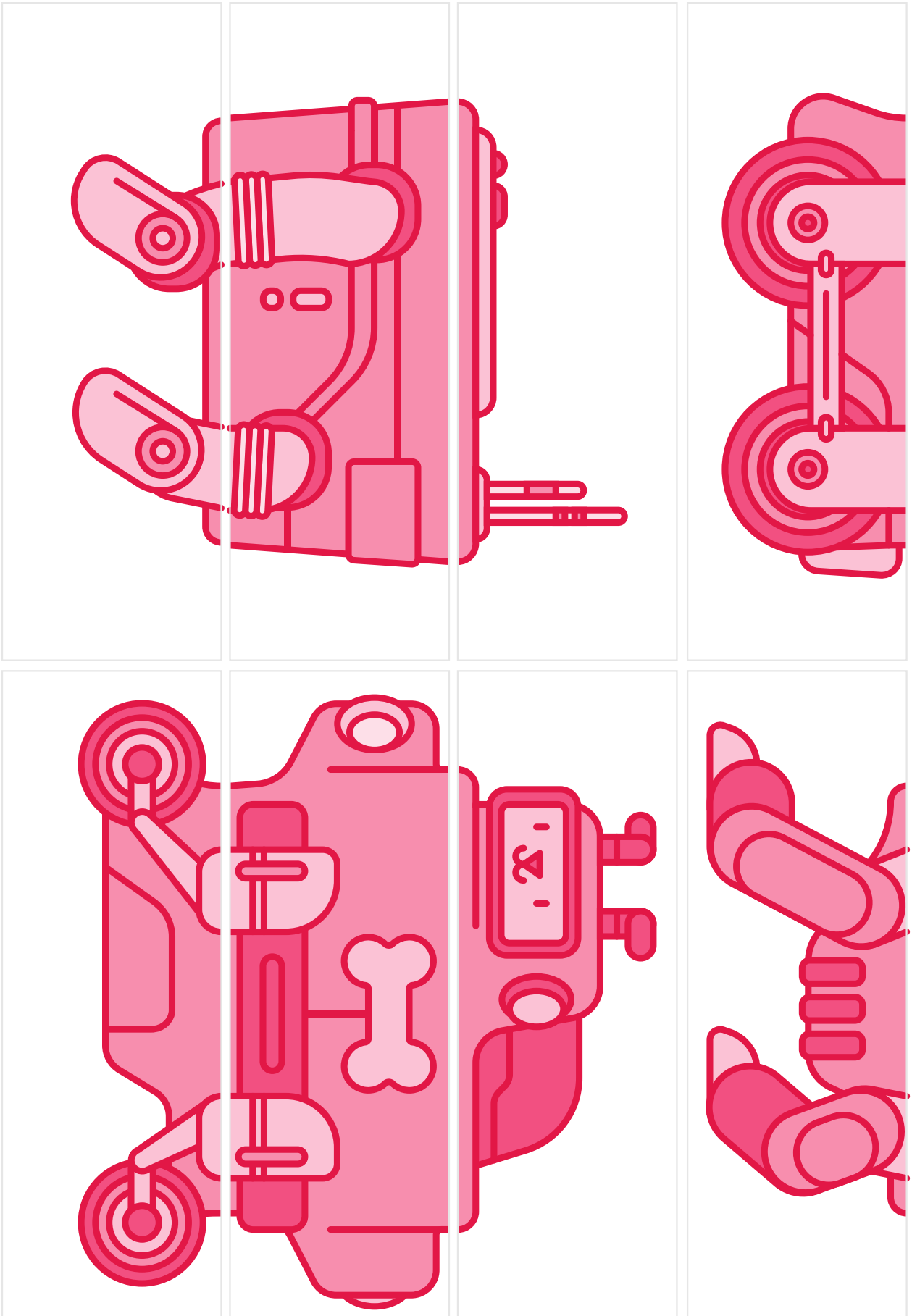

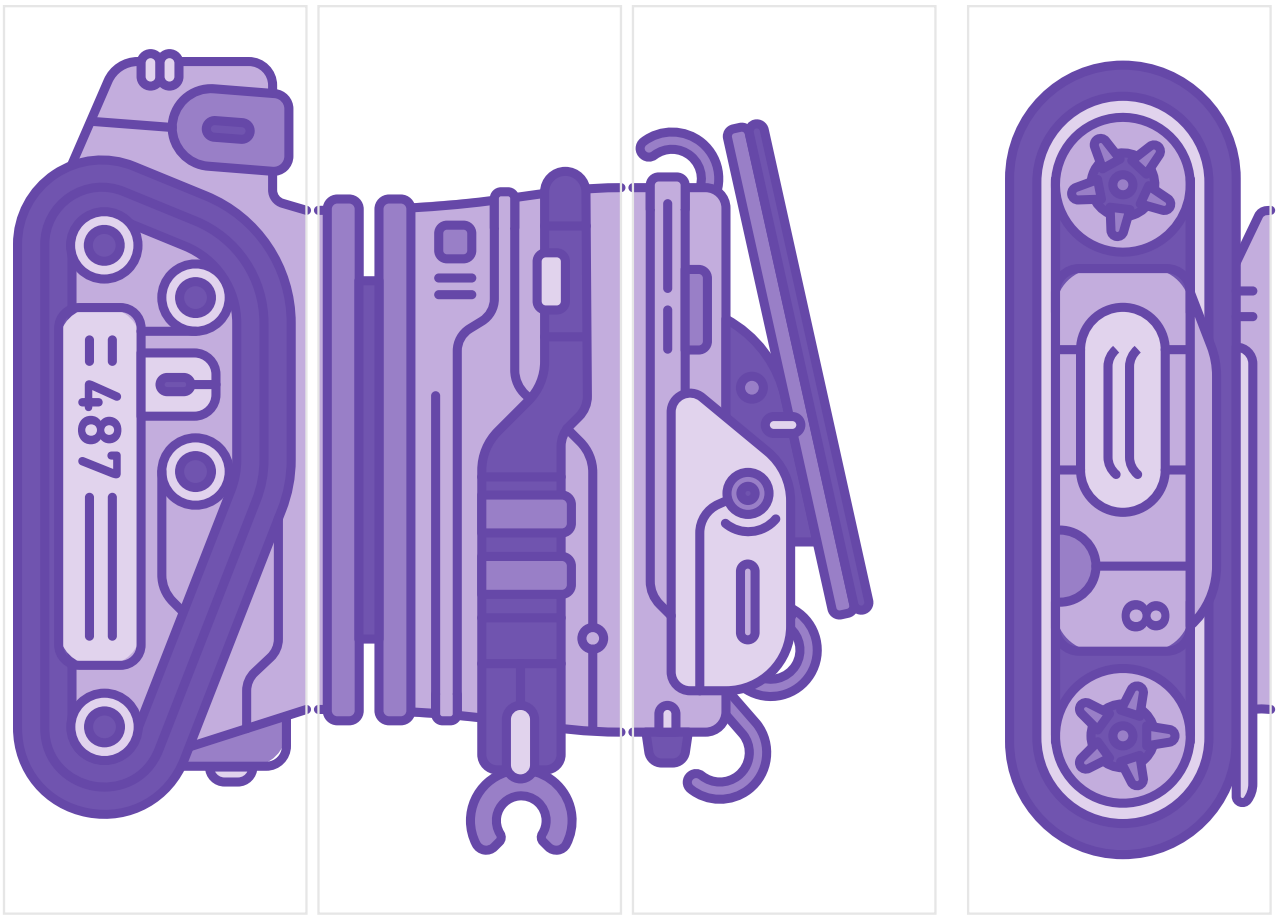
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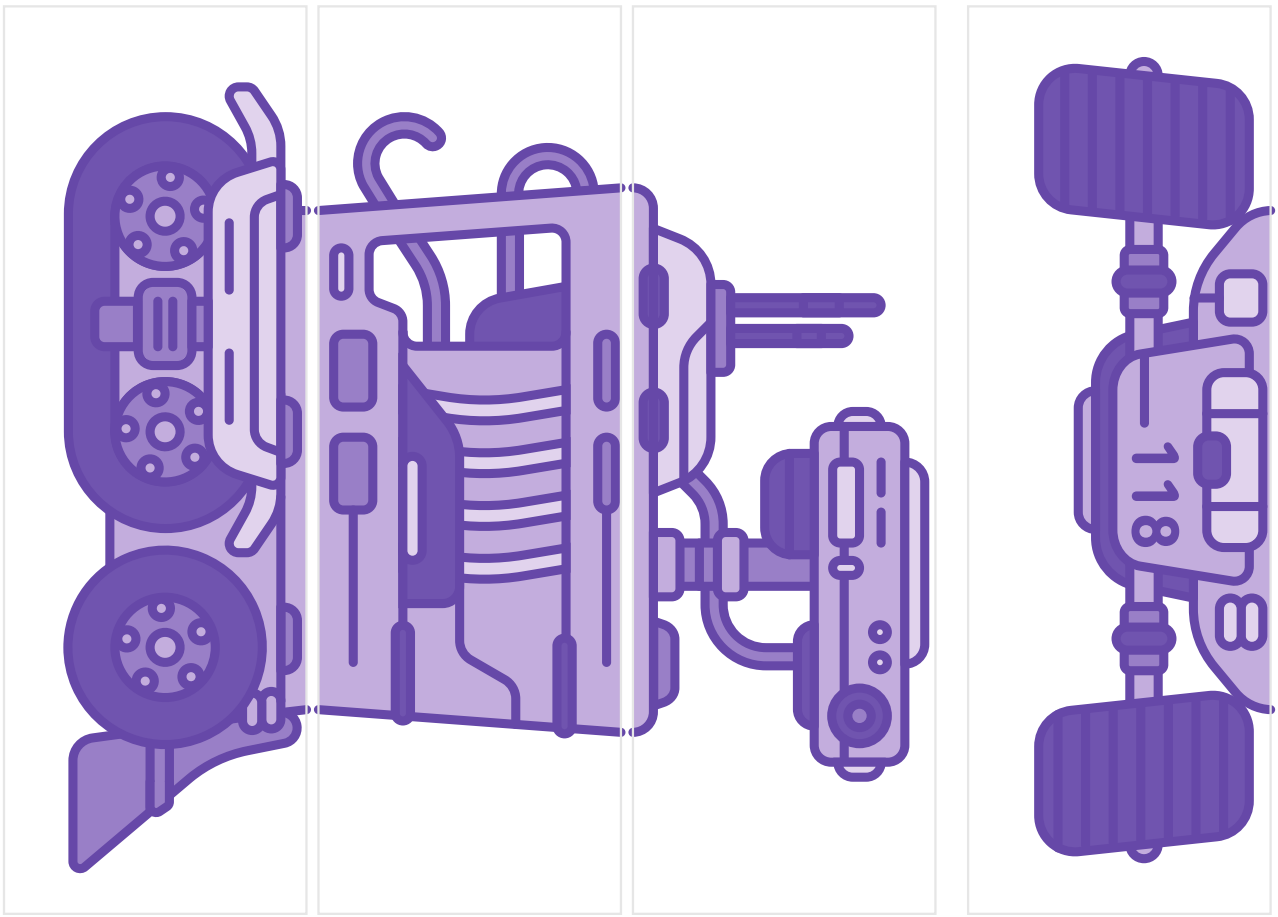
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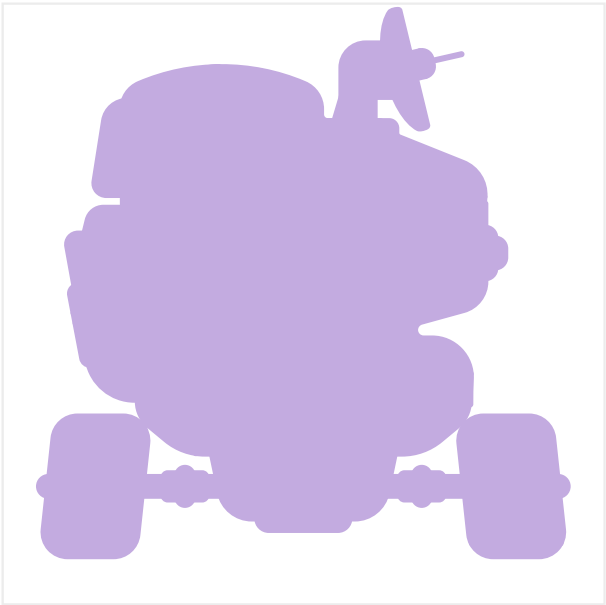
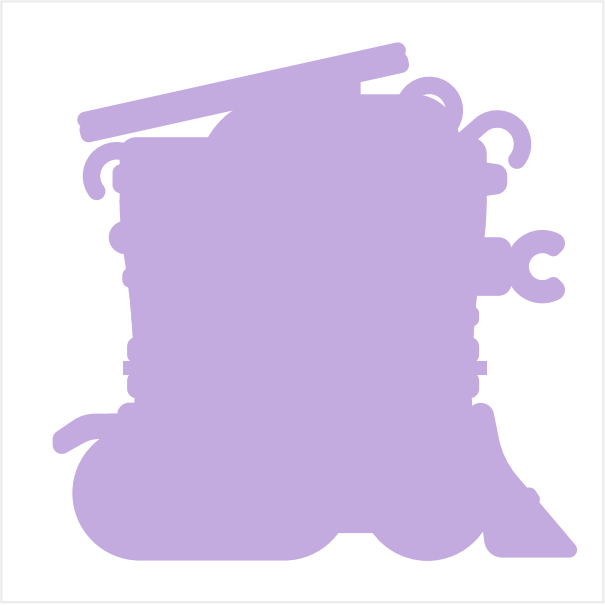
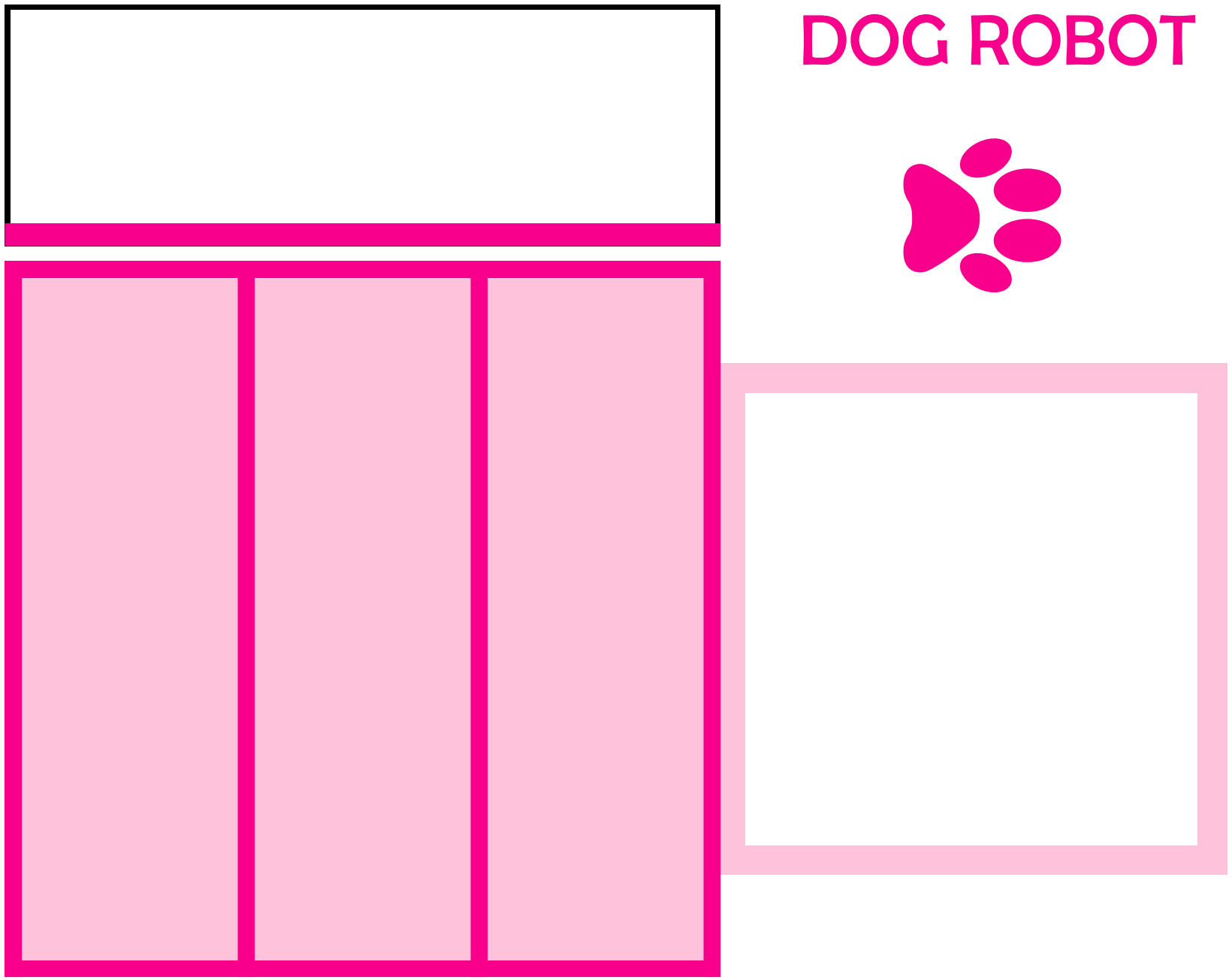
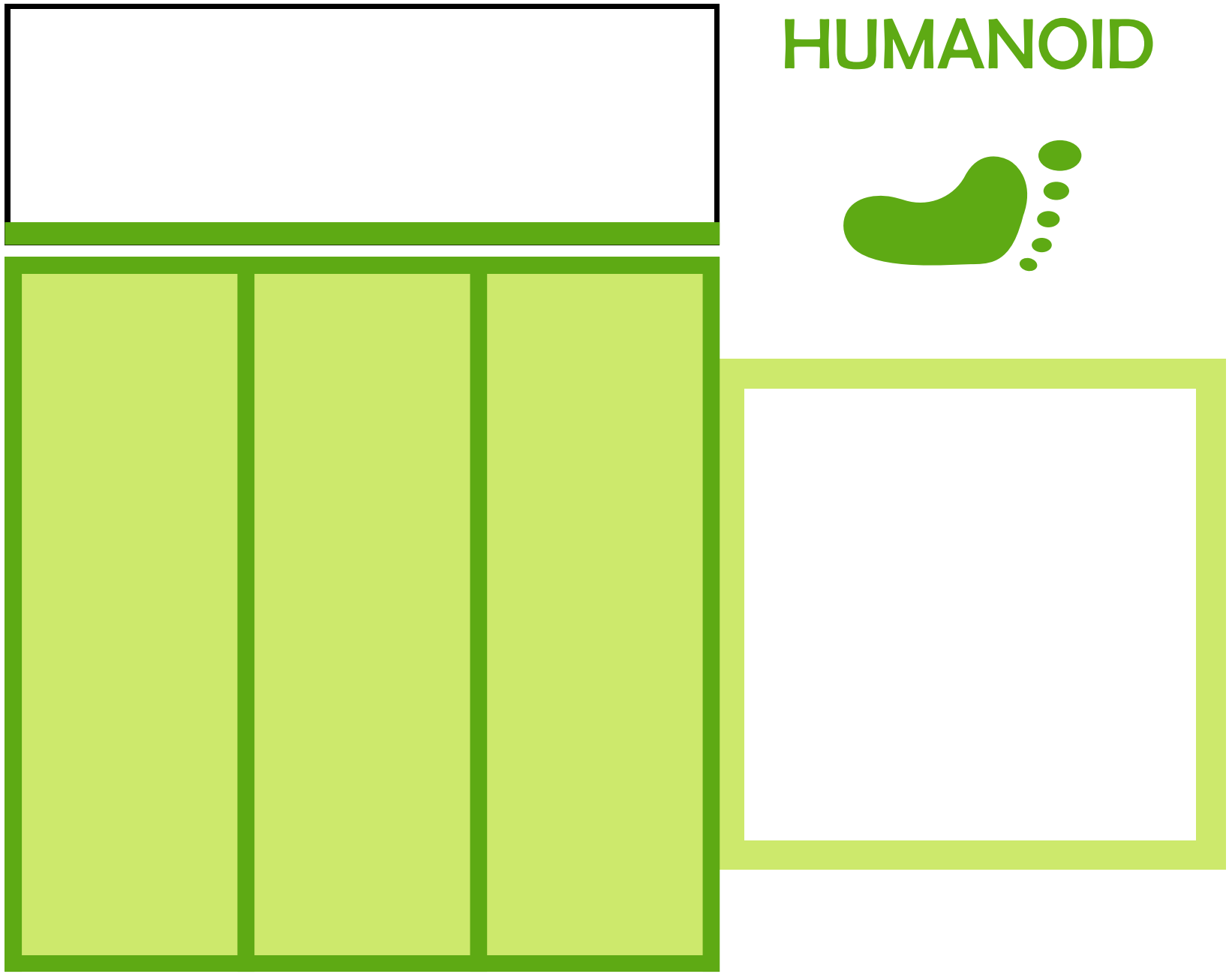
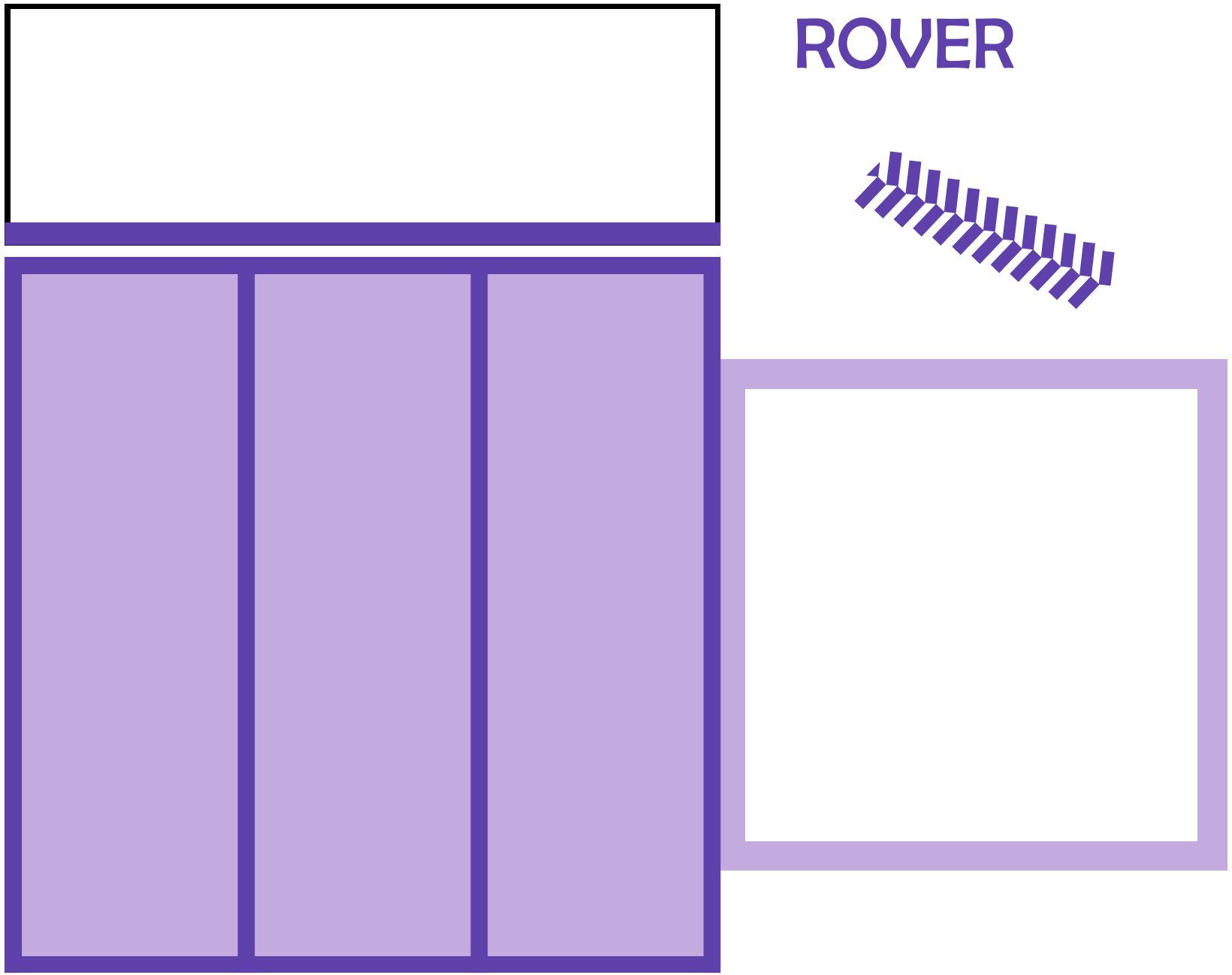





DOG ROBOT


HUMANOID

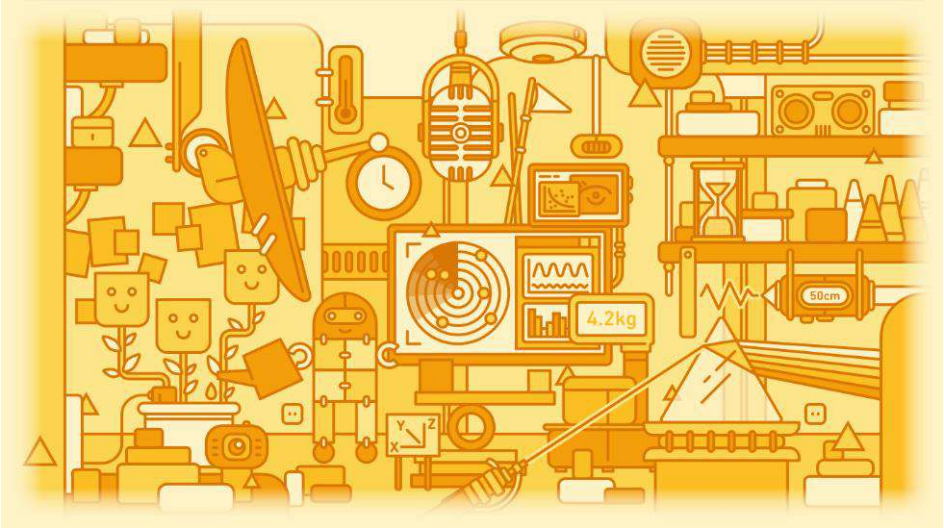

ROVER

Eddy's Secret : Sensors

1. Online game : room contents

Robots use sensors to obtain information about their environment, similar to how humans use their five senses. This information allows robots to have a certain autonomy, i.e. to react and adapt to their environment. This differentiates them from automatons which execute their instructions without taking their environment into account.

In the sensor room there are many clickable elements that correspond to different types of sensors used in robots or in everyday life.



Here are the different clickable elements as well as the text displayed in the game:

This potted plant is equipped with a moisture sensor, called a hygrometer. Perhaps it is there to remind the scientists working here to water it! Hygrometers are also widely used to measure air humidity, for example, for weather forecasting.

This is a huge radar! Did you know that it works like the sonar of bats which allows them to hunt for insects in the dark of night?

A smoke detector, just like the ones used in people's homes! It is very important for detecting fires.

This thermometer indicates 20°C. It is a device used to measure temperature. This sensor uses a liquid that rises or falls according to the temperature of the room.

This microphone records sound peaks of 22 decibels. They are as regular as the ticking of the clock behind it. The microphone picks up sound and converts it to an electrical signal. Sound is measured on a scale of approximately 0 to 130 decibels.

This distance sensor indicates 50 centimetres. That is probably how far it is from the shelf in front of it. Distance sensors often work using ultrasound or infrared light, which is invisible to the naked eye – like the TV remote control.

This prism breaks down white light into several colours, like a rainbow! By using several sensors, each sensitive to a different colour (e.g. red, green and blue), the robot can detect the colour of an object.

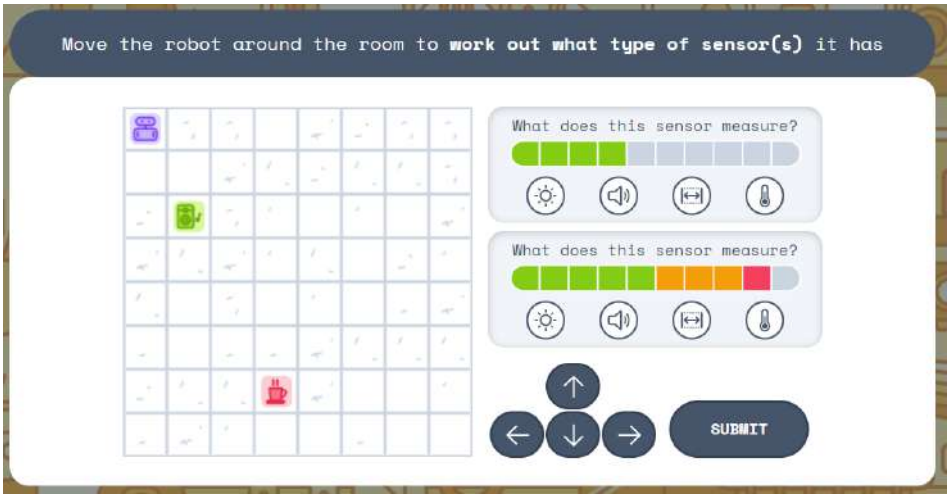
This is an accelerometer! Accelerometers detect tilt, acceleration and rotation. They are the components that ensure the orientation of your smartphone screen adjusts automatically when you turn it.

Is measuring time useful? Of course! That is what stopwatches are for. These sensors are much more accurate than an hourglass, and thankfully so!

A camera can capture and record video. Useful? Yes! But you need very advanced programming to analyse the resulting images automatically.

Click on the screen displaying a graph and the room symbol and the main puzzle starts!

In this puzzle, you will move a robot on a grid and bring it close to different elements (light bulb, speaker, hot coffee, recharging base). Then observe how its sensors react. For each of the three levels deduce what each sensor displayed measures (sound, temperature, distance or brightness). The code to find is 3241.



2. Additional puzzles on paper

Activity 1: Sensor crossword

Difficulty: ★★★

Crossword with the names of different sensors encountered in the game and the units of measurement of some of them.

Objectives: Identify the roles of the different types of sensors
Recognise the units of measurement of some sensors
Summarise the information from the game

Activity 2: Which sensor for which robot?

Difficulty: ★☆☆

To build a robot you need to choose the right sensors according to what it should be able to detect its environment. Here, we want to build three robots, and we have nine sensors available. Start by cutting out the sensor cards. Your task is then to find the correct three sensors needed for each robot according to its description. Then for each robot put the three cards together to get a number from the secret code.

Objectives: Recognise the function of a robot and then the sensors it needs
Recall the role of the different types of sensors

Activity 3: Sensors and the five senses

Difficulty: ★★☆

Link each of the 5 human senses to the correcponding robot's sensor or measurement that best matches it. The secret code will appear in the coloured areas. Be careful to connect the dots precisely and with a ruler.

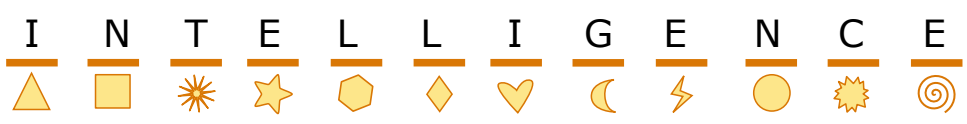
Objectives: Compare the sensors of a robot to the 5 human senses
Recognise the role of sensors in the functioning of a robot

3. Answer to the additional puzzles

Sensor crossword

1 - Measuring, by means of a liquid that rises or falls, different values in summer and winter.
1U - In what unit is the temperature measured?
2 - Singers use this sensor for a recording or a concert.
2U - Unité du capteur de son.
3 - "Attention, obstacle" - "The way is clear" - this _____ sensor can detect obstacles.
3U - Unit of sound sensor.
4 - This sensor is more accurate than an hourglass and is used in races.
5 - Is the air dry or humid? To find out, use this sensor.
5U - Unit of measurement for air humidity.
6 - In your phones, this sensor always knows which way to turn the picture.
7 - Film, selfie or frame by frame, it records everything!
8 - Watch your speed, this sensor can detect if you are exceeding the speed limit!

Code secret:

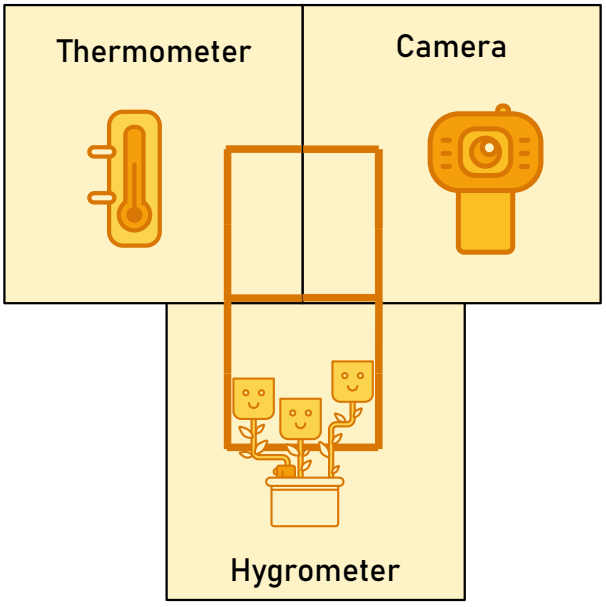


Which sensors for which robot ?

To build a robot you need to choose the right sensors according to what it should be able to detect its environment. Here, we want to build three robots, and we have nine sensors available. Start by cutting out the sensor cards. Your task is then to find the correct three sensors needed for each robot according to its description.
Then for each robot put the three cards together to get a number from the secret code.

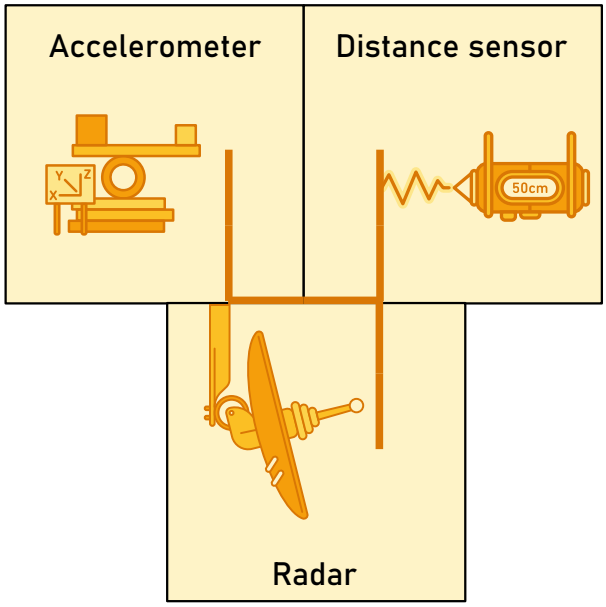
A

I am an explorer robot, all-terrain, I analyse the weather (temperature and humidity) and take pictures of remote areas.



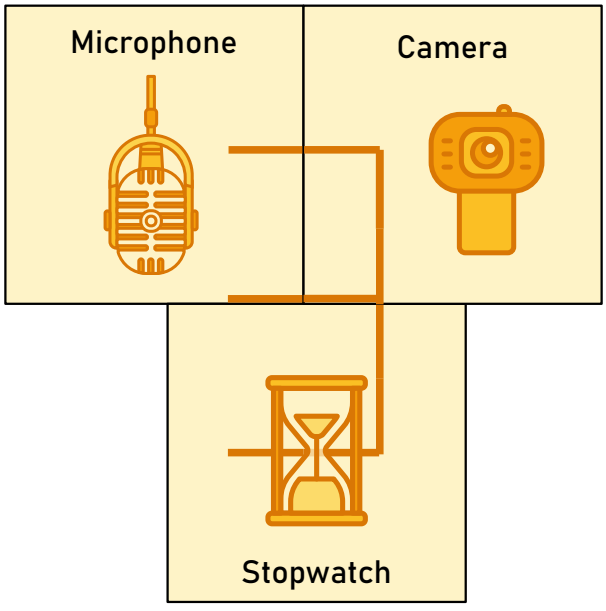
B

I am an autonomous car : I control my acceleration according to speed and distance from other cars.



C

I am a humanoid robot at a hotel reception. I film faces, record voices, and measure the time spent with each person.



Secret code:

A	B	C
8	4	3

Sensors and the five senses

Link each of the 5 human senses to the correcponding robot's sensor or measurement that best matches it.
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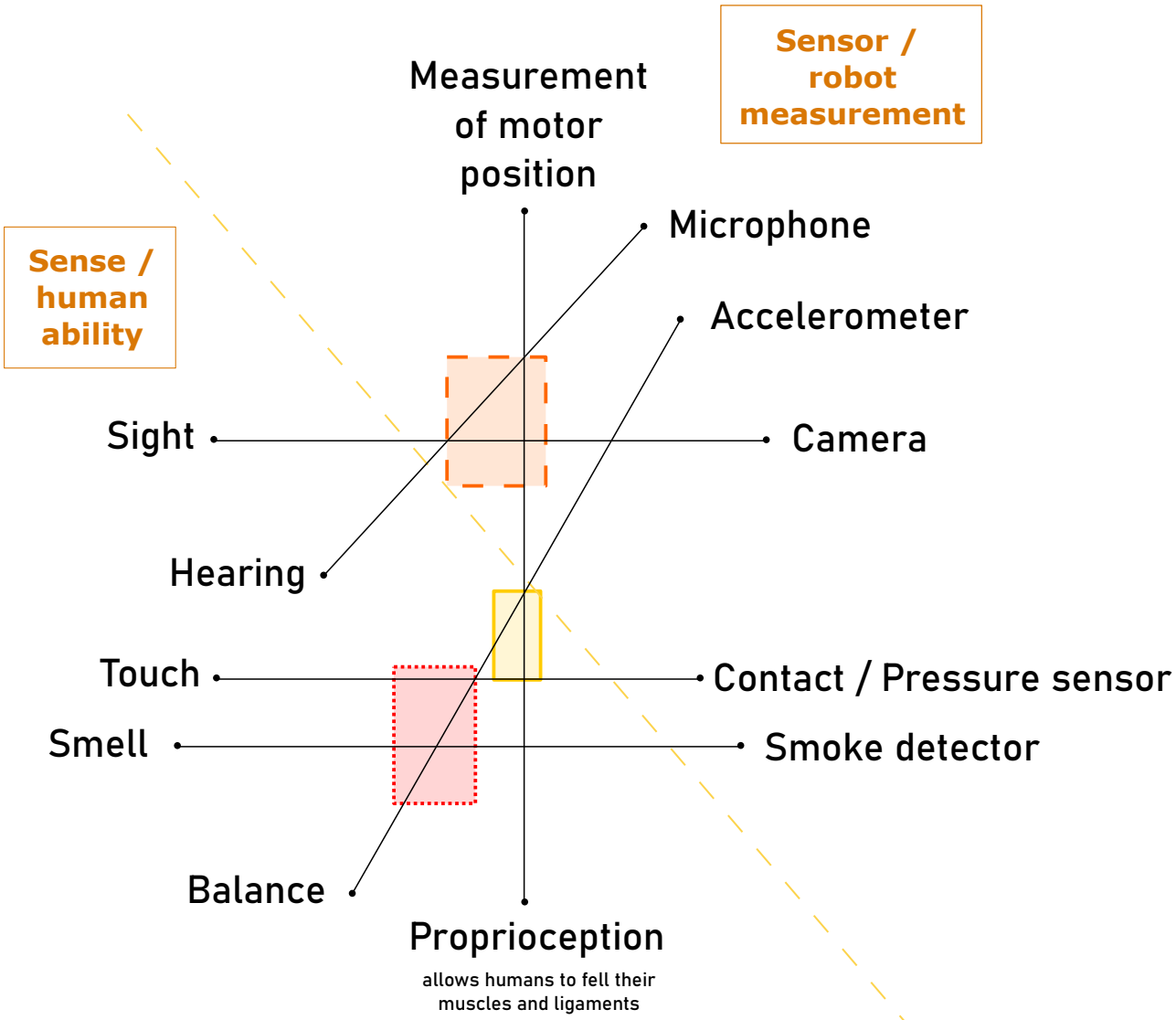
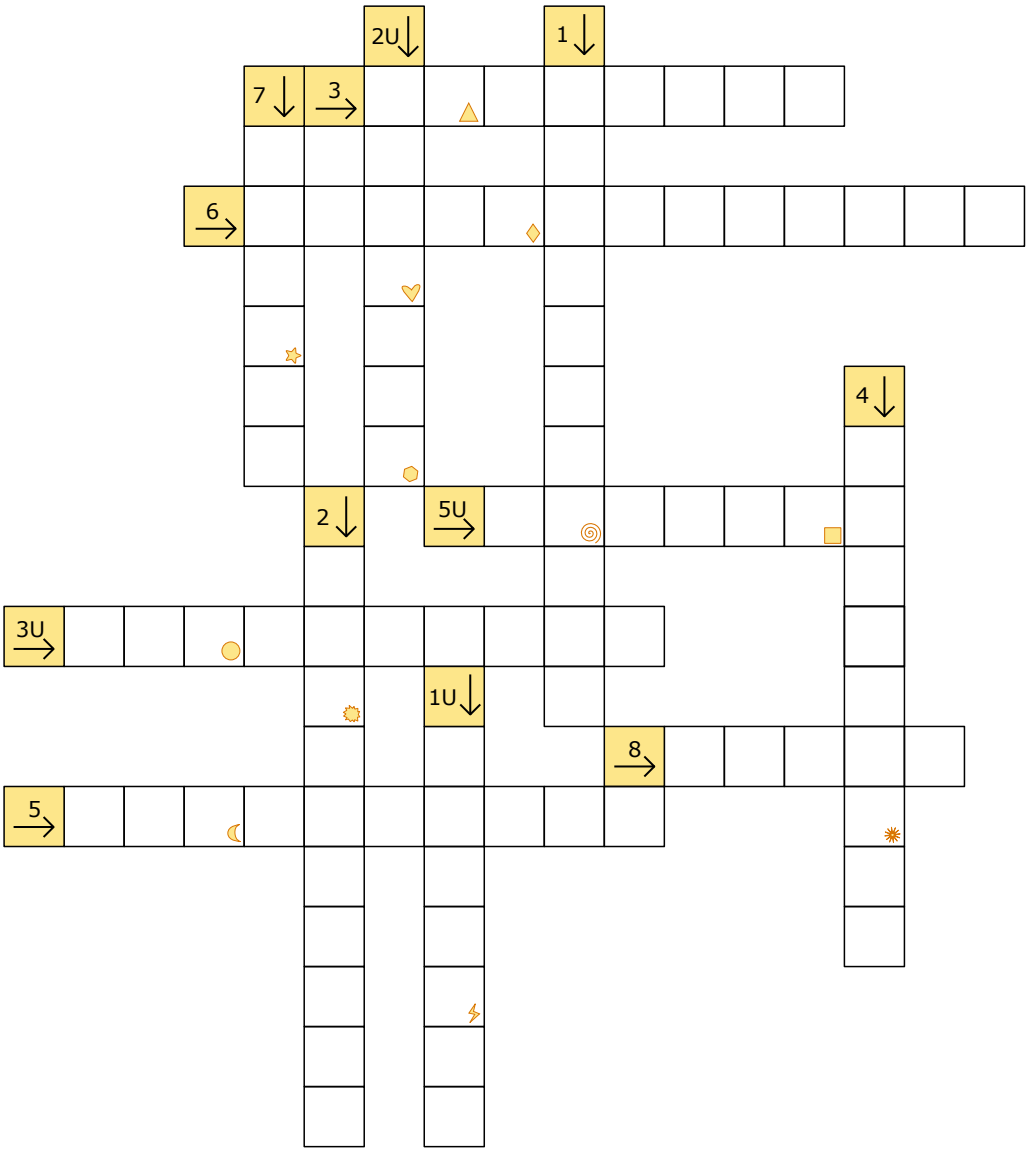
Be careful to connect the dots precisely and with a ruler.



Secret code: 4 7 1

Sensor crossword



1 - Measuring, by means of a liquid that rises or falls, different values in summer and winter.
1U - In what unit is the temperature measured?
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Code secret:

Which sensors for which robot ?

To build a robot you need to choose the right sensors according to what it should be able to detect its environment. Here, we want to build three robots, and we have nine sensors available. Start by cutting out the sensor cards. Your task is then to find the correct three sensors needed for each robot according to its description.
Then for each robot put the three cards together to get a number from the secret code.

A

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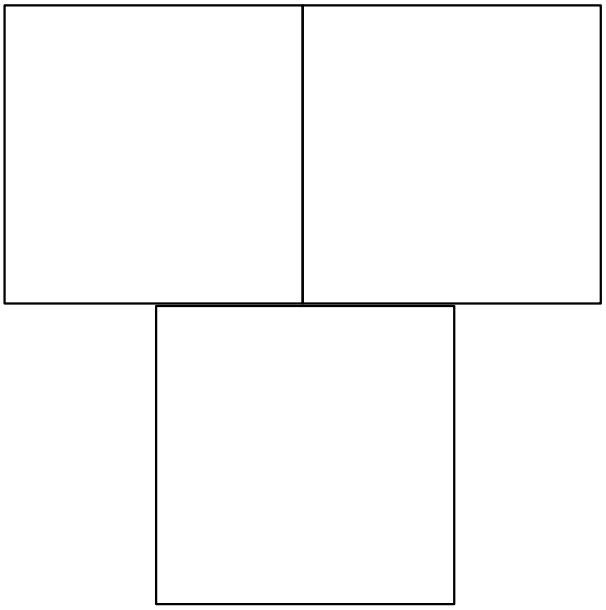
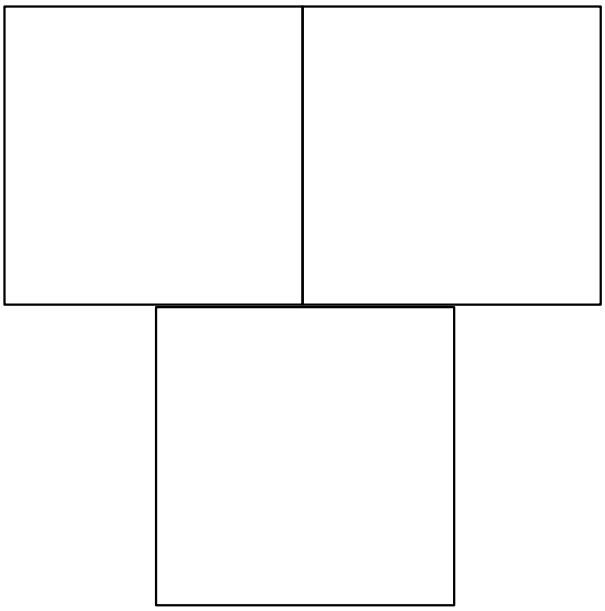


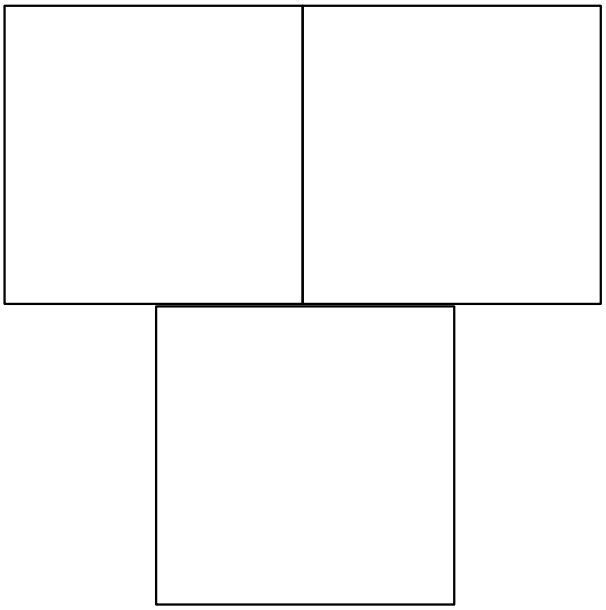
B

I am an autonomous car : I control my acceleration according to speed and distance from other cars.



C

I am a humanoid robot at a hotel reception. I film faces, record voices, and measure the time spent with each person.



Secret code:

A B C

Which sensors for which robot ?

Microphone

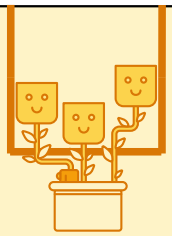
Thermometer

Accelerometer

Camera

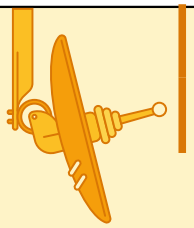
Distance sensor

Camera



Hygrometer

Stopwatch



Radar

Sensors and the five senses

Link each of the 5 human senses to the correcponding robot's sensor or measurement that best matches it.
The secret code will appear in the coloured areas.
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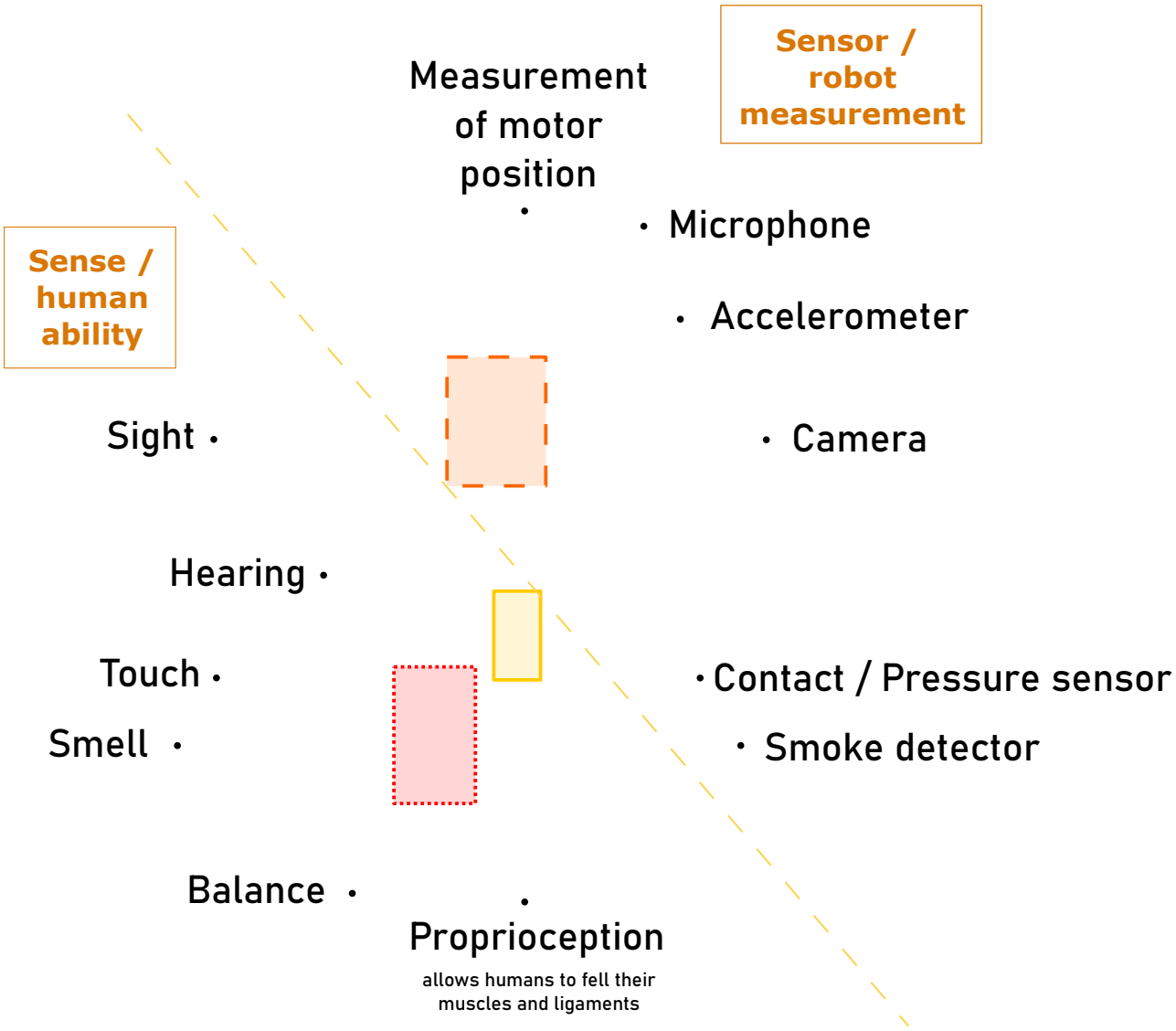


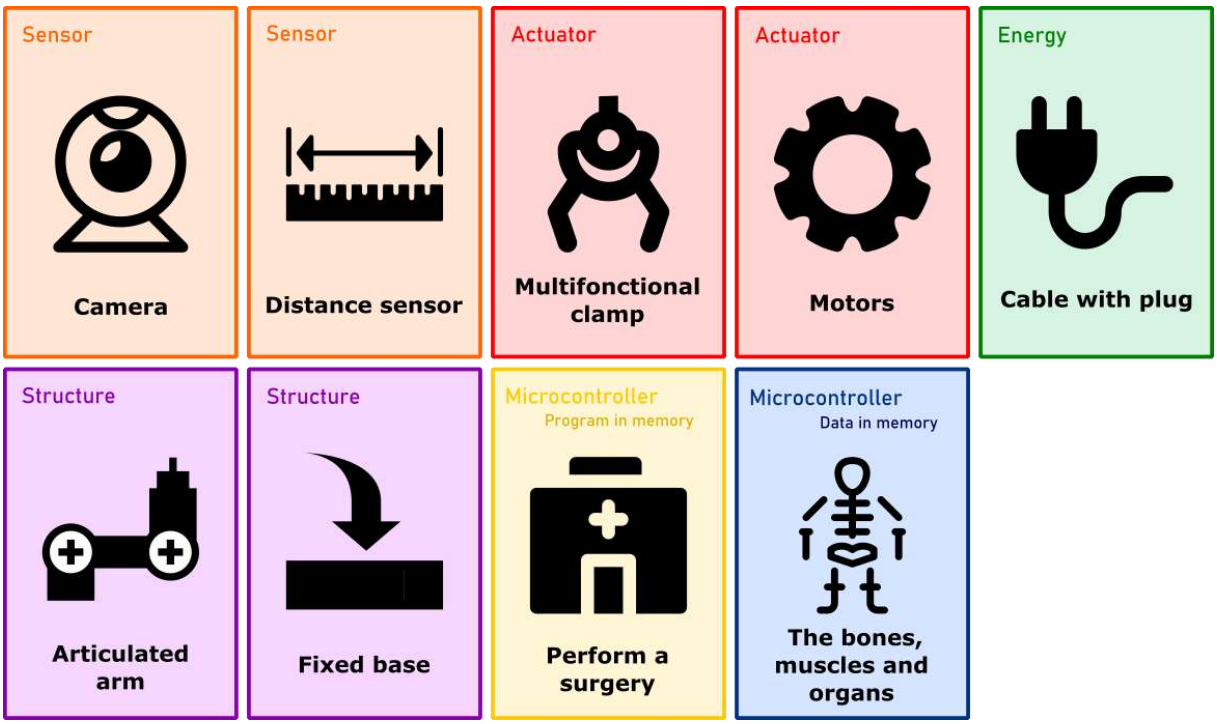
Secret code:

Eddy's Secret : Invent your robot

Now it is your turn to invent a robot that can do something specific. Helping humans, exploring an unknown area, imitating animals or humans indeed the choices are endless! However each robot will need specific elements to work properly.

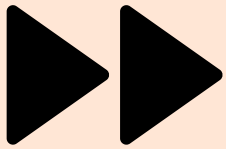
Once you have chosen what your robot will do, choose the elements it will need from the cards: sensors, actuators, energy source, basic structure, microcontroller (program and data in memory). Be careful as resources are limited. You can only use a maximum of 10 cards!

When you have found the right cards, try to make your classmates guess what your robot can do, just by showing them the cards you have chosen. You can also draw the resulting robot, or build it with recycled materials.



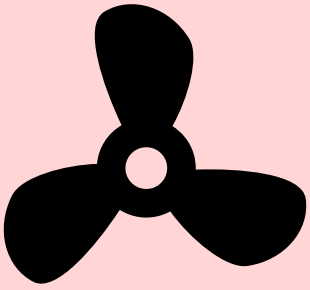
Example: Selection of cards that could be chosen to invent a surgical robot

Sensor



Accelerometer

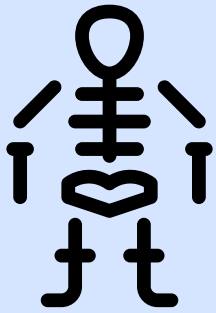
Actuator



Propeller

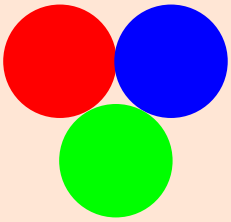
Microcontroller

Data in memory



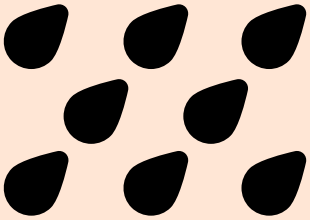
The bones, muscles and organs

Sensor



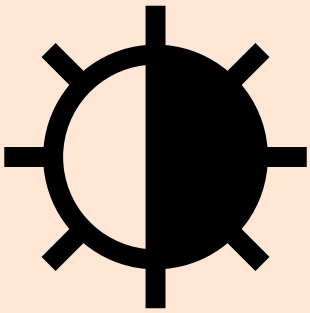
Color sensor

Sensor



Humidity sensor (hygrometer)

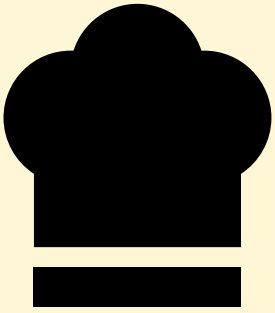
Sensor



Light sensor

Microcontroller

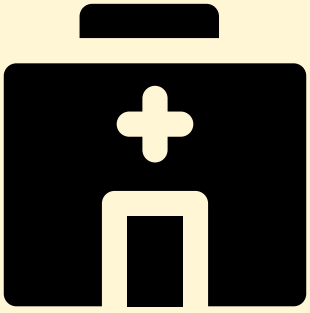
Program in memory



Follow a receipe

Microcontroller

Program in memory



Perform a surgery

Microcontroller

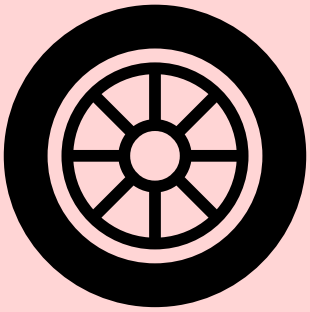
Program in memory

Search for information on the internet

Sensor

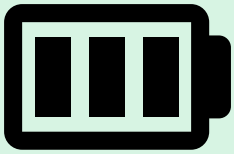
Stopwatch or clock

Actuator



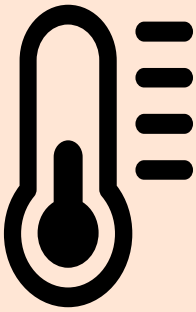
Wheels

Energy



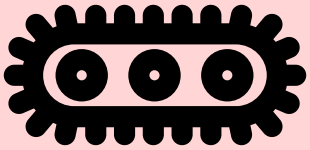
Ultra-light battery

Sensor



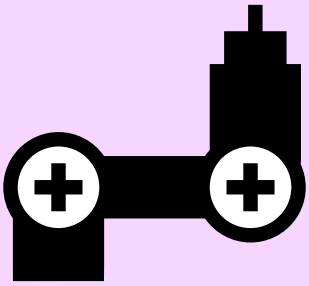
Thermometer

Actuator



Tracks

Structure

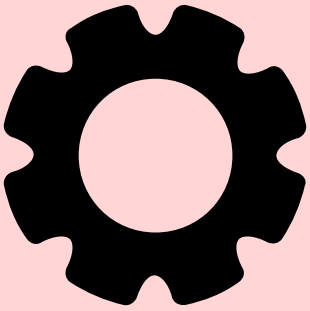


Articulated arm

Sensor

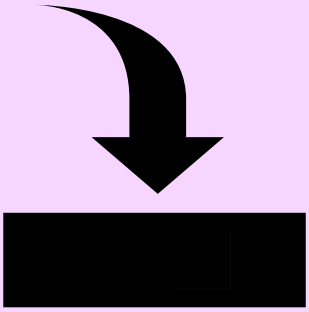
Radio or wifi antenna

Actuator



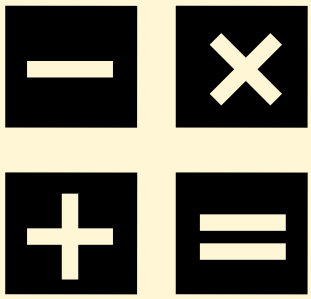
Motors

Structure



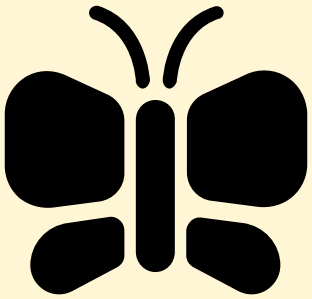
Fixed base

Microcontroller
Program in memory



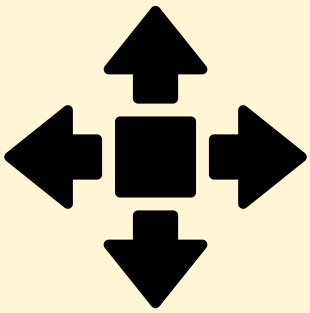
Calculate

Microcontroller
Program in memory



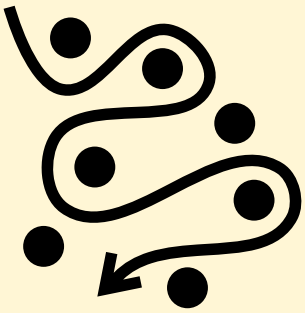
Fly

Microcontroller
Program in memory



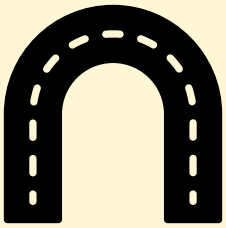
Move

Microcontroller
Program in memory



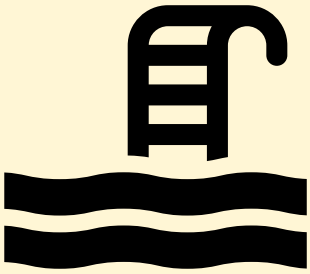
Avoid obstacles

Microcontroller
Program in memory



Follow a path

Microcontroller
Program in memory

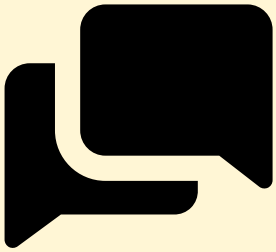


Swim

Microcontroller
Program in memory

Imitate emotions

Microcontroller
Program in memory



Talk to a human

Microcontroller
Program in memory

Keep its balance

Microcontroller
Data in memory

The detailed world map

Microcontroller
Data in memory

The answer to all your homework

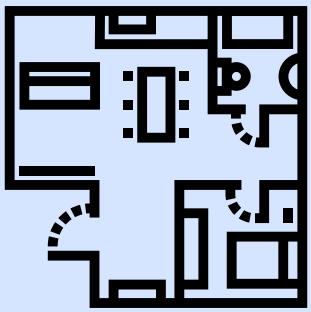
Microcontroller
Data in memory

The English vocabulary and grammar

Microcontroller
Data in memory

The weather forecasts all around the world

Microcontroller
Data in memory

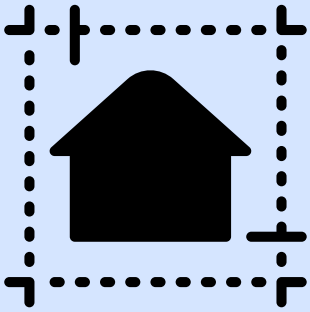


The location of the furniture in your house

Microcontroller
Data in memory

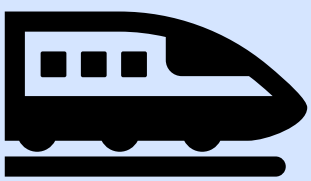
Your personal information

Microcontroller
Data in memory



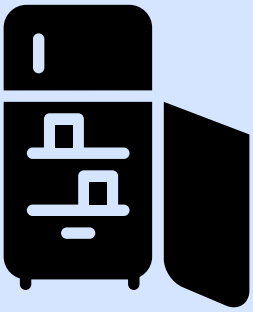
The exact shape of your lawn

Microcontroller
Data in memory



The train timetables all around the world

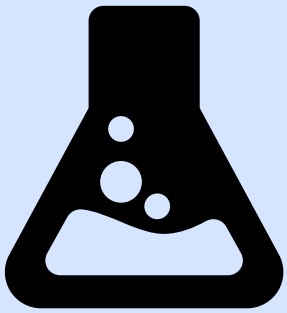
Microcontroller
Data in memory



Everything in your fridge

Microcontroller

Data in memory

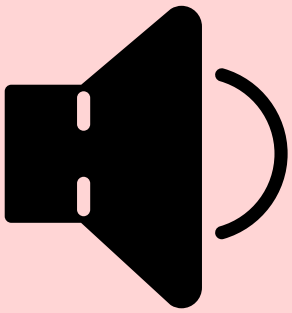


All the chemical elements

Sensor

Microphone

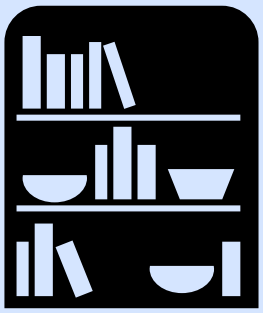
Actuator



Loudspeaker

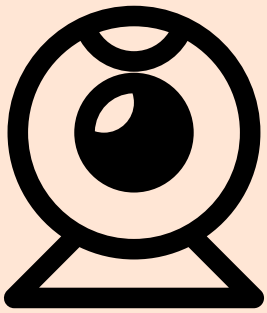
Microcontroller

Data in memory



Everything in your bedroom

Sensor



Camera

Actuator

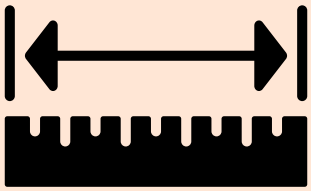
LED screen

Microcontroller

Data in memory

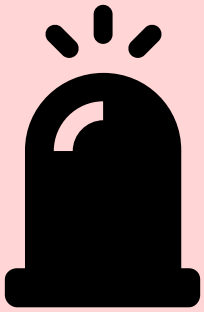
Your favorite videos, music and books

Sensor



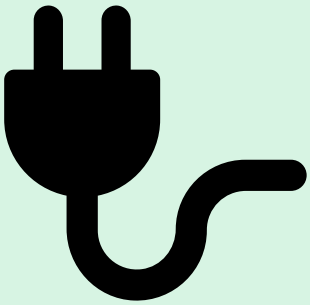
Distance sensor

Actuator



Flashing light

Energy

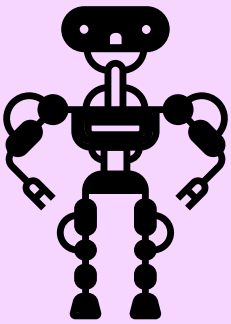


Cable with plug

Structure

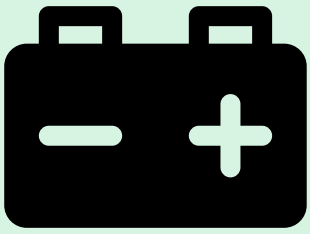
Pencil holder

Structure



Human-like skeleton

Energy

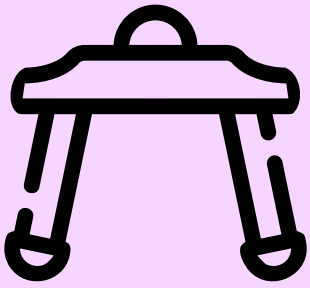


Long-life battery

Structure

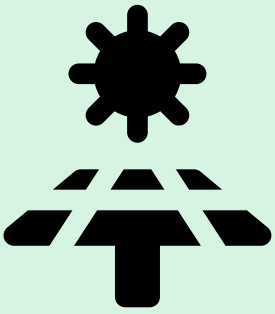
Hose

Structure



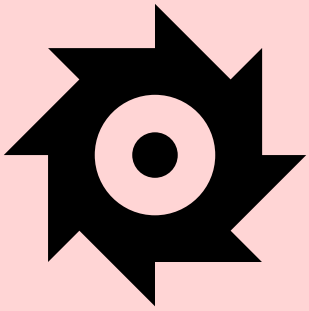
Drone structure

Energy



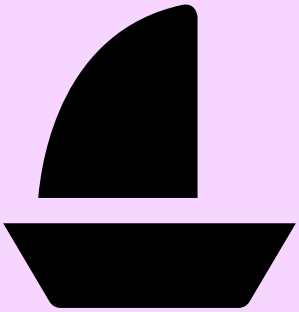
Battery connected to a solar panel

Actuator



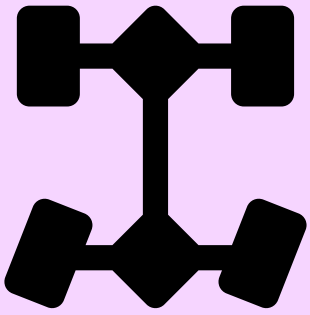
Sharp blade

Structure



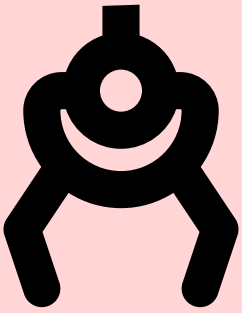
Boat hull

Structure



Wheeled vehicle chassis

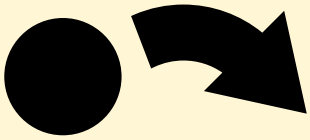
Actuator



Multifonctional clamp

Microcontroller

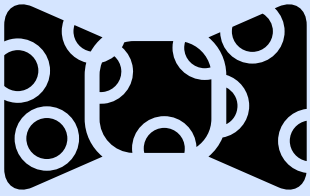
Program in memory



Move objects

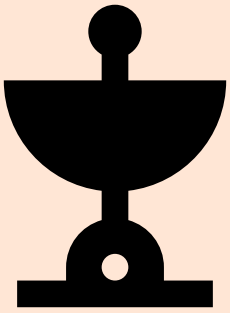
Microcontroller

Data in memory



100 funny jokes

Sensor



Speed sensor (radar)

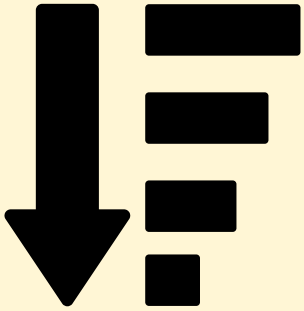
Microcontroller

Program in memory

Translate a text

Microcontroller

Program in memory



Sort

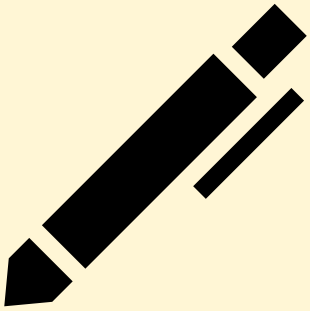
Microcontroller

Program in memory

Clean

Microcontroller

Program in memory



Write