Coding Lab

Write your initials in code, make a binary necklace and an ancient encryption device!

Science4you

Play Monster

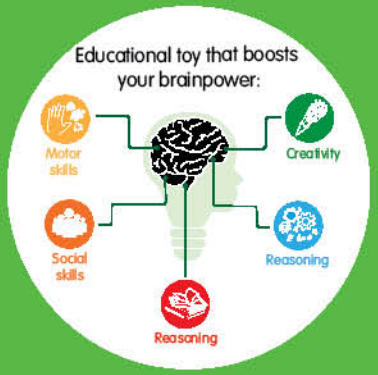
Dear parents and guardians:

Through play, children develop different cognitive skills. Scientific studies show that when we are having fun or making discoveries during an experiment, a neurotransmitter called Dopamine is released.

Dopamine is known to be responsible for feelings like motivation, reward and learning, and that's why experiences are related to positive feelings. So, if learning is a positive experience, it will stimulate the brain to develop various skills.

Therefore, Science4you aims to develop educational toys that combine fun with education by fostering curiosity and experimentation.

Find out below which skills can be developed with the help of this educational toy!



The educational feature is one of the key strengths of our toys. We aim to provide toys which enable children's development of physical, emotional and social skills.

Learn more about Science4you toys at:

www.playmonster.com

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Science4you

PlayMonster

We wanna hear how much fun you had! Get in touch at:
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playmonster@playmonster.com | 1-800-524-4263
For more fun, visit playmonster.com

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SAFETY RULES

- Read these instructions before use, follow them and keep them for reference.
- Keep young children and animals away from the experimental area.
- Clean all equipment after use.
- Make sure that all containers and/or non-reclosable packaging are fully closed and properly stored after use.
- Ensure that all empty containers and/or non-reclosable packaging are disposed of properly.
- Wash hands after carrying out experiments.
- Do not use any equipment which has not been supplied with the set or recommended in the instructions for use.
- Do not eat or drink in the experimental area.

GENERAL FIRST AID INFORMATION

- **In case of eye contact:** Wash out eye with plenty of water, holding eye open if necessary. Seek immediate medical advice.
- **If swallowed:** Wash out mouth with water, drink some fresh water. Do not induce vomiting. Seek immediate medical advice.
- **In case of inhalation:** Remove person to fresh air.
- **In case of skin contact and burns:** Wash affected area with plenty of water for at least 10 minutes.
- In case of doubt, seek medical advice without delay. Take the reagent and its container with you.
- In case of injury always seek immediate medical advice.

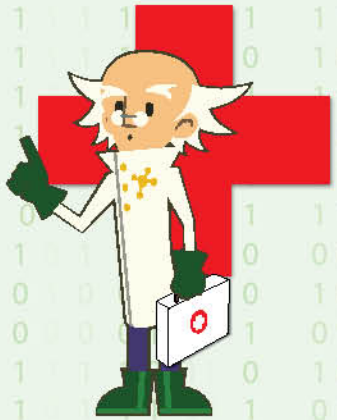
ADVICE FOR SUPERVISING ADULTS

- Read and follow these instructions, the safety rules and the first aid information, and keep them for reference.
- This experimental set is for use only by children ages 6 and up.
- Because children's abilities vary so much, even within age groups, supervising adults should exercise discretion as to which experiments are suitable and safe for them. The instructions should enable supervisors to assess any experiment to establish its suitability for a particular child.
- The supervising adult should discuss the warnings and safety information with the child or children before commencing the experiments.
- The area surrounding the experiment should be kept clear of any obstructions and away from the storage of food. It should be well lit and ventilated and close to a water supply. A solid table with a heat resistant top should be provided.

In case of poisoning by any of the components used in the experiments of this toy, contact your local poison control center or the nearest hospital. Please consult the following link for more information: https://www.poison.org/

In case of emergency dial:

9-1-1 or Poison Control: 1-800-222-1222



LIST OF SUBSTANCES SUPPLIED

Sand

Recommendations for substances and mixtures: Do not ingest. Avoid contact with the eyes and mouth. Use only according to the instructions. Store in tightly closed containers. Keep in a cool, dry place. Protect from moisture, direct sunlight and heat sources.

DISPOSAL OF USED SUBSTANCES

Do not dispose of substances and / or mixtures together with household or other waste. Please recycle packaging materials where local recycling programs exist.

KIT CONTENTS


Coding stand


Small bottles

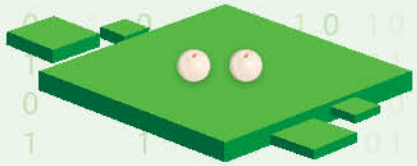

Decorative stickers

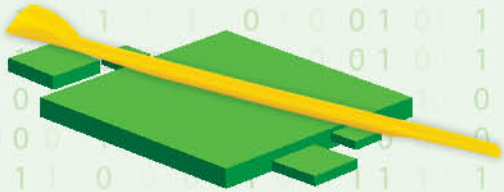

Card with graphic elements


Cups

Binary coding beads


Sand


Beads

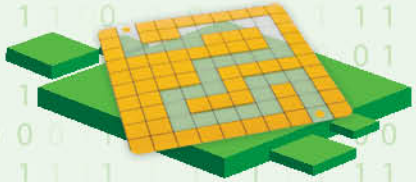

Scoop


Fishing line


Yarn


Paper straws


Card ribbons


Maze card

Coding stand
Look at your Coding stand! Throughout this adventure you will encode and use different algorithms present on the Coding stand. Have fun!


Suggested setup

(Od !ng!

WHAT IS CODING?

Computers and robots are programmed to act. The execution of each action depends on the instruction set received by the computer.
But, how does it happen?

Coding means writing step-by-step instructions to tell the robot or computer what to do.

The specific instruction set we give can be called the **algorithm**. On the other hand, a **program** is the realization, in a given programming language, of a certain algorithm (which solves a specific problem).

There are many languages spoken in the world: English, Chinese, French, Spanish... and as we have our way of communicating, so do computers.

Scientists who give instructions to computers do **programming**, and transform what they want the computers to do in their language.

In our daily lives many machines and mechanisms are controlled by computer programs.

OTHER COMPUTERS AND PROGRAMS:

1 2 3 4 5

1 MOBILE PHONES

Special software allows these devices to make phone calls or send text messages. Mobile phone and tablet applications are also computer programs.

2 VIDEO GAME CONSOLES

This is another type of computer, and the games you play on it are also programs. Every graphic and sound of the game is controlled by a code.

3 CARS

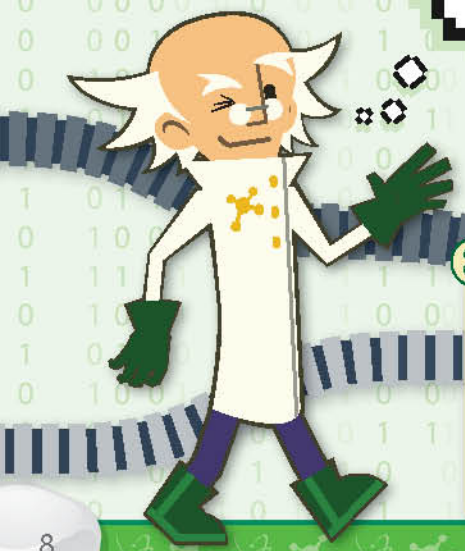
In some cars, computer programs control the speed, temperature and the amount of fuel in the vehicle.

4 WASHING MACHINES

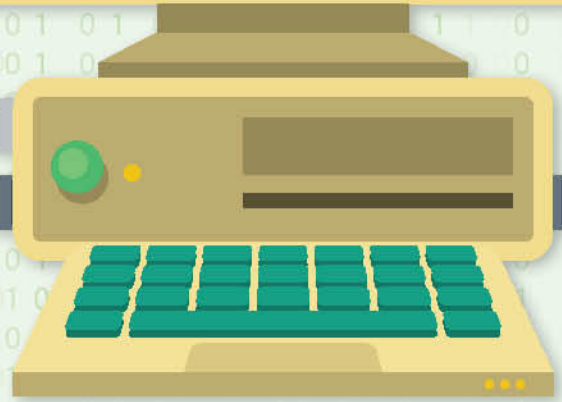
This type of machines are programmed to follow different cycles. One code controls water temperature and washing time.

5 ROBOTS

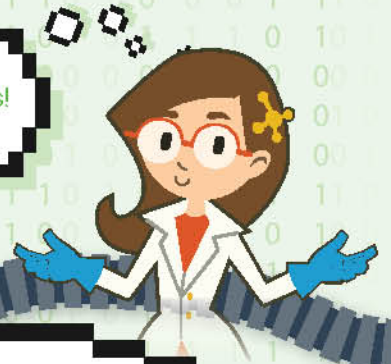
They can be programmed to perform any type of task and movement. Robots can build cars, play soccer, vacuum the house and perform many more functions.



Hi Scientist! Welcome to the **CODING LAB!**



In this Lab we learn to think like computers! Or... do computers think like us?



Code has been made outside of computers for a long time — you can even do coding without a computer. Let's jump into this adventure!

EXPERIMENT 1

Binary code

What you will need:

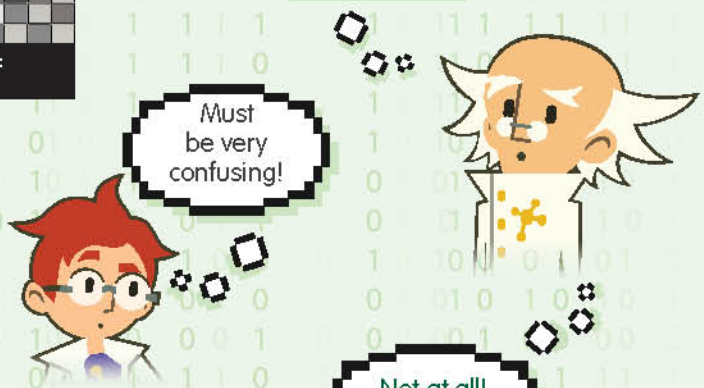
Material included in the kit:

- Card with graphic elements - dot cards

Extra items you will need:

- Scissors

Ask an adult to help you!



Code in action:

1 With the help of an adult, start by cutting out the five dot cards from your card with graphic elements.

2 Place the cards in **descending order** on the table.

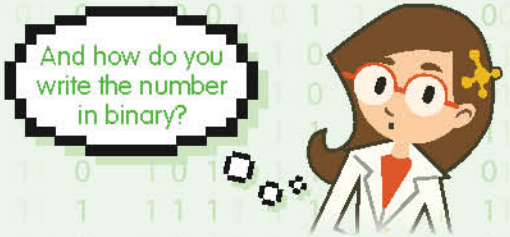
Each card has twice as many points as the card on the right. How many points would the next card placed on the left have?

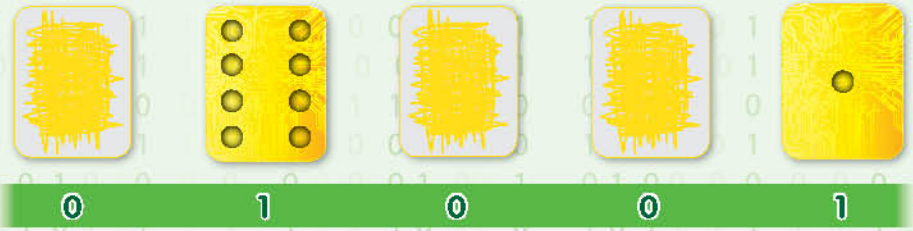
3 Use the cards to represent numbers. **How?** Leave the number of points corresponding to the number you want to represent.

Example:

Number 9

4 Write zero when the card is facing down and one when it is facing up. That is, follow this matching rule:





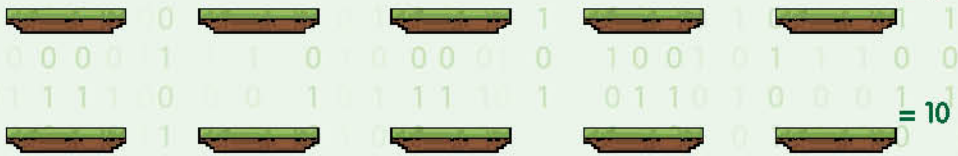
ALGORITHM

The binary system uses zero and one to represent whether a card is facing up or down. The **0** indicates that the card points are hidden, and **1** means that the card points are visible

5 It's time to start coding!

Challenge 1:

With the help of your cards, write the number 5, 10 and 22 in binary.



= 22

Challenge 2:

What number is represented by the binary:

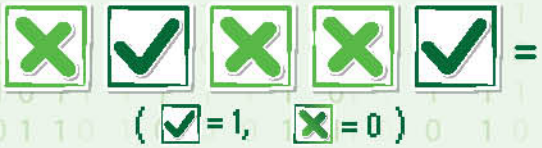
10101 = **11111 =** **01000 =**

SUPER CODING

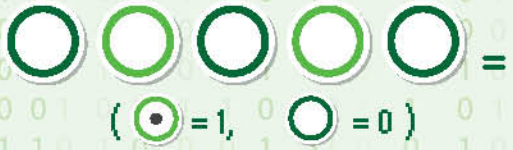
Is there more than one way to get a certain number? What is the largest number you can create? What is the smallest? Is there any number that cannot be formed between the smallest and largest?

Challenge 3:

Decipher the following coded numbers:



(☑ = 1, ☒ = 0)



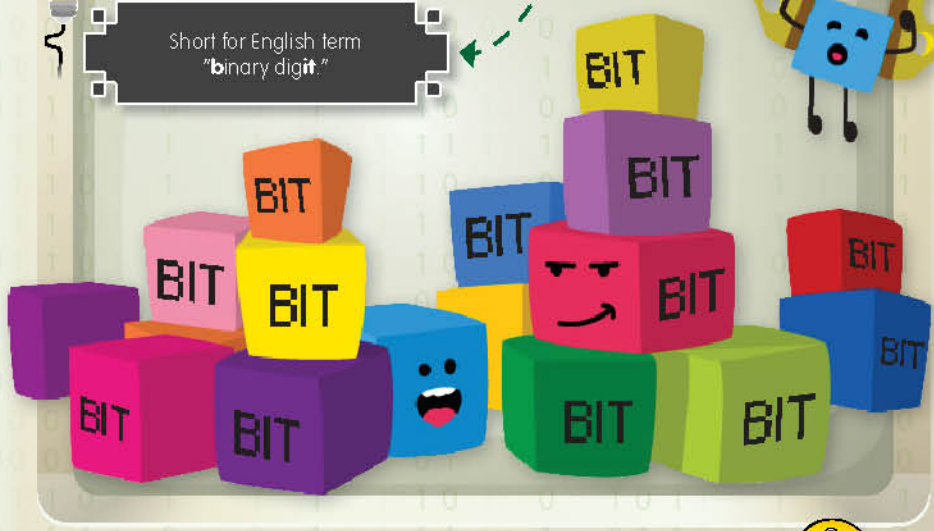
(⊙ = 1, ○ = 0)

(▲ = 1, ▼ = 0)

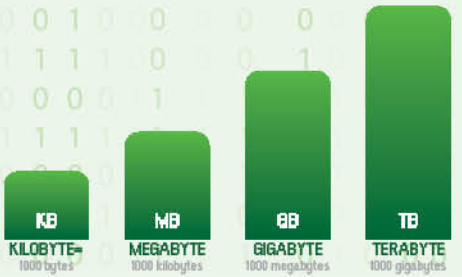
(⬆ = 1, ⬇ = 0)

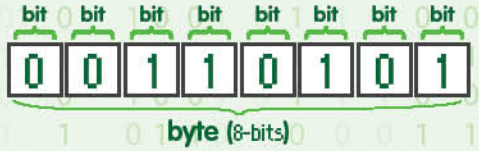
Each card you have used so far represents one **bit**. Each zero or one is a binary digit.

Short for English term "**bin**ary dig**it**."



One ***bit*** by itself does not mean much! Therefore, they are commonly used in groups of eight bits, and represent numbers from 0 to 255. **An 8-bit group is called a byte!**





A gigabyte is made up of more than 8.5 billion zeros and ones.

UM BIT = 0 or 1 | **UM BYTE** = 01010101 | **UM GIGABYTE** = 0101... (+ 8.5 billion zeros and ones).

EXPERIMENT 2

Binary jewelry

What you will need:

Material included in the kit:

- Fishing line
- Beads
- Coding stand
- Binary coding beads

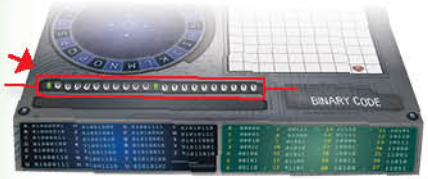
Extra items you will need:

- Scissors

Ask an adult for help!

In addition to numbers, a computer must also recognize letters or symbols. Our alphabet, i.e. the **alphabetic code**, can also be represented only by five "**bits**" (Experiment 1). To read, computers use a representation called **ASCII** (American Standard Code for Information Interchange).

Code in action:



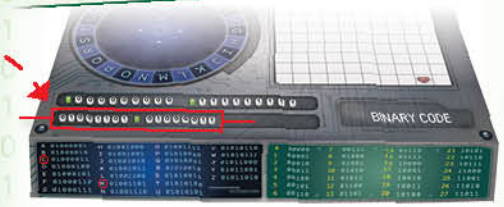
1 Place your binary coding beads on your coding stand. First all "0" and then all "1."

2 Choose the letters you want and look them up in the ASCII table below. You can also consult your coding stand.

ASCII table

A	01000001	H	01001000	O	01001111	V	01010110
B	01000010	I	01001001	P	01010000	W	01010111
C	01000011	J	01001010	Q	01010001	X	01011000
D	01000100	K	01001011	R	01010010	Y	01011001
E	01000101	L	01001100	S	01010011	Z	01011010
F	01000110	M	01001101	T	01010100		
G	01000111	N	01001110	U	01010101		

In the example below, we write Marie Curie's initials **MC**: 01001101 _ 01000011



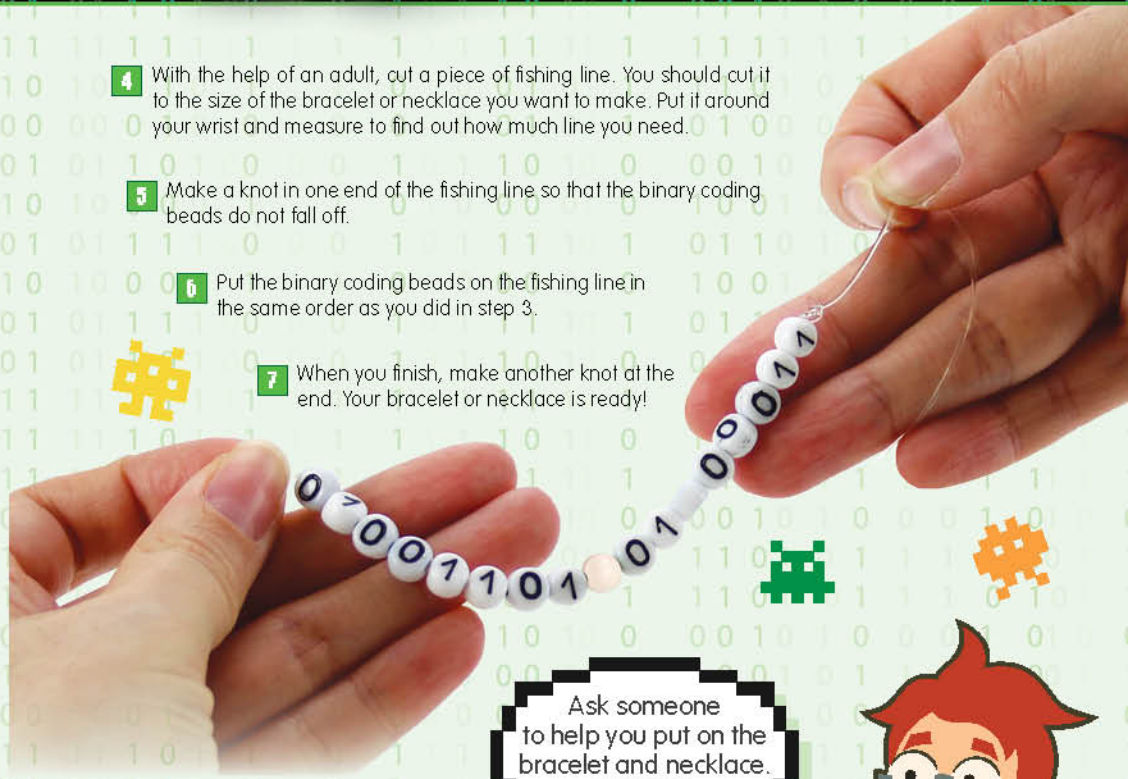
3 Place the binary coding beads of your chosen letter in the line below, in the order you see in the table. **You just created one letter in binary code!** Before moving on to the next, separate it with a colorful bead.

4 With the help of an adult, cut a piece of fishing line. You should cut it to the size of the bracelet or necklace you want to make. Put it around your wrist and measure to find out how much line you need.

5 Make a knot in one end of the fishing line so that the binary coding beads do not fall off.

6 Put the binary coding beads on the fishing line in the same order as you did in step 3.

7 When you finish, make another knot at the end. Your bracelet or necklace is ready!



Ask someone to help you put on the bracelet and necklace. **WOW!**

SUPER CODING

- Have fun coding other messages on your necklaces, bracelets, or even key chains!

- In addition to letters, you can also enter numbers in binary code. Look at the match in the ASCII table and create all the codes you like.

- You can, for example, code the day and month of your birthday, your age, or even the first letter of your favorite superhero. Get creative and surprise everyone with your binary jewelry!

CODING CHALLENGE

Want to code, but don't have any more binary coding beads? You can create your own!

Use modeling compound to make your own beads, and decide which color corresponds to "**0**" and which color corresponds to "**1**."

You can also use other types of beads or buttons that you have at home, as long as you make the necessary match.

EXPERIMENT 3

Encrypted messages

What you will need:

Material included in the kit:

- Card ribbons

Extra items you will need:

- Paper towel tube or other tube
- Pencil or marker
- Paper clip

Code in action:

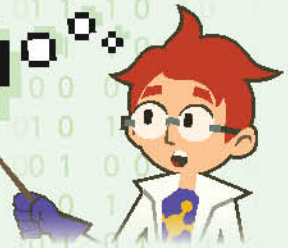
1 Wrap one of the rolled card ribbons around a tube as shown. Make about 5 turns. The paper should be rolled up so that there is no overlap.

2 Hold the paper tightly and rest the tube on a table with the ends of the card ribbons securely attached.

Tip: Place a paper clip at each end to fix the paper in place.

3 With the pencil, draw a line that separates the card ribbons along the length of the tube.

Choose your secret message, scientist! Try it with 9 or 10 letters.



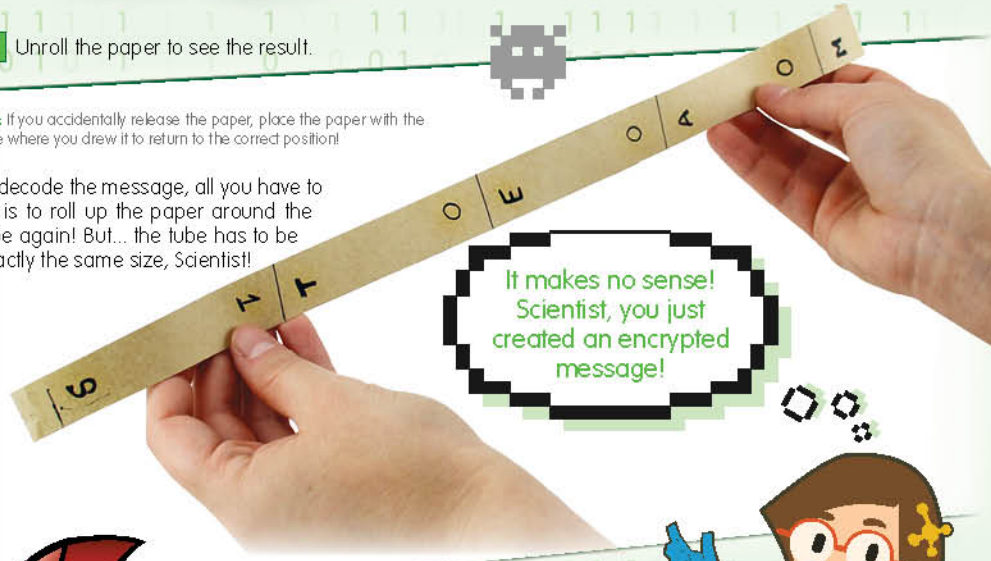
4 Write your secret message on the paper. Hold the tube tightly with the paper, and write each letter between each piece of the rolled up paper.

5 Rotate the tube to the other side to write the next line of the message.

6 Unroll the paper to see the result.

Tip: If you accidentally release the paper, place the paper with the line where you drew it to return to the correct position!

To decode the message, all you have to do is to roll up the paper around the tube again! But... the tube has to be exactly the same size, Scientist!



It makes no sense! Scientist, you just created an encrypted message!

This code has been used by the Greeks for over 2000 years!

Encryption is a coding process widely used today, and it allows you to protect information.

CRYPTOS → Hidden

GRAFIEN → Writing

The Greeks used **SCYTALE** that had the **TRANSPOSITION CIPHERS**

Change of each letter to another (or any other symbol) in the encoded text (decipher it simply by reversing the process). That is, the character order is changed.

They were widely used by the Sparta army. Everyone had a stick the same size so they could decipher all their messages! If the enemy took possession of it, they would not understand anything...

EXPERIMENT 4

Decoding secrets

What you will need:

Material included in the kit:

- Card with graphic elements - code wheels
- Coding stand

Extra items you will need:

- Scissors
- Sharp pencil or needle
- Paper fastener

Ask an adult for help!

Code in action:

Part 1 - Preparation

1 With the help of an adult, start by cutting out the 2 code wheels from the card with graphic elements.

2 With the help of an adult, poke a hole in the center of each code wheel.

3 Place the small wheel on top of the other, and secure with the paper fastener to the coding stand wheel.

Part 2 - Code

1 Choose a reference point from your code and register it. You must choose a letter on the outer wheel, a number and a symbol.

Example: Z | 23 | ≈

2 Align your wheels according to this reference point and do not move them.

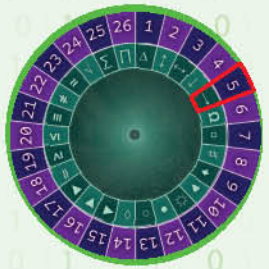
3 Write your message. For each letter of your message, find the corresponding character and choose which wheel you want to send the message to.

Example

Alphabetical wheel:	C	O	D	I	N	G
Numerical wheel:	26	12	1	6	11	4
Symbol wheel:	∏	_	_	_	_	_

4 Spin the wheels again and share your message and code reference with a friend. Could you decipher it?

You can use the examples below, and make more secret messages!



EXPERIMENT 5

Inside the computer

What you will need:

Material included in the kit:

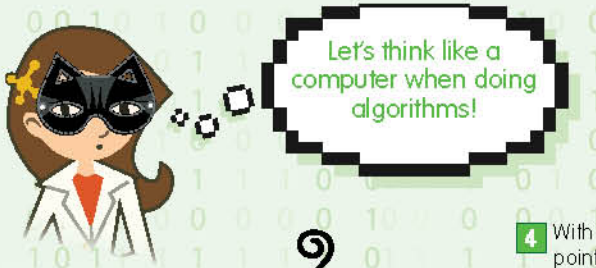
Extra items you will need:

• Empty yogurt containers or paper cups • Thin paintbrush • Toothpick

ALGORITM

There are 10 cats in a room and you have to order them! You can sort by size, color, day of birth, or even alphabetical order of name. Sounds simple doesn't it? Now imagine that you had to order millions of cats...

Computers have to sort a lot of information and data every day. To help them, scientists have developed algorithms to speed up the process, for example, using comparative conditions. These are the **algorithms they use to sort or rank!**



Code in action:

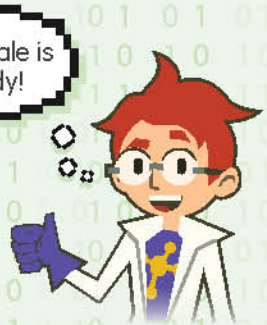
Part 1 - Preparation

1. Unroll your yarn and stretch it well.

2. Thread the yarn through the center of all 3 straws to connect them. You can use the end of a thin paintbrush or toothpick to help you.

3. Make a triangle with the straws. At one point, make a knot in the yarn to close it.

4. With more yarn, attach two cups to two different points, as illustrated. Make sure that the cups are attached at exactly the same height.



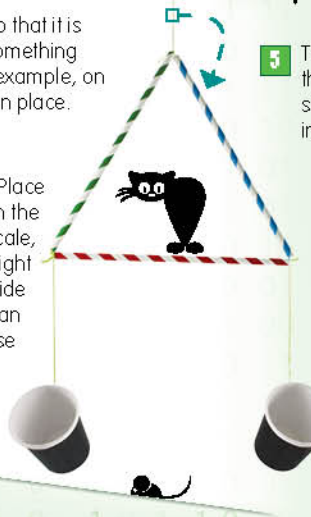
5. Using the scoop, fill the bottles with sand according to the table below:

Position 1 –	2x	**Position 5** –	10x
Position 2 –	4x	**Position 6** –	12x
Position 3 –	6x	**Position 7** –	14x
Position 4 –	8x	**Position 8** –	16x

As you fill the bottles, place them in their correct position on the coding stand.

6. Hang your scale so that it is balanced. Place something heavy, a book for example, on the yarn to hold it in place.

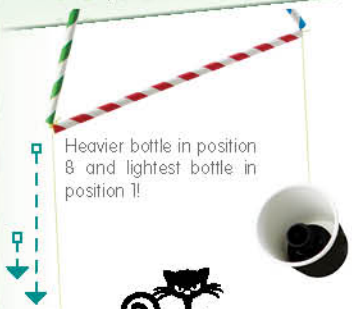
7. Let's test the scale! Place bottle 1 in the cup on the left side of the scale, and bottle 2 on the right side. The right side should go lower than the left side, because bottle 2 is heavier.



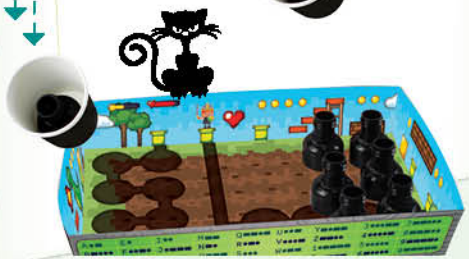
4. Repeat steps 2 and 3 until you have found the heavier bottle. Put that one in its position on the coding stand — **position 8**.

5. The ones outside the coding stand should be placed inside again.

6. Repeat steps 2 through 5 until you manage to place all the bottles in the correct position on the table.



Heavier bottle in position 8 and lightest bottle in position 1!



Part 2 - Code

1. On the other side of the coding stand, mix up all the bottles so you don't know which one is which.

2. Choose 2 bottles and put them on the scale. Which is the heaviest? Keep that one on the scale, and take the lightest off the coding stand.

3. Pick another bottle and place it on the free side of the scale. Again, keep the heavier on the scale, and take the lightest off the coding stand.

EXPERIMENT 6

Robotic adventure

Ask an adult for help!

Code in action:

Part 1 - Preparation

1 With scissors and the help of an adult, cut out the robot stickers from the sheet.

2 Stick one robot on each cup.

Your robot-cups are ready!

9 With scissors, cut the indication cards.

Indication cards:

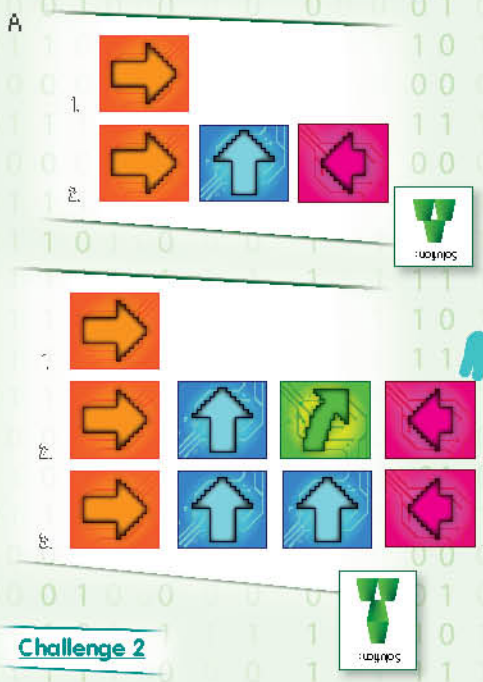
- Place the cup on the right
- Place the cup on the left
- Place the cup halfway to the right
- Place the cup halfway to the left
- Turn the cup (180º)
- Place the cup on top

Part 2 - Code

Challenge 1

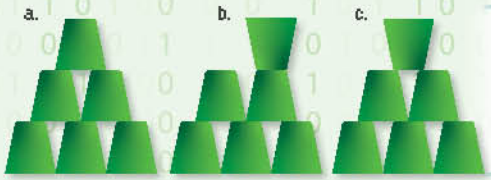
1 Place the red robot-cup (or another you want) in position 0. This robot-cup will be your reference.

2 Follow these algorithms doing the steps that the arrows indicate.



Challenge 2

1 Discover the algorithm with the steps required to build the following cup stacks:



2 Place the arrow cards on the table for each one.

9 Test your algorithm with the robot-cups.

Remember to always use a robot-cup as a reference!

Challenge 3

1 Create a cup stacking design.

2 Write the algorithm following the necessary steps to build it.

Have fun writing algorithms, and ask your friends to discover the stacking cups you created!

Computers or robots are following clear and exact instructions when doing tasks!

CODING CHALLENGE

Turn the arrow cards facing down and mix them. Now take them randomly one by one and write the algorithm that works.
Follow the algorithm, and find out which robot-cup stacking happens!

Sequence is the same as saying that there is a list of steps which follow a certain order.

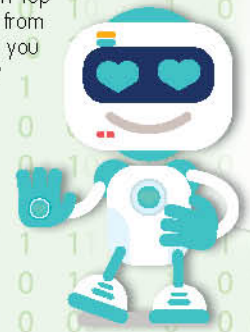
Imagine a recipe for a cake; you must follow the recipe steps so that everything goes as expected!

That is why it is so important to write down the algorithm and test it to make sure the order makes sense, so you manage to get the computer or robot to perform the algorithm's function.

EXPERIMENT 7

Maze codes

2 Place your maze card on top of the maze square from the coding stand. Did you manage to find the path?



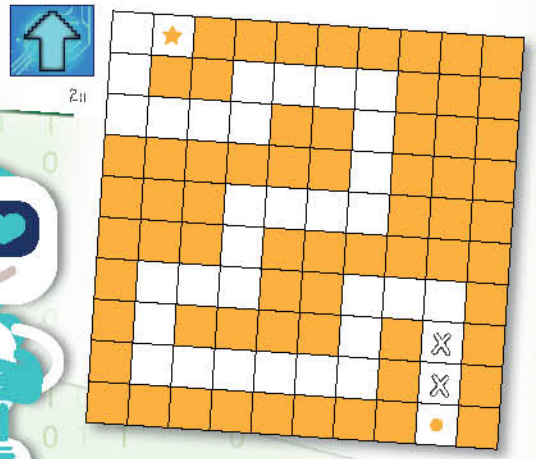
Code, action

Challenge 1:

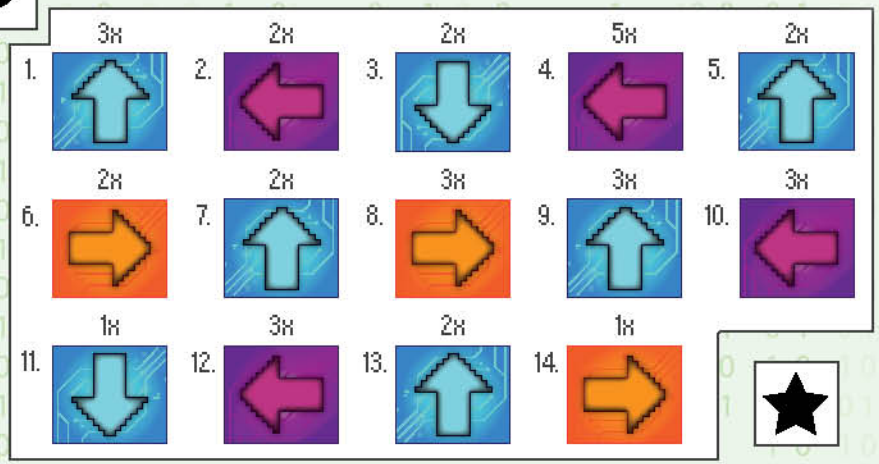
1 Take the dot to the star!

Follow the following indications of the maze algorithm, and make an X in the position of the indication it gives you.

Example:



Indications:



Challenge 2

1 With the maze card, change the position path.

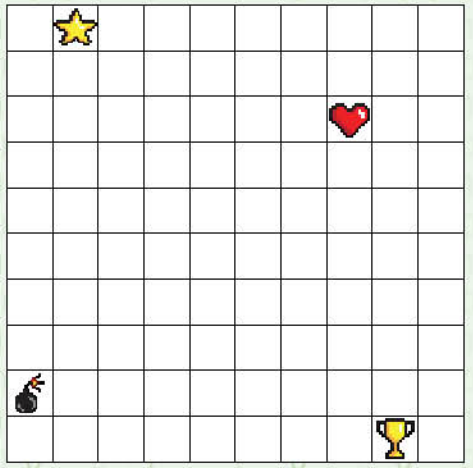
2 Cut out two elements of your choice from the decorative stickers.

3 Put one at the beginning of the path (of your choice), and the other at the end.

4 Write the algorithm with the necessary indications to be able to follow this path.

1.	2.	3.	4.	5.
6.	7.	8.	9.	10.
11.	12.	13.	14.	15.

Example:



SUPER CODING

Create other paths, and make the algorithms for them!

Draw the path on some cardboard and cut it out with the help of an adult. You can also try it with a sheet of paper and a marker.

Show the algorithm to your friends, and see if they can get follow the path you created.

Have fun!

EXPERIMENT 8

Pixel paintings

What you will need:

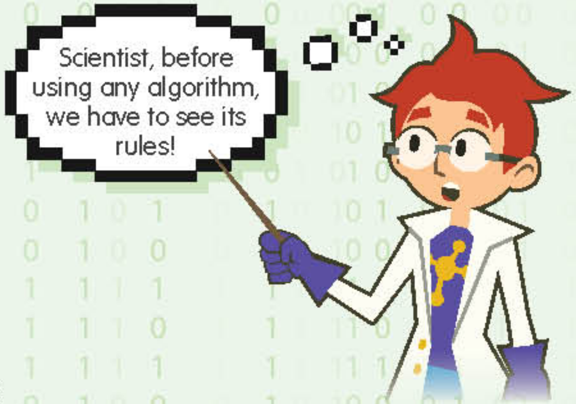
Material included in the kit:

- Pixel Frames (page 26 and 30)

Extra items you will need:

- Crayons or markers

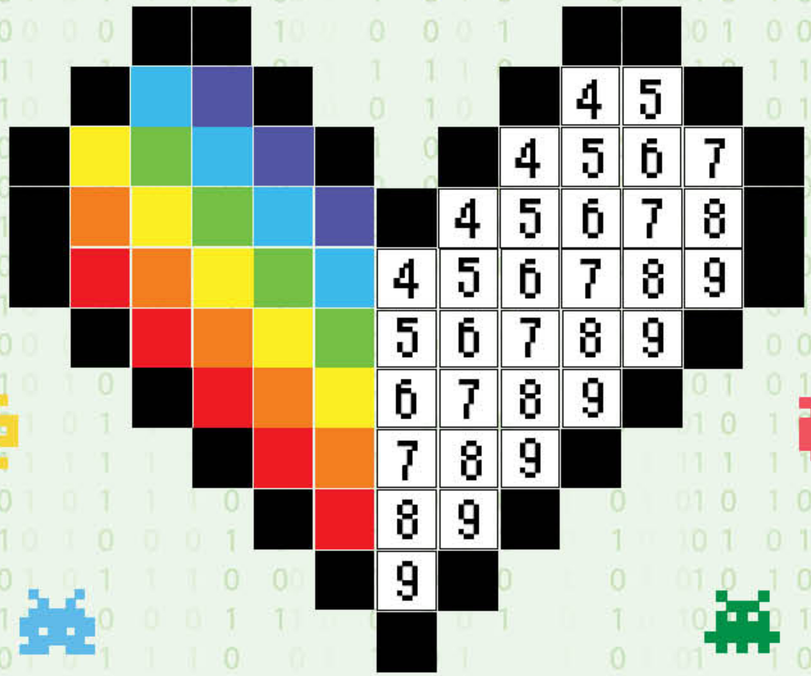
Code, action



1. Follow the rules of the algorithm for each challenge, to color the images that follow. According to the associated algorithm, color each square according to the established rule.

2. Discover the image you just created!

Example:



Challenge 1:

Rule:
0 - white 1 - black

Algorithm 1

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Challenge 2:

Algorithm 2

Rule:
0 - white 5 - yellow
1 - black 6 - pink 8 - orange

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	5	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	1	0	0	0	0	1	1	5	5	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	5	1	1	1	1	5	5	5	5	5	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	5	5	5	5	5	5	5	5	5	5	5	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	5	5	5	5	5	5	1	5	5	5	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	5	1	5	5	5	1	5	5	5	5	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	5	1	1	1	1	5	5	5	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	5	5	5	5	5	5	5	5	5	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	5	5	5	5	5	1	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Challenge 3:

Algorithm 3

Rule:
D - white R - purple Y - blue
K - black B - yellow A - pink

D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	D	D	D	D	D	D	D	D	K	K	K	D	D	D	D	D	D	D	K	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	D	D	D	D	D	D	D	D	D	K	A	K	D	D	D	D	D	K	A	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	D	D	D	D	D	D	D	D	D	K	A	A	K	D	D	D	K	A	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	D	D	D	D	D	D	D	K	K	K	A	A	K	D	D	K	B	B	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	D	K	K	K	K	K	K	K	A	A	A	A	K	D	K	A	B	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	K	Y	Y	Y	K	A	A	A	A	A	K	K	A	K	R	A	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	K	Y	Y	Y	K	A	A	K	K	K	K	K	K	A	K	R	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	K	Y	K	K	K	K	K	A	A	A	A	A	A	A	A	K	K	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	K	R	K	K	D	K	K	K	K	A	A	A	A	A	A	A	K	Y	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	K	K	R	K	D	K	Y	Y	K	K	K	K	K	K	A	K	Y	Y	Y	K	D	D	D	D	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	K	R	R	K	D	K	Y	K	K	D	D	D	D	D	K	K	Y	Y	Y	K	K	D	D	D	K	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	K	R	R	K	D	K	K	K	D	D	D	D	D	D	K	K	D	K	Y	Y	Y	K	D	D	K	Y	K	D	D	D	D	D	D	K	K	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	K	R	R	K	D	K	D	D	D	D	D	D	D	D	D	D	D	D	K	K	Y	Y	Y	K	K	Y	Y	K	D	D	D	D	D	D	D	K	B	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	K	R	R	K	D	D	K	D	D	D	D	D	D	D	D	D	D	D	K	R	K	K	Y	Y	Y	Y	K	D	D	D	D	D	D	D	D	K	B	B	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	K	R	R	K	D	D	D	D	D	D	D	D	K	D	D	D	D	D	D	K	R	R	K	Y	Y	Y	K	D	D	D	D	D	D	D	K	B	B	B	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	K	R	R	K	D	D	D	D	D	D	D	D	K	K	K	K	D	D	D	K	R	R	R	K	Y	K	D	D	D	D	D	D	D	K	K	B	B	B	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	K	K	R	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	K	R	R	R	K	K	D	D	D	D	D	D	D	D	K	B	B	B	B	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	K	K	R	K	D	D	D	D	D	D	Y	Y	Y	Y	D	D	D	D	D	D	D	K	K	R	K	D	D	D	D	D	D	K	K	K	K	B	B	B	B	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	K	B	K	K	D	D	D	D	D	D	Y	Y	Y	Y	D	D	D	D	D	K	D	D	K	R	K	D	D	D	D	K	K	B	B	B	B	B	B	B	B	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	K	B	B	K	D	D	D	D	D	D	D	Y	Y	D	D	D	D	D	D	K	D	D	K	R	K	D	D	D	K	B	B	K	K	K	K	K	K	K	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	K	B	B	K	D	D	D	D	D	D	D	D	D	D	D	D	K	D	D	D	D	D	K	R	K	D	D	K	B	B	K	Y	Y	Y	Y	Y	Y	Y	Y	K	K	D	D	D	D	D	D	D	D	D	D	D	D	D
D	K	B	B	K	D	D	D	D	D	K	K	D	D	D	D	D	K	K	D	D	D	K	R	R	K	K	K	K	K	K	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	K	D	D	D	D	D	D	D	D	D	D	D	D	D
D	K	B	B	K	D	D	D	D	D	D	D	K	K	K	K	K	K	K	K	K	K	R	R	K	D	D	D	K	K	K	K	K	K	K	K	K	Y	Y	Y	Y	Y	Y	K	D	D	D	D	D	D	D	D	D	D	D
D	D	K	B	B	K	D	D	D	D	D	D	D	D	D	K	R	R	R	R	R	R	K	K	D	D	D	D	D	D	K	K	K	K	K	A	A	K	K	Y	Y	Y	Y	Y	K	D	D	D	D	D	D	D	D	D	D
D	D	D	K	B	K	D	D	D	D	D	D	D	D	D	K	R	R	R	R	R	K	K	D	D	D	D	D	D	D	D	K	K	Y	K	K	A	A	A	K	Y	Y	Y	Y	K	D	D	D	D	D	D	D	D	D	D
D	D	D	D	K	K	D	D	D	D	D	D	D	D	D	D	D	R	R	R	R	K	D	D	D	D	D	D	D	D	D	D	K	K	Y	K	A	A	A	A	K	Y	Y	Y	Y	K	D	D	K	K	K	K	D	D	D
D	D	D	D	D	K	D	D	D	D	D	D	D	D	D	D	D	K	K	R	K	K	D	D	D	D	D	D	D	D	D	D	K	K	Y	K	A	A	A	A	K	Y	Y	Y	Y	K	D	D	D	K	Y	Y	K	D	D
D	D	D	D	K	K	D	D	D	D	D	D	D	D	D	D	D	D	D	K	K	K	K	D	D	D	D	D	D	D	D	D	K	Y	K	K	A	A	A	A	A	K	Y	Y	Y	K	D	D	D	D	K	Y	Y	K	D
D	D	D	K	D	D	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	K	Y	K	Y	K	A	A	A	A	K	Y	Y	Y	K	D	D	D	D	K	Y	Y	K	D
D	D	D	K	D	D	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	K	D	D	D	D	D	D	D	D	D	D	D	K	K	Y	K	A	A	A	A	A	K	Y	Y	Y	K	D	D	K	Y	Y	Y	K	D
D	D	K	D	D	D	D	K	D	D	D	D	D	D	D	D	D	D	D	D	D	K	D	D	D	D	D	D	D	D	D	D	K	D	K	Y	K	A	A	A	A	A	K	Y	Y	Y	K	K	K	K	Y	Y	Y	K	D
D	D	K	D	D	D	D	K	D	D	D	D	D	D	D	D	D	D	D	D	D	K	D	D	D	D	D	D	D	D	D	D	K	D	K	Y	K	A	A	A	A	A	K	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	K	D
D	K	D	D	D	D	D	D	K	D	D	D	D	D	D	D	D	D	D	D	D	K	D	D	D	D	D	D	D	D	D	D	K	D	D	K	K	A	A	A	A	A	A	K	Y	Y	Y	Y	Y	Y	Y	Y	Y	K	D
D	K	D	D	D	D	D	D	K	K	D	D	D	D	D	D	D	K	D	D	D	K	D	D	D	D	D	D	D	D	D	D	K	D	D	K	K	A	A	A	A	A	A	K	Y	Y	Y	Y	Y	Y	Y	Y	Y	K	D
D	K	D	D	D	D	D	D	K	D	K	D	D	D	D	D	D	K	D	D	D	D	K	D	D	D	D	D	D	D	D	K	D	D	D	D	K	K	A	A	A	A	A	A	K	Y	Y	Y	Y	Y	Y	Y	K	D	D
D	K	D	D	D	D	D	D	K	D	K	D	D	D	D	D	D	K	D	D	D	D	K	D	D	D	D	D	D	D	D	K	K	D	D	D	D	K	A	A	A	A	A	A	A	K	Y	Y	Y	Y	Y	K	D	D	D
D	K	D	D	D	D	D	D	K	D	K	D	D	D	D	D	D	K	D	D	D	D	K	D	D	D	D	D	D	D	D	K	D	K	K	K	D	D	K	A	A	A	A	A	A	A	K	Y	Y	K	K	D	D	D	D
D	D	K	D	D	D	D	D	K	D	D	K	D	D	D	D	D	D	K	K	K	K	K	K	D	D	D	D	D	D	D	K	D	D	D	D	K	D	K	A	A	A	A	A	A	A	K	K	D	D	D	D	D	D	D
D	D	K	D	D	D	D	K	K	D	D	K	D	D	D	D	D	D	K	D	D	D	D	K	K	D	D	D	D	D	D	D	K	D	D	D	D	K	D	K	K	A	A	A	A	A	A	A	K	K	K	D	D	D	D
D	D	D	K	D	D	K	K	A	K	D	K	D	D	D	D	D	D	D	K	D	D	D	D	D	K	D	D	D	D	D	D	D	K	D	D	D	D	K	D	D	K	K	K	A	A	K	K	K	K	D	D	D	D	D
D	D	D	D	K	K	K	A	A	K	D	K	D	D	D	D	D	D	D	K	D	D	D	D	D	D	K	D	D	D	D	D	K	D	D	D	D	D	D	K	D	D	D	D	K	K	D	D	D	D	D	D	D	D	D
D	D	D	D	D	K	K	K	K	K	D	K	D	D	D	D	D	D	K	D	D	D	D	D	D	K	D	D	D	D	D	D	K	D	D	D	D	D	D	D	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	D	D	D	D	D	D	K	D	D	D	D	D	D	K	D	D	D	D	D	D	K	D	D	D	D	D	D	K	D	D	D	D	D	D	K	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	D	D	D	D	D	K	D	D	D	D	D	D	D	K	D	D	D	D	D	D	K	D	D	D	D	D	K	K	D	D	D	D	D	K	K	A	K	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	D	D	D	D	D	K	D	D	D	D	D	D	K	D	D	D	D	D	D	K	D	D	D	D	D	D	K	K	D	D	D	K	K	K	A	A	K	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	D	D	D	D	D	K	D	D	D	D	D	D	K	D	D	D	D	D	D	K	D	D	D	D	D	D	K	D	K	K	K	K	A	A	A	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	D	D	D	D	D	K	K	K	K	K	D	D	K	D	D	D	D	D	K	K	K	K	D	D	D	K	K	D	D	D	K	K	A	A	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	D	D	D	D	K	A	A	A	A	K	K	K	D	D	D	D	D	K	A	A	A	K	K	K	K	K	D	D	D	D	D	D	K	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	D	D	D	D	K	A	A	A	A	A	A	K	D	D	D	D	D	K	A	A	A	A	A	A	K	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	D	D	D	D	K	K	K	K	K	K	K	K	D	D	D	D	D	K	K	K	K	K	K	K	K	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

SUPER CODING

Create your own pixelated figure. Then, write the associated algorithm and give it to another person so they try to draw that same figure.

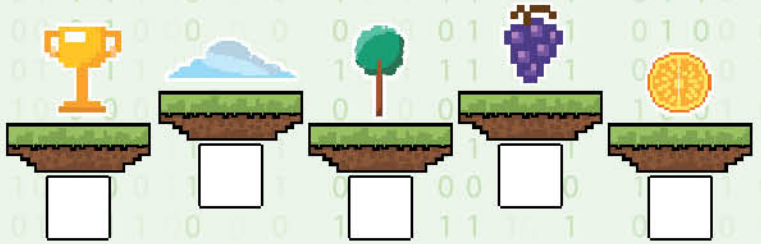
A Pixel is the smallest unit that makes up an image, regardless of its source. Photos, videos, films, animations — or on television screens or monitors — all have the pixels present.

Pixels are grouped into rows and columns to form an image.
An 800 x 600 pixel digital photo, for example, is 800 pixels wide by 600 high, i.e. it's made up of 480,000 pixels, all the same size. The higher the number of pixels, the greater the amount of information stored.

When we zoom in on a photo, we see several squares that make it up. Each of these squares is a pixel. There are millions or thousands of them!

Extra Challenges

Place the first letter of each word in the drawings below. What is it written?



Scientist, you just used another form of code!

EXPERIMENT 9

Bingo Morse

What you will need:

Material included in the kit:

• Coding stand

Extra items you will need:

• Scissors • Pencil • sheets of paper or cards

Ask an adult for help!

Morse Code was invented by Samuel Morse in the 19th century to establish long distance communication.

Each number, letter, or punctuation mark is represented by a combination of short and long signs (dots and dashes).

These signals could be sent over long distances by radio waves via the **telegraph. Morse code is still used on ships to transmit SOS signals.**

The letters **S** and **O** were chosen because they are the fastest and easiest to understand in case of an emergency! The acronym can also mean "Save our Souls."

Code in action:

Part 1 - Preparation

1 Make the Bingo cards. On small squares of cardboard or sheets of paper, write each letter and its Morse correspondence. These will be your bingo "balls."

2 Now create the game cards. Randomly place 4 to 6 letters and its Morse match.

P .——	S ...	V ...—
◦ SHORT SIGN	Bingo Morse	— LONG SIGN
R .—.	U ..—	X —..—

3 Practice reading Morse code before you start playing.

(●) – short sign – **dot**

(▬) – long sign – **dash**

Always pause between each of the signals you are making.

Part 2 – Coding

Let's play Bingo!
minimum 3 players

A player will be responsible for saying the letter or number in Morse code — the encoder. The remaining players receive bingo cards — the decoders.

1 The "encoder" starts by mixing all the "bingo balls." They can use a bag, or put them on the table face down.

2 The "encoder" takes a "bingo ball" at random, and says it out loud in Morse code. To monitor those who have already been shown, the "encoder" must always write the letter that came out.

Example:

L .—.. – **dot dash dot dot**

3 "Decoders" should check to see if they have this letter on their card. When they do, they make a cross mark.

Now repeat the letters and numbers:

A .—	B —...	C —.—.	D —..	E .	F ..—.
G ——.	H	I ..	J .———	K —.—	L .—..
M ——	N —.	O ———	P .——.	Q ——.—	R .—.
S ...	T —	U ..—	V ...—	W .——	X —..—
Y —.——	Z ——..	1 .————	2 ..———	3 ...——	4 ....—
5	6 —....	7 ——...	8 ———..	9 ————.	0 —————
@ .——.—.	? ..——..	. .—.—.—	, ——..——	/ —..—.	$ ...—..—

4 The first "decoder" to complete the card shouts "Bingo!" The "encoder" checks to see if they are the same ones that came out, if everything is right the "decoder" wins.

CODING CHALLENGE

Can you imagine an entire sentence in Morse code? Between each letter, there is a pause of three time units, and seven units between each word. Start by writing the sentence, and then write it in Morse code. Say the phrase to someone and see if he or she understood it! **Great idea for secrets, don't you think?**

EXPERIMENT 10

Coding in daily life

What you will need:

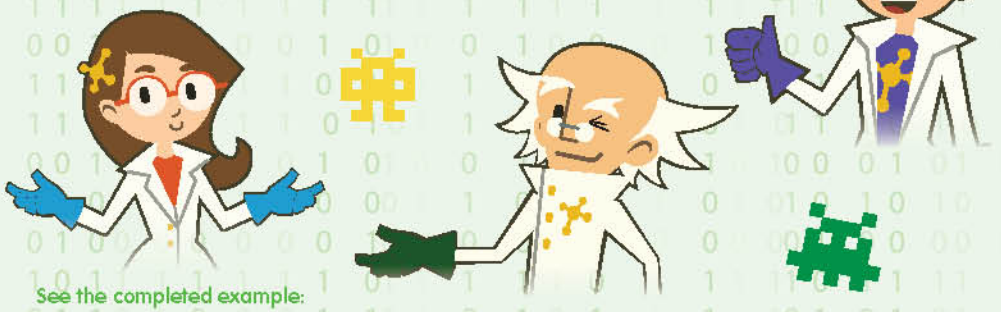
Material included in the kit:

- Decorative stickers

Extra items you will need:

• Scissors • Crayons or markers

Ask an adult for help!



Code in action:

1. With the help of an adult, cut out the elements from the decorative stickers.
2. Think of a route you follow in your everyday life and describe it using an action code.

See the completed example:

Key actions	Transition Actions	Required items
Eat breakfast	Walk to the kitchen	
	Eat	Plate, milk, cereal, spoon
	Put the dishes in the washing machine	

Key actions	Transition actions	Required items

3. In the required items you can put whatever you have available on the stickers.

Tip: If you don't have the sticker you're looking for, you can also draw it!

It may not seem like it, but this type of code is more complex!

Key actions and transition actions are very important in computer performance. Neither part of the process can be ignored, but there are some more important than others.

main actions → transition actions → support actions

For example, when you have breakfast, you cannot skip the step of using a dish because you will have nowhere to put your cereal and milk! This is a support action. However, going to the kitchen can be considered a transition action.

To perform their tasks, computers and robots need to have all of these actions perfectly described for them. When they are not, they will simply stop and wait for someone to tell them what to do!

Check out more COOL experiments!

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