EXAMPLE ACTIVITIES

FOR THE INTEGRATION OF ALGORITHMIC THINKING SKILLS INTO PRESCHOOL EDUCATION

3 2 1 ALGO LITTLE

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University of Maribor

Scuola di Robotica

EduCloud IDEAS FIRST

INTRODUCTION

ALGORITHMIC THINKING SKILLS

Algorithmic thinking consists of skills such as realising a problem or a process, solving a problem or breaking down a process into smaller steps that are easier to understand and follow, planning the steps of a process in line with the objectives, following the steps and reaching the aimed results and evaluating unnecessary or useless steps in the process. These skills provide us to organise our daily activities better, quickly see what doesn't work correctly and change what we do more effectively.

DEVELOPMENT & LEARNING AREAS

Preschool education is the very first step of the education life of many people. In today's world where technology dominates the way of our living, professions have been transformed into more digital contexts and day by day, every occupation has been being digitalised. This means education needs to catch up with the contemporary implementations and prepare students for the future jobs. Starting from the very beginning of education life will facilitate future generations to adapt to the newly emerging occupations faster. ALGOLITTLE draws attentions to this fact that improving algorithmic thinking as a part of computational thinking is a must to have the necessary skills for the future jobs.

Algorithmic thinking skills can be integrated into different development and learning areas of preschool education. These are given as follows.

1- Cognitive Development
   a- Mathematics and Reasoning
   b- Science and Nature
2- Language Development
   a- Native Language Development
   b- First Foreign Language Development
3- Social & Emotional Development
   a- Social & Emotional Learning
   b- Social Life Skills
4- Motor Development
   a- Sports & Play
   b- Art & Handcraft
   c- Music & Dance
5- Self-Help Skills Development
   a- Health
   b- Daily Life Skills

This activity book has been developed as a result of the online workshops carried out by the project team members of İzmir Democracy University and EduCloud in Turkey on 16/17-01-2021. The activities compiled were mostly offered by the preschool and ICT teachers who participated in the workshops. The activities and Annexes provided are free to use, all images were obtained from www.pexels.com and www.pixabay.com and the activities are licenced under CC BY SA. https://creativecommons.org/licenses/by-sa/4.0/

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1- COGNITIVE DEVELOPMENT

A- MATHEMATICS AND REASONING

ACTIVITIES

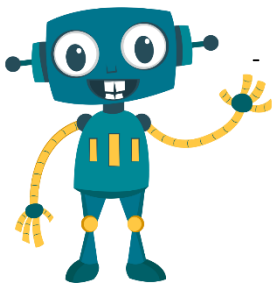
1- **Title:** Shall we eat apples?
Aim: Problem-Solving, Planning, Implementing, Evaluating the results
Preparation: Make ready apples or other fruit for the activity (Or you can make ready toy fruits or picture cards for this activity)
Process/Instructions:

- This activity is suitable for the circle time.
- Bring in some apples or other fruit (equal to the number of children)
- Tell children that you saw an apple in the tree which belongs to your mother. You wanted to eat it, but you couldn't reach it. Then you found a solution.
- Ask children to estimate what was your solution.
- Let children talk. (You can take notes to observe the improvement in their problem-solving skills.)
- Do not share what was your solution.
- Place an apple (attach the picture of an apple) to a high place and turn the conversation into a drama activity.
- Let children show their solutions.
- Let them try and see the results (in a safe way)
- Then sit down together with them and discuss which one was the best solution.
- They can also order the steps of the solution together and try one-by-one.
- You can eat the apples together with children at the end of the activity. Now, it's your turn to share your solution with them.

2- **Title:** Number two!
Aim: Number reinforcement, Following the steps of the game
Preparation: Puzzle Annex 7 (Number Two), classroom objects,
Process/Instructions:

- Two children will play the game at a time.
- The game consists of 4 steps (algorithms).
    1- Jumping over the obstacles
    2- Walking on the colour lines.
    3- Grouping the objects by twos
    4- Doing the puzzle (Annex 7) and finding the number two.
- Children will complete the activities in sequence and the child who finishes first will be the winner.
- Repeat the activity until all children play the game.

Important: Keep motivating the children who fall behind and take care of them after each game.



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1- COGNITIVE DEVELOPMENT

B- SCIENCE & NATURE

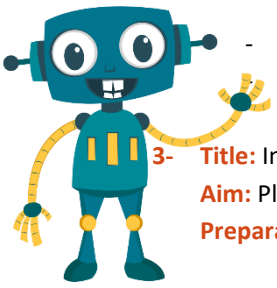
ACTIVITIES

1- **Title:** Look, what we have found!
Aim: Planning, Sequencing, Evaluation
Preparation: Prepare small pictures of the objects that can be found in nature, stick them to the paper bags, the number of the paper bags will be the same as the number of children
Process/Instructions:

- Give each child a paper bag.
- Take them to the preschool garden.
- Tell them that they will find the objects whose pictures are on the paper bags.
- Ask children about their plans to find the objects by asking questions. Elicit the answers.
- Let children go around the garden and look for the objects.
- After they finish looking for the objects, go to classroom together with them.
- Ask children to take the objects out of the paper bags and order them according to the order of the pictures on the bags.
- Check each sequencing together with the children.

2- **Title:** Tiny, Tiny Bread
Aim: Planning, Sequencing, Evaluation
Preparation: Flour, Water, Salt, Yeast, Bowls, Glasses, Spoons, Bottles, Aprons,
Process/Instructions:

- Ask children to follow you during the preparation of the bread.
- Take some flour and open a pool in the middle of it.
- Put some warm water in the pool and add some instant yeast to the water.
- Add a pinch of salt.
- Mix the ingredients.
- Let children follow you and do the same.
- Knead the dough.
- Wait for the children to do the same.
- Ask children to leave the dough for a while.
- By the way, play a song and clean the room with children and tidy yourselves up.
- When the dough rises, place small pieces of dough on the trays and put the trays into the oven.
- Do not let children touch the oven for safety issues.
- While the bread is in the oven, ask children to draw pictures and show the steps of the bread preparation process.
- Revise the process after they have drawn their pictures.
- Then eat tiny loaves of bread together.



3- **Title:** In nature
Aim: Planning, Sequencing, Selecting, Evaluation
Preparation: Draw four square shapes on the ground in the garden. Place natural objects on the squares.

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Process/Instructions:

- Do this activity in the preschool garden.
- Children will complete given tasks and move on to the other steps of the game.
- Decide the first task together with children.
- Show them you have leaves, stones, small branches, etc.
- Let them vote for the objects and start with the selected one.
- Tell them they will find e.g. 7 stones. Start the activity.
- When they all found 7 stones, ask them to put the stones on the first square.
- Make sure all children have found the exact number of stones.
- Then move on to the next step and ask them to find other objects in certain numbers.
- At the end, let children tell you how they found the objects, whether they have seen different objects, where they looked for the objects mostly etc.
- You can extent the activity by using the collected objects in an art activity.

4- Title: Colourful roads

Aim: Following the steps of a process,

Preparation: Draw different paths on the ground as in Annex 5 by using duct tape. Make ready coloured water in different glasses as in Annex 5.

Process/Instructions:

- Discuss what happens when we mix different colours. Listen to children's opinions.
- Ask a child to mix blue and yellow coloured water in one glass.
- Ask which colour has been obtained. Elicit the answer.
- Let him/her find the green path.
- Ask him/her to follow the path and find a green object in the box at the end of the path and bring it back.
- Repeat the activity with other colours until all children take place in the activity.

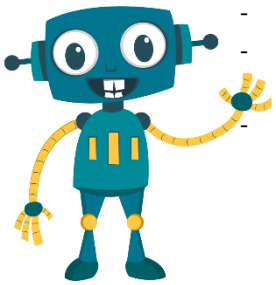
5- Title: Order, order!

Aim: Annex 1, Annex 2, Annex 3

Preparation: Cut out the pictures on Annex 1 and 3.

Process/Instructions:

- Attention: Children must have a prior knowledge about the life cycle of beans. So, you can make an experiment before this activity and plant bean seeds to observe the growth process. Remember that watering bean seeds regularly is also an example of cyclic algorithms.
- Copy and give Annex 1 to children and ask them to cut out the pictures. You can cut out them before if you don't have much time for the activity.
- Ask children to order the cards to show the growth of a bean.
- Let them order for a while.
- Then evaluate the sequences together with them.
- Ask children to draw the lifecycle of beans on Annex 2.
- You can repeat the activity with Annex 3.
- Annex 3 is about completing a hexagon and revising colours.



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2- LANGUAGE DEVELOPMENT

A- NATIVE LANGUAGE

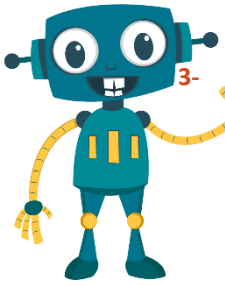
ACTIVITIES

1- **Title:** Neighbour Octopuses
Aim: Planning, Sequencing, Evaluation
Preparation: Coding carpet, images of arrows, toy octopuses (change the toys if not available), place the toys on the coding carpet side by side.
Process/Instructions:

- Tell a story to children. Hold the puppet/toy of the story and support your story with the puppet.
- Example story: There were two octopuses once upon a time. (Show the toys on the coding carpet.) They lived as neighbours. One day, one of them (let's name it blue octopus) went for a walk alone and got lost. We need to help the other one (let's name it red octopus) to find its friend.
- Ask children where the blue octopus went, let them take the blue octopus to a point away from the red one.
- Children will use the arrows and code the route to the blue octopus. One of them will take the red octopus and follow the coded route.
- Children will watch the walking child and when the child followed the route they will evaluate if the walking child was taking the steps correctly.
- You can repeat the activity with different children for a few times. So, let them draw their own paths each time. You can also change the toys and repeat the activity.

2- **Title:** Draw your road yourself!
Aim: Choosing and planning the steps according to the objectives
Preparation: coding carpet, foam sheets, classroom toys
Process/Instructions:

- Let children sit down around the coding carpet.
- Put a classroom toy (e.g. a toy cat) on a square on the coding carpet.
- Put another toy (e.g. a doll girl) on another square.
- Tell children that the doll missed the cat, and she wants to reach it immediately.
- Let children put the foam sheets to connect the road between the two toys.
- Make sure the road has the shortest route.
- Then tell them that the cat is hungry, and she needs to buy some milk for the cat.
- Put a toy market on a square on the coding carpet and let children put the foam sheets on the carpet and determine the route.
- You can produce more stories and let children draw the routes according to the objectives given.



3- **Title:** Let's find the cat!
Aim: Planning, Determining the steps, Following the steps, Evaluation,
Preparation: Smart board, Scratch-Jr,
Process/Instructions:

- Design a code game on Scratch Jr with start and end points, including the parts of the school.

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- Bring in a puppet cat and say, “My cat is curious about inside of the school.” Then ask, “Are you curious, too?”
- Elicit the answers.
- Then organise a tour with children and take them to the different parts of the school.
- After the tour, go to the classroom altogether and say, “Oh my cat is lost. Where is it?”
- Turn on the smart board and start the game.
- Ask children where the cat is, and make sure all of them see the cat in the game board.
- Ask one child to come forward, and let other children give instructions together and lead him/her. The child will follow the instructions to reach the cat.
- When the cat is found, ask children if they could follow another route to find the cat.
- Then play the game again.

4- **Title:** Little Red Riding Hood
Aim: Planning, Determining the steps, Following the steps, Evaluation,
Preparation: Annex 8, Story book (Little Red Riding Hood)
Process/Instructions:

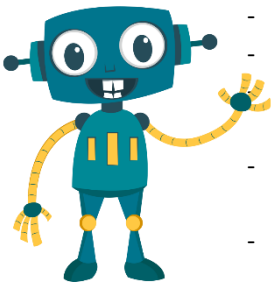
- Tell children about the story “little red riding hood”
- Hand out Annex 8, one for two children.
- Children will do the activity in pairs.
- Let children cut out the pictures.
- Ask them to place the pictures on the grid.
- One child will give instructions and the other one will follow the steps to take the girl to her grandmother’s house.
- They can add other fairy tale characters to the grid.
- After the activity, let children talk about how they played the game.

2- LANGUAGE DEVELOPMENT

B- FIRST FOREIGN LANGUAGE

ACTIVITIES

1- **Title:** Hungry caterpillar
Aim: Planning, Sequencing, Evaluation
Preparation: Story cards (hungry caterpillar), Annex 6, cut out the food items and make them ready for the activity.
Process:



- Tell children about the story of hungry caterpillar by using the story cards.
- Give each child a copy of Annex 6.
- Children will first cut out the food items.
- Then they will place the food items on different places on the grid, follow the correct path and take the caterpillar to the foods one by one as in the story.
- It may be difficult to remember all the food items for children. So, you can do the activity with four food items at a time.
- You can change the food items and repeat the activity.

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3- SOCIAL & EMOTIONAL DEVELOPMENT

A- SOCIAL & EMOTIONAL LEARNING

ACTIVITIES

1- **Title:**

Aim: Following the steps of a process, Evaluation

Preparation: Annex 4, crayons, Lego pieces, teddy bear,

Process:

- Ask children to imitate an angry person.
- Use your gestures and imitate an angry person, too.
- Do the same activity with the emotions; happy and sad.
- Imitate the three emotions by using your gestures and ask children to guess which emotions they are.
- Ask some of them to show one of these emotions and let others guess the emotions.
- Then hand out Annex 4.
- Ask children to choose an emotion and follow it through the route.
- Each child will go to the box at one corner of the room and find the object in the picture that they reached at the end of the grid.
- At the end, evaluate the activity with children.

3- SOCIAL & EMOTIONAL DEVELOPMENT

B- SOCIAL LIFE SKILLS

ACTIVITIES

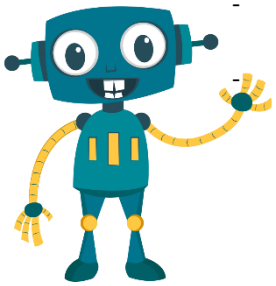
1- **Title:** Let's Go Shopping!

Aim: Planning, Sequencing, Evaluation

Preparation: Tables will be stalls, make ready the pictures of the grocery products, prepare the grocery products (real objects or models).

Process:

- Children will make a list of what they want to buy. (Let them choose)
- The lists will include the pictures of the grocery products.
- Determine a child to sell the products.
- Children will go shopping and buy the products one by one.
- You can ask them to buy the products in an order, or you can ask them to put the pictures of the bought products into a box.
- Children check if they have bought all the products in their lists.



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4- MOTOR DEVELOPMENT

A- SPORTS & PLAY

ACTIVITIES

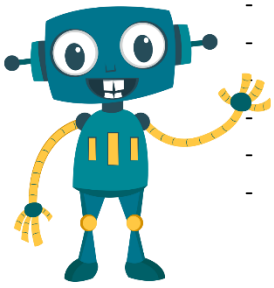
1- **Title:** Take me across the road.
Aim: Planning, Determining the Steps, Selection, Evaluation, (Empathy towards disabled people)
Preparation: A coding carpet, big-size classroom objects, blindfold,
Process/Instructions:

- This game is played with two children at a time.
- Let one of the children place ten classroom objects on the coding carpet randomly.
- The other child will be blindfolded and won't see the locations of the objects.
- Ask the leading child to plan how to take his/her blindfolded friend across the road on the carpet.
- Then the leading child will give instructions and help the blindfolded child to go across the road without touching any classroom objects scattered on the coding carpet.
- The leading child should employ his/her reasoning to help the blindfolded child to go across the road. There will be options to lead him/her to different directions.
- After the activity, check if the leading child gave correct instructions.

2- **Title:** We go through the hoops!
Aim: Problem-solving
Preparation: Classroom objects will be obstacles.
Process/Instructions:

- Tell children a story that a bird is injured and needs their help. However, they have to overcome some obstacles on their ways.
- Show the injured toy bird and put it somewhere in the room.
- Place a table between children and the toy.
- Ask them how they can overcome this obstacle and reach the bird to help.
- Let children talk and offer solutions.
- Make sure they can see that there may be different solutions to a problem.
- Ask children to try their solutions to see if they work.
- Change the obstacle and repeat the activity.

3- **Title:** Fetch the toys quickly!
Aim: Planning, Following the steps, Evaluation
Preparation: Three classroom objects with different colours (red, blue, yellow)
Process/Instructions:



- Put three toys on different learning centres.
- Ask a child to fetch the red, blue, and yellow toys respectively.
- Let the child go and pick the toys, first the red one, second the blue one and third the yellow one.
- Motivate the child with applauses.
- Ask if there is a volunteer who will put back the toys in the correct order.
- Choose a child and let him/her do the activity.

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- Then repeat the activity with other children. You can change the order of the colours, add a new colour, or remove one of them. At the end, evaluate the activity together with children.

4- **Title:** Take the rabbit to the carrots
Aim: Planning, Following the steps, Evaluation
Preparation: Coding carpet, a box of carrots
Process/Instructions:

- Place a box of carrots on a square of the coding carpet.
- Tell children that half of them will imitate rabbits and they will be very hungry.
- Children will take turns and play the game as couples at a time and each child who imitates the rabbit will start from a different point on the carpet.
- While one of the children hops like a rabbit, the other child will give instructions such as hop one step forward, turn right, hop two steps forward, etc.
- The game will finish when the rabbit reaches the box of carrots.
- You can let the two children who finish the game eat their carrots. (optional)
- Repeat the game with other children.

4- MOTOR DEVELOPMENT

B- ART & HANDCRAFTS

ACTIVITIES

1- **Title:** What do we have on our faces?
Aim: Planning, Sequencing, Evaluation
Preparation: Colourful foam sheets, scissors, cut some shapes of eye, nose, mouth, ear, hair, eyebrow, and face (circles, ovals)
Process:

- Listen to a song about the parts of a face.
- Let children show their eyes, noses, ears, etc. along with the song.
- Then place the circle shapes on the carpet.
- Ask children to place the parts of the face on the circles.
- The sequences may be randomly.
- You can be involved in the process and place the parts incorrectly to observe the attention of children. (Optional)
- Then give children some foam sheets and ask them to prepare their own shapes.
- Let them stick the parts of the face on the circle or oval shapes.
- Evaluate each face together with children.
- Exhibit their art crafts on the bulletin boards.

2- **Title:** Let's make a mandala!
Aim: Applying iterations, loops
Preparation: Natural objects like stones or leaves, glue, paper, or preprepared mandala
Process:

- Walk around the preschool garden and pick some stones or leaves with children.

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- Then go to the classroom and sit down with them.
- Show some mandala examples and let children check them in detail.
- Ask them to create a mandala by using the natural objects collected from the garden.
- They will repeat some patterns and create their mandalas.
- Help them if needed.
- You can also hand out simple preprepared mandalas and ask them to colour the mandalas.
- The repetitions are the examples to cyclic algorithms.

4- MOTOR DEVELOPMENT

C- MUSIC & DANCE

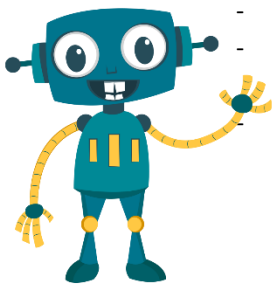
ACTIVITIES

1- Title: Clip them all!
Aim: Applying cyclic algorithms (iterations, loops)
Preparation: Paper (foam) plates, clothespins, board markers or crayons
Process:

- Give each child a paper plate and 10 clothespins, 5 of them red and 5 of them green.
- Tell them that they will clip one red and one green side-by-side at a time and make a pattern around the plate.
- They will have time until the music is over.
- Start the music and let them do the activity.
- At the end, check the patterns together with children.
- You can repeat the activity with other colours.

2- Title: Robot dance
Aim: Applying cyclic algorithms (iterations, loops)
Preparation: Arrows
Process:

- Sing a simple song and show the arrows (directions: right, left, up and down) to let children turn right, turn left, jump high and crouch
- The song:
  Turn right, clap, clap, clap (clap three times)
  Turn left, clap, clap, clap (clap three times)
  Jump high, shake, shake, shake (shake hands)
  Crouch now and say goodbye (wave hands)
- Repeat the activity until all children do the same movements.
- Then draw three circles on the ground side by side. Make sure that it is easy to jump from one circle to the other.
- Ask each child to jump to the left, right or centre by saying, right, left and centre randomly.



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5- SELF-HELP SKILLS DEVELOPMENT

A- HEALTH

ACTIVITIES

1- **Title:** Let's Wash Our Hands!
Aim: Planning, Sequencing, Evaluation
Preparation: Prepare picture cards showing the steps of hand washing, a puppet
Teaching Methods & Techniques: Demonstration, Trial & Error
Process:

- Take a puppet and make it imitate hand-washing activity.
- Let children imitate the puppet.
- Put the picture cards in front of the children.
- Make the puppet order the cards incorrectly (for example the puppet can take the card showing foamy hands first) and ask for children's help.
- Let children order the cards.
- Then, if possible, you can take children to the restroom and let them wash their hands. This will be a real-life experience.
- At the end, discuss the activity with them and make sure if they learnt the steps thoroughly.

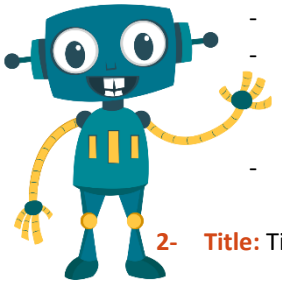
5- SELF-HELP SKILLS DEVELOPMENT

B- DAILY LIFE SKILLS

ACTIVITIES

1- **Title:** Mm, Yummy Lemonade!
Aim: Planning, Sequencing, Evaluation
Preparation: Menu, lemons, water, bowls, sugar, spoons, picture cards of lemonade preparation process
Process/Instructions:

- Provide a menu with lemonade and let children taste it.
- Ask children how lemonade is made.
- Listen to their answers.
- Ask children to learn from their parents about the preparation of the lemonade.
- Ask parents to take their children to the market and buy some lemonade together.
- Ask parents to procure the ingredients of lemonade and bring them to the preschool. (or bring the ingredients yourself)
- Prepare lemonade with children (at the workshop) and drink it together with them.
- Ask children if they like it.
- Then go to the classroom and ask children to order the picture cards showing the steps of the lemonade preparation process.
- At the end, let them discuss the process.



2- **Title:** Tidy up!

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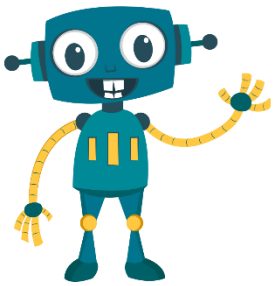
Aim: Planning, Sorting, Evaluation

Preparation: A song about tidying up the room

Process/Instructions:

- At the end of the day (or an activity), ask children to tidy up the room.
- However, they must sort the objects according to their functions/colours/sizes. (You can decide.)
- For example, they will put the toys in a green box while they put the crayons in a blue basket.
- Play a music during the activity.
- When the music is over, they must finish the activity.
- After the activity, check the boxes with children and see if there are improperly put objects in the boxes.



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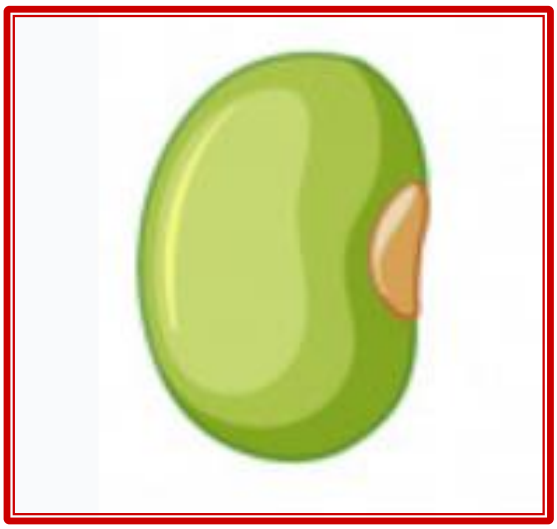
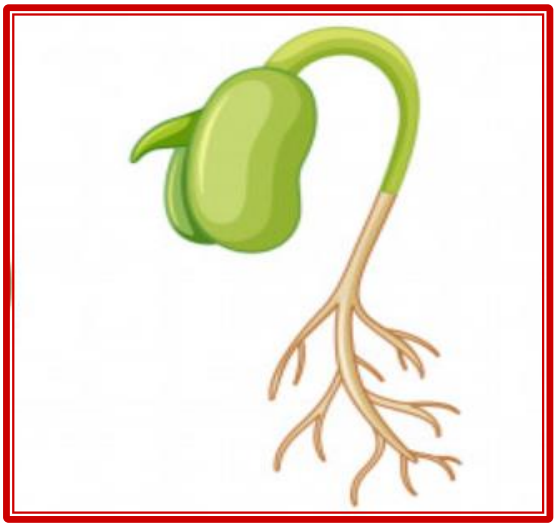
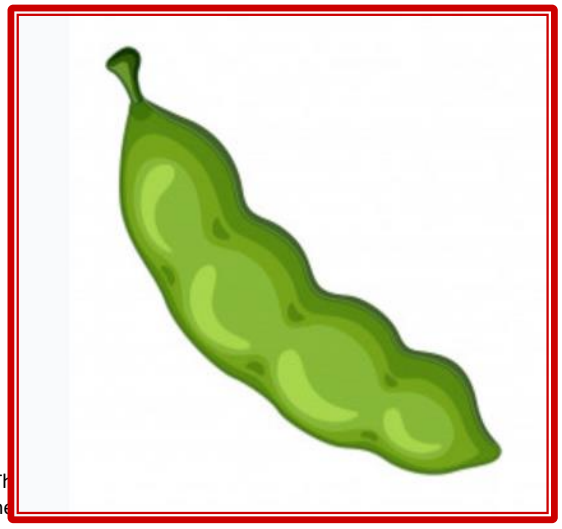
ANNEX 1







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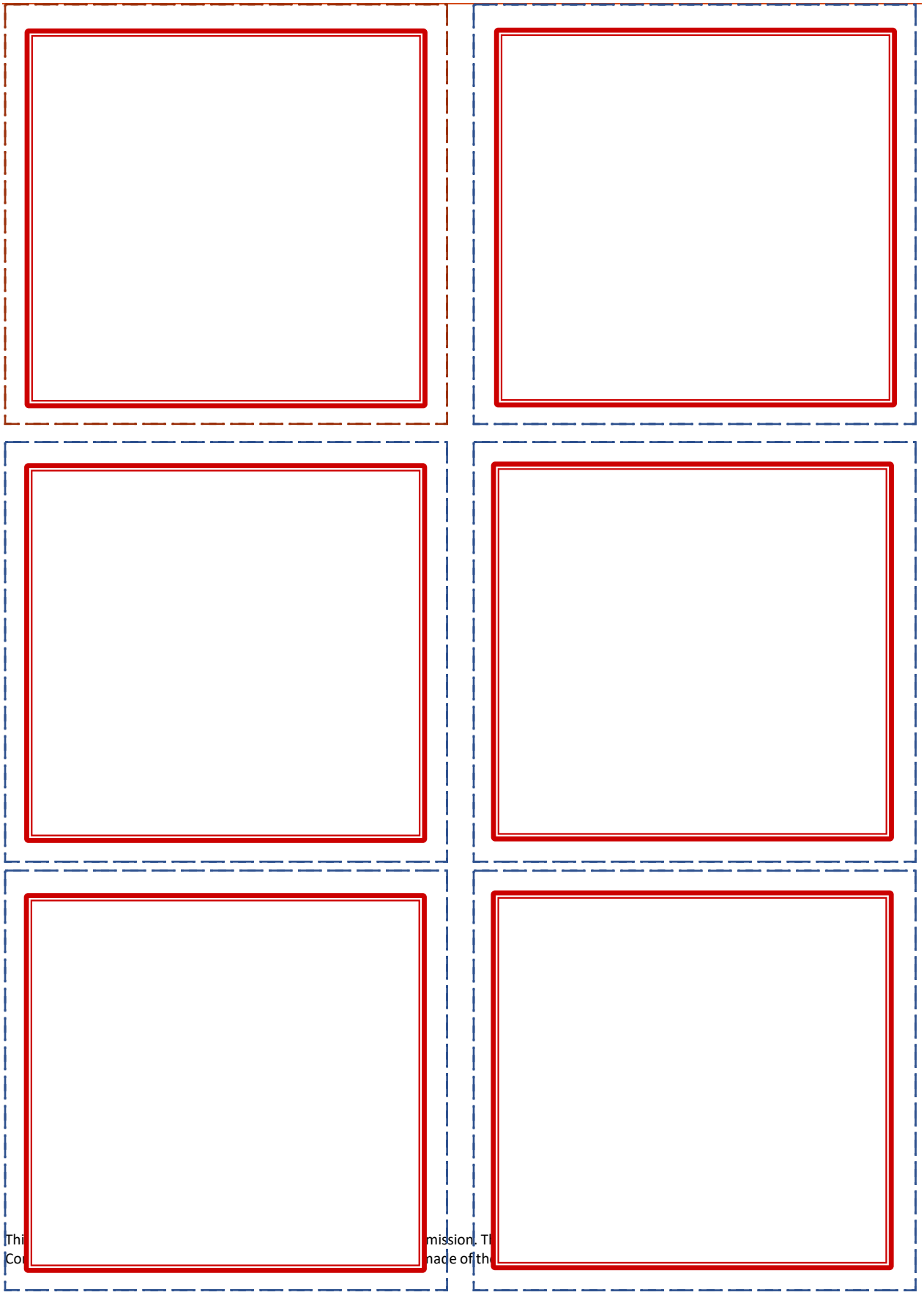

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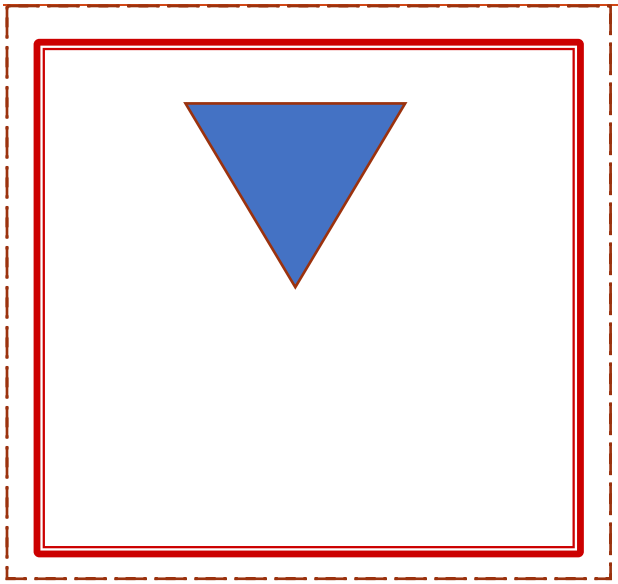
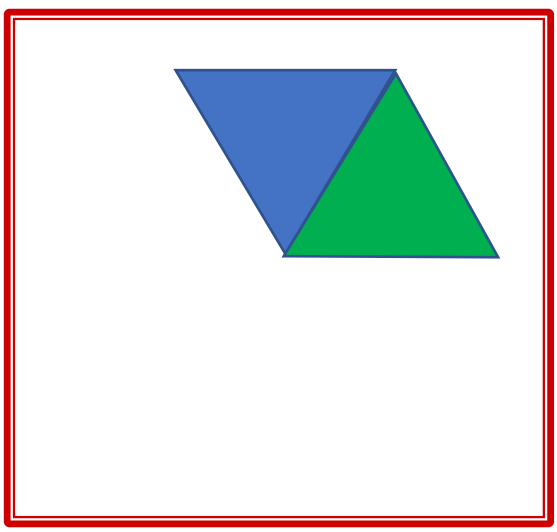
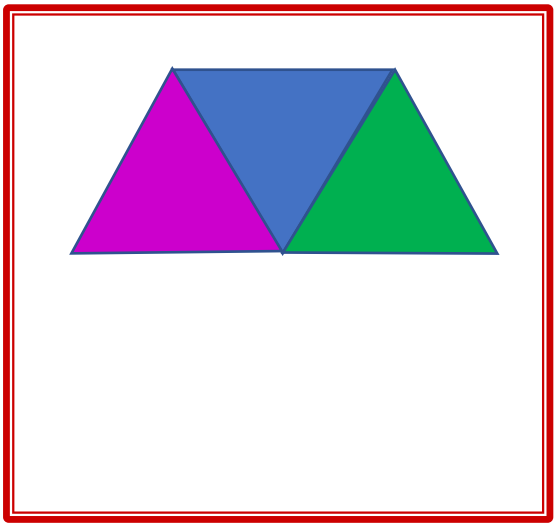
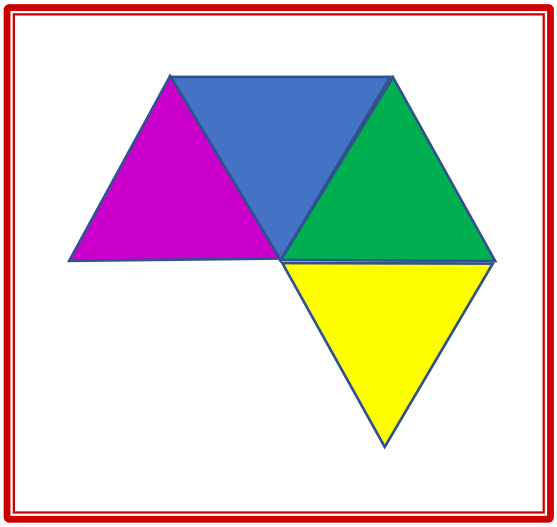
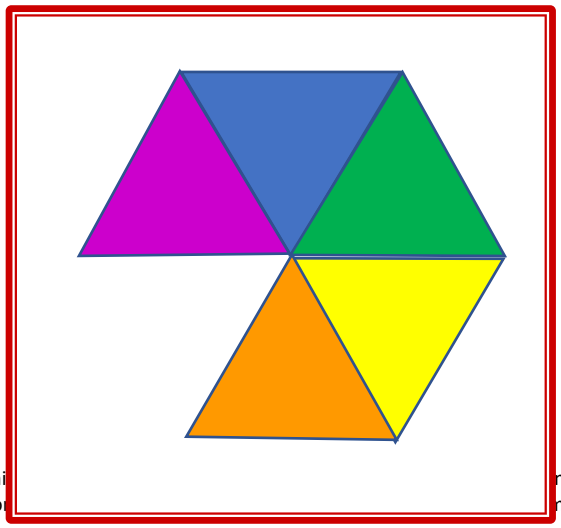
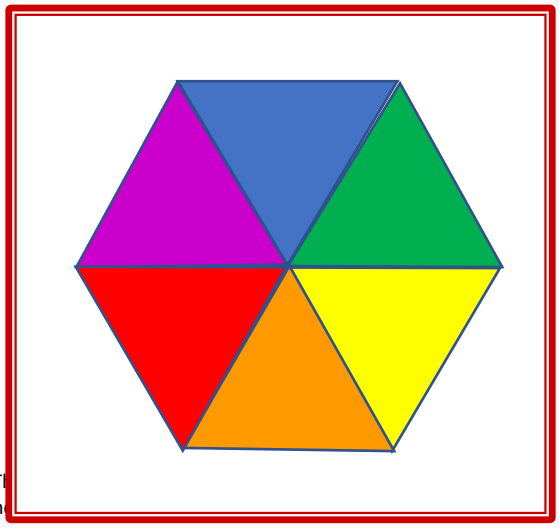




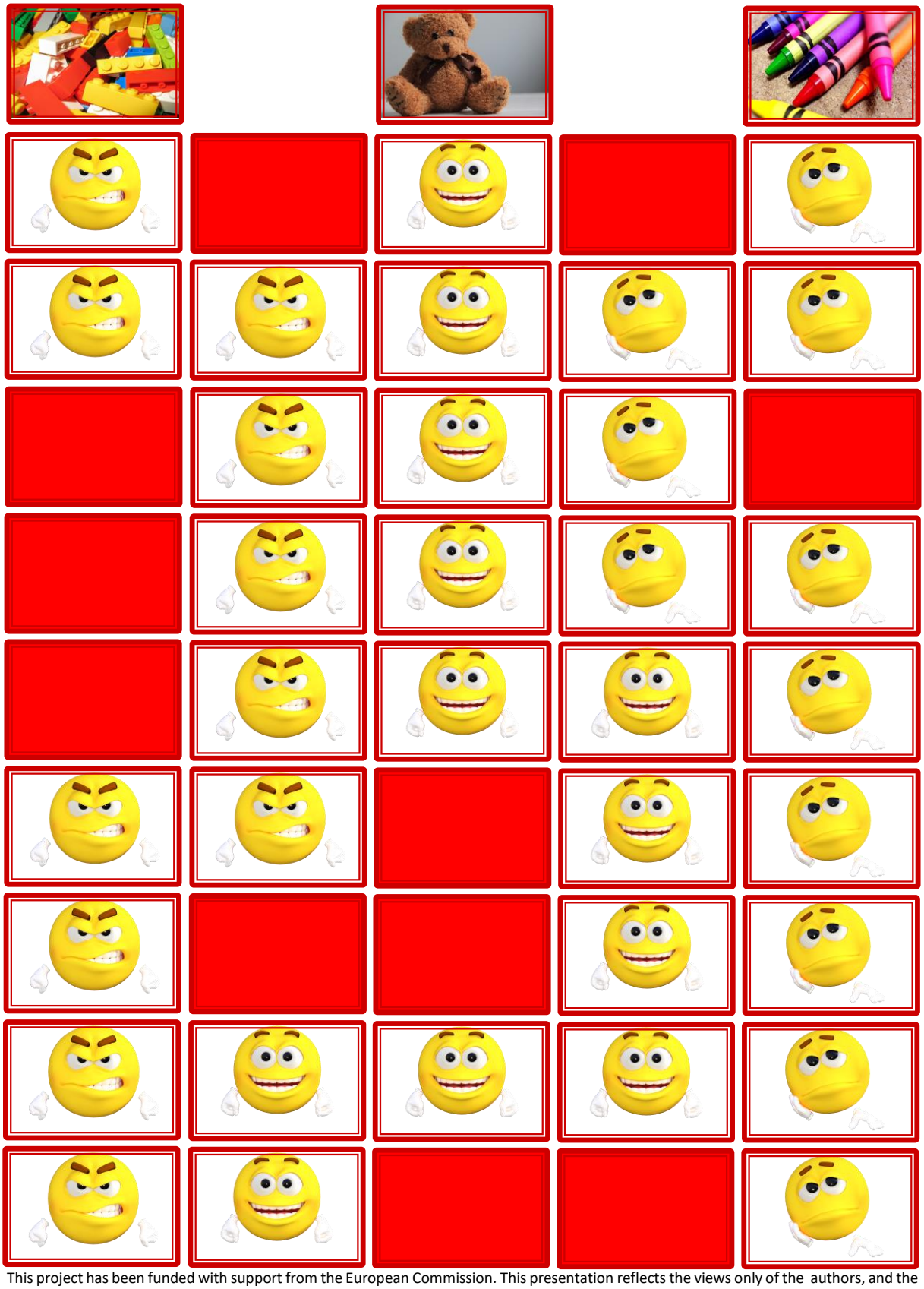








ANNEX 4



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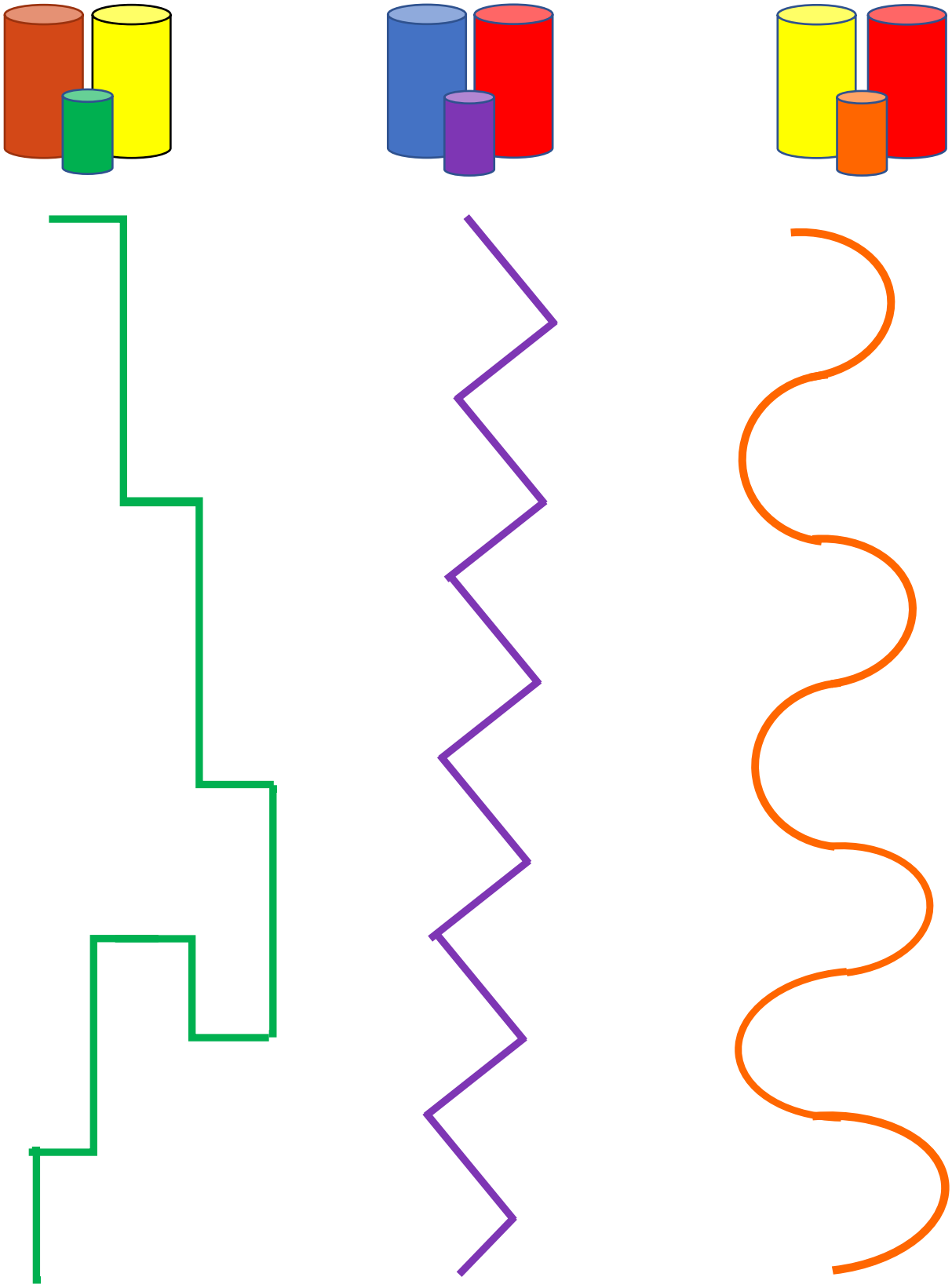

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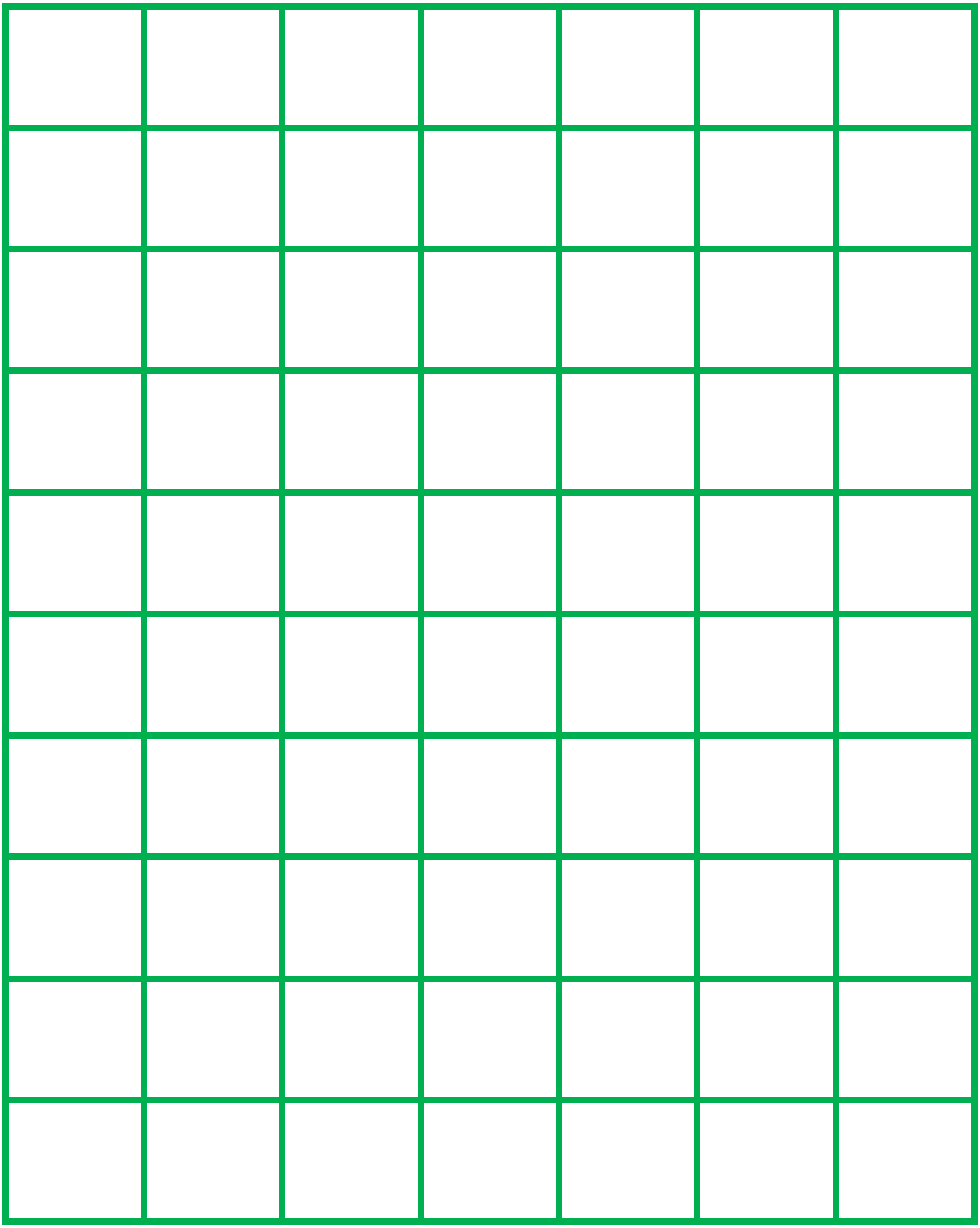
ANNEX 6



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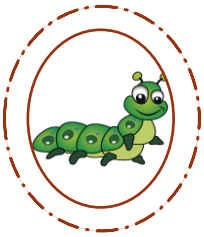


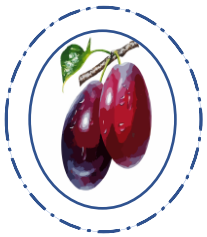
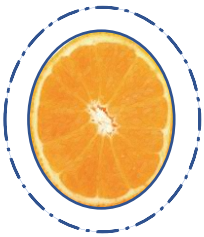
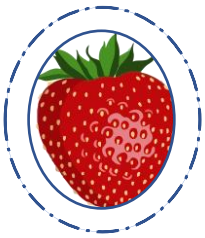



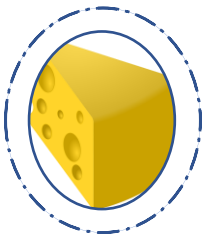

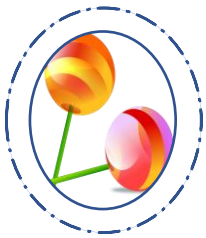


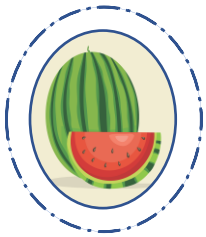
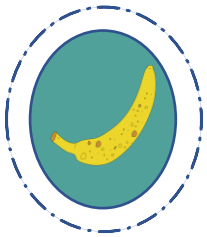


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ANNEX 8

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