TangIn

Tangible Programming & Inclusion

TangIn Toolbox

Symmetry

9-12 years old

Reflection Symmetry

Probotic

www.tangin.eu

/tanginproject

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Summary

Finding the symmetric axis in different shapes

Expected duration: **60 min** (the lesson plan duration is flexible, and teachers can adapt them accordingly to their needs and class duration).

Learning Outcomes

At the end of the session, students are expected to:

- Recognize figures that show reflection symmetry;
- Identify and draw several symmetry axes in different shapes;
- Identify, in the real world, examples of different types of symmetries and appreciate it;
- Predict the result of a presented code or infer the functions of the blocks used in programming;
- Value STEM areas;
- Develop transversal competencies such as problem-solving, communication and reasoning;
- Develop group work skills, namely, to respect and favor the inclusion of all elements, regardless of gender, culture, etc.

Links With Curriculum Topics

Covered Curriculum Topics		
Subject		**Topics**
Engineering	**Mathematics**	Geometry • Isometries and symmetries • Shapes • Angles
	Sciences	Natural Sciences, Arts, … • Symmetries in the real world
	Technology	Programming • Concepts of programming • Programs – Results, errors, and troubleshooting Robotics • Programming objects to solve challenges

Notes for Teachers

The teacher should prepare, in advance, all the materials needed and the classroom according to the activities to be developed.

The teams should be as heterogeneous as possible to foster the integration of all students.

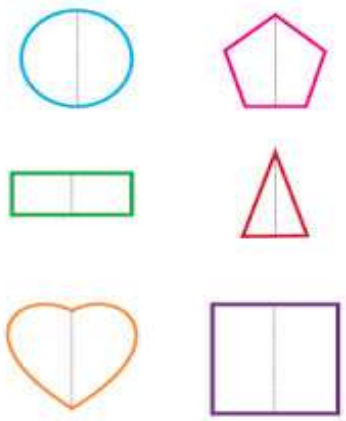
It's important that clear rules are established in terms of group work. This way, it avoids the most active children assuming the lead and the quitter ones only observing.

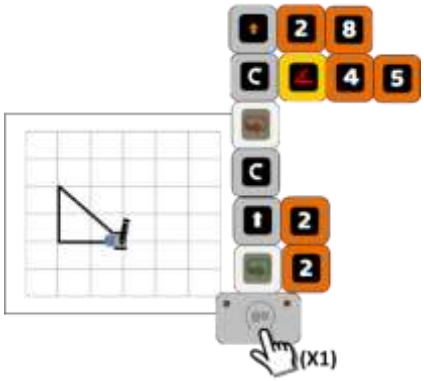
This lesson introduces the concept of reflection symmetry. Teachers should remember that a figure has symmetry if it is invariant by the action of an isometry. Thus, a figure can present symmetry by reflection, by rotation (rosacea) or by translation (friezes and 'wallpapers', etc.).

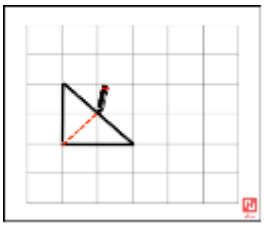
Within this lesson teachers uses codes, provided to students, with the *angle* block and *loops*. **1)** If students have already explored these blocks, they must predict which figure they will get with the given code. And sketch this figure before confirming what the robot draws. **2)** If students have not yet worked with these blocks, after seeing the figures that the robot designed, they should write a small composition about the functions of such blocks.

The teacher must circulate through the various groups to support the activities and the dynamics of each one. In the end, it should promote a collective discussion of the main issues focused and the constraints and difficulties experienced.

Lesson Plan

Intro	15'	Class	Discuss the concept of reflection symmetry (the axis(es) divide(s) an object in equal parts) and try to explain it with our body, natural and art elements and geometric shapes. Use the mirror analogy.	

<table>
<tr><th></th><th></th><th></th><th></th><th></th></tr>
<tr><td rowspan="3">Play</td><td rowspan="3">30'</td><td rowspan="3">Groups</td><td rowspan="2">Give the group the necessary blocks and the code.
Tell them to position the BOT along the line with the marker in a central square vertex as shown in the image.
Now, the group must do activity 1) or 2) described in “Notes for Teachers”:
• If students have already explored these blocks, they must predict which figure they will get with the given code. And sketch this figure before confirming what the robot draws;
• If students have not yet worked with these blocks, after seeing the figures that the robot designed, they should write a small composition about the functions of such blocks.
The next goal will be to cut the area of the figure in equal halves by hand using a red marker.</td><td> 

 </td></tr>
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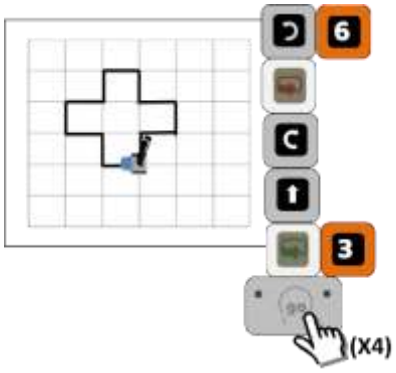
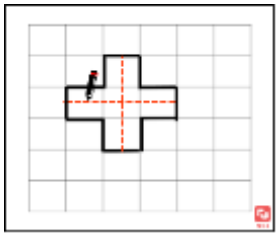
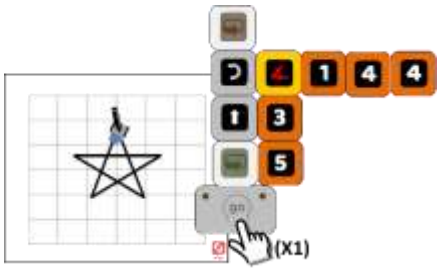
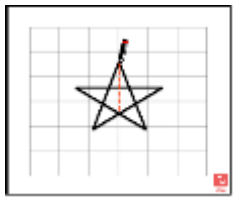
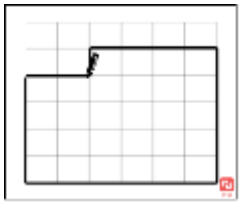
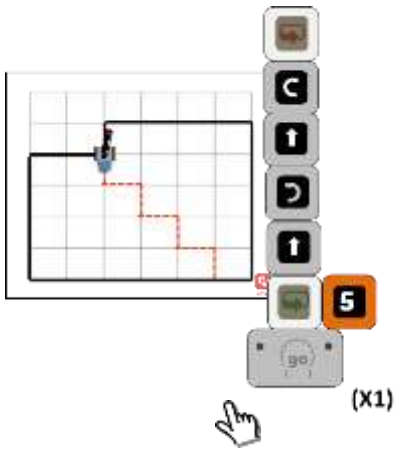
Now, the group must do activity 1) or 2) described in ‘Notes for Teachers’.
The next goal will be to cut the area of the figure in equal halves by hand using a red marker.</td><td> 
</td></tr>
</table>

			Note: 1) they must execute four times the code. An alternative would be to use another *loop* function (four times repeat the code). It is not shown here to save blocks and make sure every group has what it needs to code. 2) Instead of rotating six times left it could be done with only two moves. Six was used to save blocks and make sure every group has what it needs.	
			Give the group the necessary blocks and the code. Tell them to position the BOT along the line with the marker in a central square vertex as shown in the image. Now, the group must do activity 1) or 2) described in 'Notes for Teachers'. The next goal will be to cut the area of the figure in equal halves by hand using a red marker.	 
Play	15'	Class	If it was too easy for the students, try to solve an extra one together. This time draw the shape in the image by hand and try to make the code for	

			the BOT to cut it in halves. In the end, you can count the squares on each side to confirm! Promote a collective discussion of the main issues regarding reflection symmetry and blocks used in codes.	

Resources List & Support Material

Per each group:

- A robot Kit with drawing capabilities;
- Transparent scenario with a 6x6 grid.
- Markers – black and red (easy to erase/clean);
- Alcohol for cleaning the scenarios (for teacher use only).