TangIn

Tangible Programming & Inclusion

TangIn Toolbox

Constellations

10+ years old

Angles | Constellations

Itineraries | Scales

Probotic

www.tangin.eu

/tanginproject

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Summary

Drawing constellations in a race against time (and stars):

Expected duration: **55 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:

- Measure angles amplitude with a protractor;
- Translate a map to a different scale;
- Identify the Polaris star in the Ursa Minor constellation;
- Understand the relevance of stars for navigational purposes (as references for cardinal directions in the sky);
- Program the robot adequately, taking advantage of the looping tool;
- 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	**Science**	Natural sciences • Universe – Constellations • The sky as a navigational tool
	Mathematics	Numbers and Operations • Scales Geometry • Localization and orientation – itineraries and maps • Measuring angles
	Technology	Programming • Concepts of programming • Programs – Results, errors, and troubleshooting • Loops Robotics • Programming objects to solve challenges

Notes for Teachers

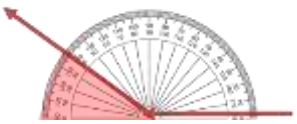
The teacher should prepare, in advance, all the materials needed and the classroom according to the activities to be developed.

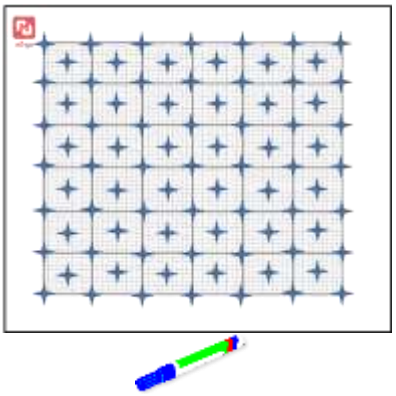
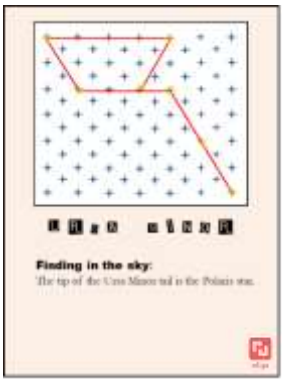
The teams should be as heterogeneous as possible to foster the integration of all students. It's important that clear rules are established in terms of group work. This way, it avoids the most active children assuming the lead and the quitter ones only observing.

The students can draw the constellations in as many steps (stars) as they want. The only rule is that they do not touch the Bot after the initial positioning. If they do, they have to start over from the beginning. Give them the tip to measure the amplitude and lengths of the angle beforehand or use other stars at the same distance and relative position.

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	20'	Class	Time for a race through the stars! Discuss the practical and historical importance of using the stars in the sky as a navigational map and points of reference (sailing, getting lost in a forest, etc..). Use the Polaris star as an example (indicating North in the northern hemisphere). Practice with the students measuring angles amplitudes with a protractor. If they never did it, teach by drawing an acute and obtuse angle and show how to measure them. **Important:** In the Bot's perspective, the angle of rotation is the external one!	  

Prep	10'	Groups	Separate the class in groups. Each one with 1 *Bot* kit and a grid *Set*. The first step is to fill the Set with stars. Ask them to draw little stars in every vertex and in the center of each big square as in the image.	
			Every group will receive also a card (image: front and back) The idea is to try to reproduce the constellation map in the back, programming the Bot to draw it, and using a ruler and a protractor as tools. To make it more exciting, you can make it a race - the group finishes (correctly) first wins. **Important**: supervise and help them using the protractor (putting in the right position by following the direction of movement at 0º and the center at the axis point of the *Bot*. **Tip**: measure the angles and lengths beforehand or use other stars at the same distance and relative position.	 

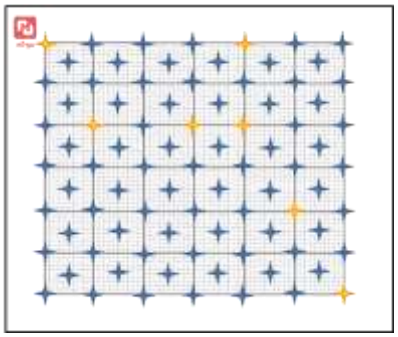
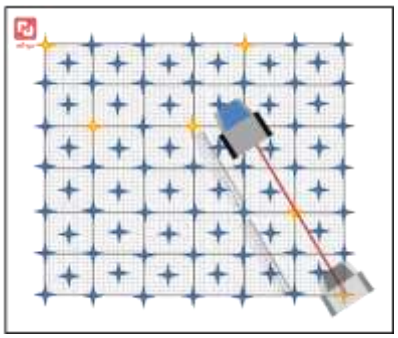
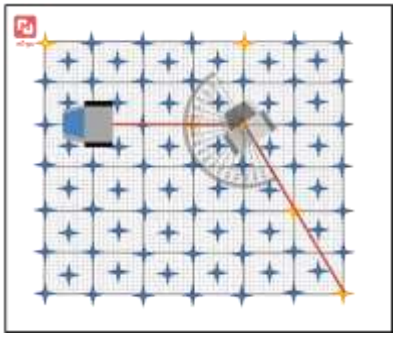
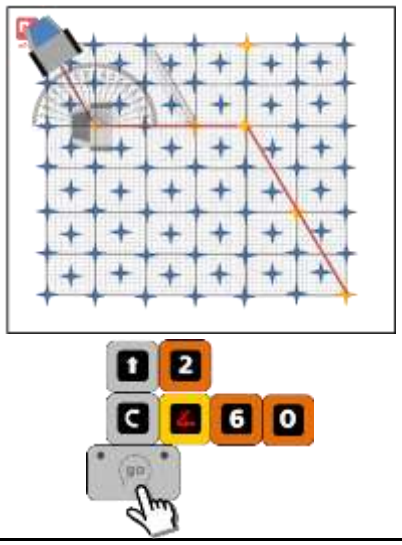
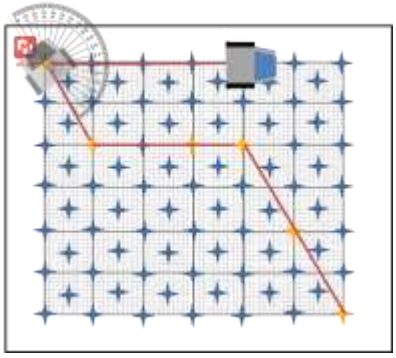
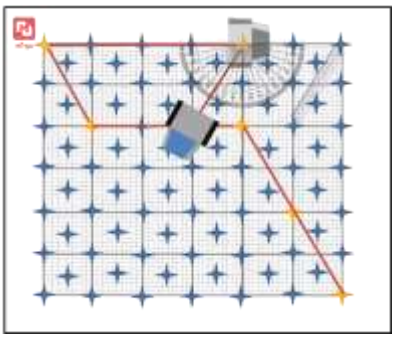
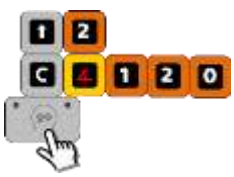
			The first task is to identify the stars on the card map and locate and differentiate them in the Set (using another color)	
Play	25′		Next, they will position the *Bot* (with a marker) by hand in one star (we recommend the Polaris one) and start measuring distance and angles amplitude between the desired stars. They can do one by one or multiple steps. What is important is that they cannot touch the *Bot* after the initial positioning, or they must start over again. **Image**: first two stars solution. **Tip**: do not forget that *Bot's* step is 10 cm. So, if you want to cover the 40cm distance, you have to program it to go forward 4 times!	 
			Image: Next 2 stars solution	 

			Image: Next star solution	
			Image: Next star solution	 
			Image: Final star solution	 

Resources List & Support Material

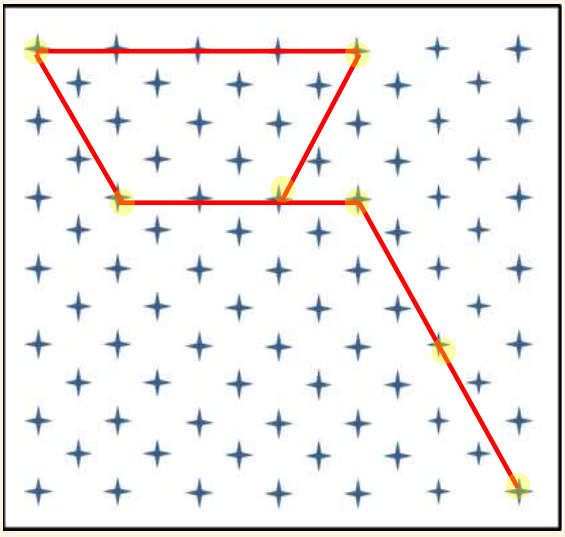
For the teacher or per each group:

- A robot Kit with drawing capabilities;
- Protractors and rulers
- Markers for each group (easy to erase/clean);
- Alcohol for cleaning the scenarios (for teacher use only);
- Transparent scenario with a 6x6 grid;
- One constellation card (Annex)

URSA MINOR

Myth:

This constellation has its origin in the Greek mythology, where Hera, the wife of Zeus (father of gods and all men), in an act of jealousy transformed Callisto in a bear (Ursa Major) to keep her away from her husband. Soon after, her son Arcas which was a hunter, crossed path with her. To avoid having him shooting his own mother, Zeus transformed him also in a bear (Ursa Minor) staying forever like this together in the sky



URSA MINOR

Finding in the sky:

The tip of the Ursa Minor tail is the Polaris star.

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