

## ***Sphero geometry, degree - EARLY Teaching scenarios***

**Topic:** How to support math with Sphero ( geometry and degrees)

**Learning outcome:** Learn how to:

- Use the protractor
- Visualize 0-360 degrees
- Understand 0-360 degrees
- Practical geometry

### **Curriculum**

#### **Finnish curriculum**

Programming is a part of mathematics and crafts and at the same time forms part of the ICT-competence, which is one of the seven key competence in the Finnish curriculum. Look at the attached image!

**Target group:** intermediate, pupils in primary school

**Age of students / School level:** from 10 years– (3rd grade)

**Number of pupils:** maximum of 20

**Duration (estimated time/number of lessons):** 2 x 45 minutes

## **Applying the 7 key competences**



**Prerequisites (necessary materials and online resources):**

- Ipads/tablets/mobile phones with the Sphero Edu app downloaded
- Spheros
- paper and pencils
- floor space
- cones or other marking tools (optional)
- exact starting point
- tape

**Introduction to the scenario** *(incl. possible applications, alternatives, and risks):*

- it is preferable working in pairs or in groups no more than four pupils
- it is also preferable that the pupils work in the same pairs or groups throughout the whole scenario
- the Sphero robot is durable but don't drive it down the stairs or in high speed towards a wall

**Before the program begins (preparatory work for teacher):**

- remember to charge the Ipads and Sphero before the lesson!
- divide the pupils carefully into groups
- book the space needed in advance
- divide the room into sections, as many as the number of groups
- collect all the necessary equipment needed
- take into account pupils with special needs
- take a look at [this tutorial](#) before you plan your lesson

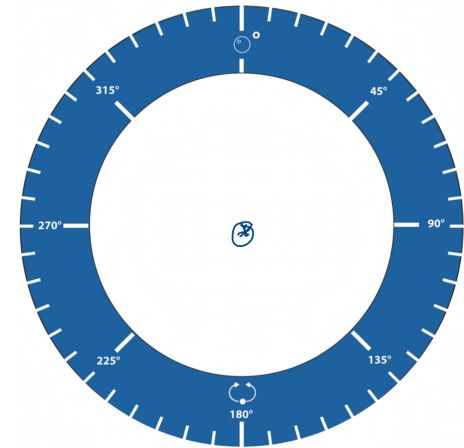
The main part of the scenario (two lessons):




## Lesson one

Preparations:

- The pupils work in pairs.
- Every pair needs paper, pencil, tape, tape measure or ruler, protractor, Sphero, and an iPad.
- Always remember to use the protractor
- Prepare the evaluation for the end of the lesson

1. Start to draw a square on the paper.
2. Use the blocks ( $90^\circ$ ) to move the Sphero to make a square.
3. Continue to draw an acute triangle, right triangle, and obtuse triangle on the paper. Measure the angles with a protractor.



Spetsvinklig triangel	Rätvinklig triangel	Trubbvinklig triangel
		
<ul style="list-style-type: none"><li>• Alla vinklar är spetsiga, det vill säga mindre än <math>90^\circ</math>.</li></ul>	<ul style="list-style-type: none"><li>• En av vinklarna är rät, det vill säga <math>90^\circ</math>.</li><li>• De andra två vinklarna är spetsiga.</li></ul>	<ul style="list-style-type: none"><li>• En av vinklarna är trubbig, det vill säga större än <math>90^\circ</math>.</li><li>• De andra två vinklarna är spetsiga.</li></ul>

(Picture source: Karlavagnen 5a, Otava 2017)

4. Enlarge the triangles (100 times) on the floor, use the protractor. And tape the triangles on the floor.
5. Use the blocks to make the robot move exactly. Use the protractor.
6. Remember that it is important to calculate what speed and what time the robot will have to move from angle to angle.
7. Do over again until success. Challenge each other with the other groups' triangles.
8. Evaluate the lesson! Then it is easier to know where to continue the next lesson.

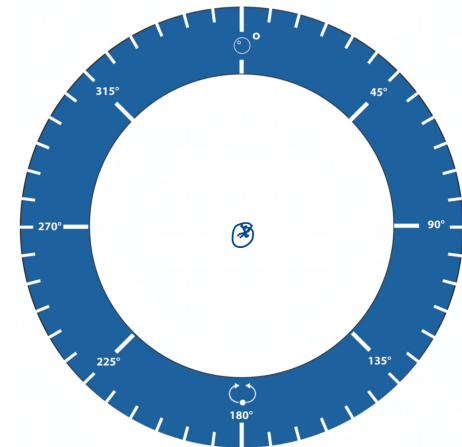
## Lesson two - How accurate are you?

### Preparations:

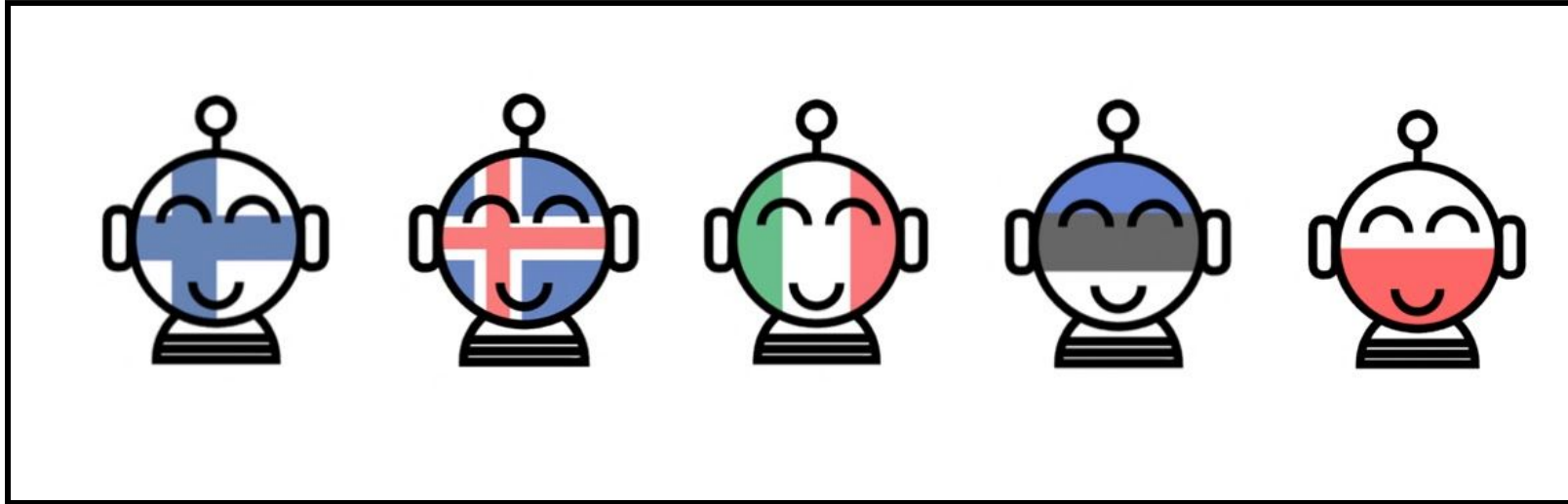
- The pupils work in pairs.
- Every pair needs paper, pencil, tape, protractor, Sphero and an iPad.
- Always remember to use the protractor!
- Prepare the evaluation for the end of the lesson

1. Every pair start by drawing the degrees on the floor (with tape for example). Remember the midpoint.
2. Use the blocks to program the Sphero to move to one exact degree - does it work?
3. Can you make the Sphero move around 360 degrees (in a circle) using the blocks?
4. The next challenge is to make a treasure map. Make accurate instructions and remember the starting point.
  - a. For example move the Sphero  $45^\circ$  in two meters.  $175^\circ$  in 5 meters and so one. Place something in the end where the treasure is.
  - b. Give your instructions to another pair to solve.
5. Remember to evaluate, both the treasure map and the lesson

1 = easy, 5 = hard.



- a) Write your valuation on the paper and give it back to the makers.  
b) Color the faces according to the difficulty levels.



## Summary (knowledge, skills, understanding):

### 1. Students will know:

- The most important things about how the Sphero Bolt is used
  - connecting
  - aiming
  - programming using blocks
  - how to use degree and protractor to steer the robot in the right direction.

### 2. Students will be able to:

- explore the Sphero Edu app
- move the Sphero in different ways using the blocks
- collaborate with other pupils
- evaluate their work
- develop their thinking

### 3. Students will understand:

- at which different speeds the robot can move
- how the Sphero reacts on commands from the app
- What an angle is
- What a degree is
- How the protractor is used
- How the robot moves in different directions