

**CODE/MOE/UOIT Makerspaces Project-**

**School Board: Wellington Catholic District School Board**

**Grade(s): 4 - 6**

**Subject(s): Mathematics--Geometry: Angles**

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| **BIG IDEAS:**Using units when describing a measurement makes it easier to describe and compare it to the measurements of other objects.**Curriculum Expectations:****OVERALL:** Comparing, classifying and measuring angles**SPECIFIC:** Grade 4: Relate the names of the benchmark angles to their measures in degrees. (4M64)Grade 5: Measure and construct angles up to 90°, using a protractor. (5M52)Grade 6: Measure and construct angles up to 180° using a protractor, and classify them as acute, right, obtuse, or straight angles. (6M48) |
| **Learning Goals:**I can use units to describe benchmark angles, and I can describe what a degree unit is.I can use a protractor to construct specific angles when I am given its measurement in degrees. | **Success Criteria:** For Grade 4: (This can be modified to better fit grades 5 and 6 curriculum and challenge)1. I have correctly identified and created a half right angle, right angle, and straight angle.
2. I have met the required criteria.
3. All angles are labelled correctly.
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| **Lesson Overview:**Challenge: Create a course for your Sphero that meets specific requirements related to length and angles.  |
| **Materials and Technology:** * Tape
* Large wooden protractors
* Spheros (or some other programmable robot)
* Device to program Sphero (iPad / Computer)
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| **Student Accommodations/Modifications:**  | **Lesson will be differentiated by:*** **Content, specifically:**
* **Process, specifically:**
* **Product, specifically:**
* **Environment, specifically:**
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| **MINDS ON: Getting Started** |
| During this phase, the teacher may: • activate students’ prior knowledge; • engage students by posing thought-provoking questions; • gather diagnostic and/or formative assessment data through observation and questioning; • discuss and clarify the task(s).  | During this phase, students may: • participate in discussions; • propose strategies; • question the teacher and their classmates; • make connections to and reflect on prior learning.  |
| **Describe how you will introduce the learning activity to your students.** Minds On: (Grade 4)Review straight angle, right angle, and half right angle with students. Have them draw with a ruler and piece of paper: A right angle, and straight angle, a half right angle, an angle smaller than a right angle, an angle larger than a right angle, and an angle almost as big as a straight angle. **What key questions will you ask?** How do you know this angle is greater than a right angle? How do you know this angle is less than a half right angle? **How will students be grouped? How will materials be distributed?** Students should be put into groups of 3 to 4 depending on the availability of Spheros**.**  |
| **ACTION: Working on it** |
| During this phase, the teacher may: • ask probing questions; • clarify misconceptions, as needed, by redirecting students through questioning; • answer students’ questions (but avoid providing a solution to the problem); • observe and assess; • encourage students to represent their thinking concretely and/or pictorially; • encourage students to clarify ideas and to pose questions to other students. | During this phase, students may: • represent their thinking (using numbers, pictures, words, manipulatives, actions, etc.); • participate actively in whole group, small group, or independent settings; • explain their thinking to the teacher and their classmates; • explore and develop strategies and concepts.  |
| **Describe the task(s) in which your students will be engaged.** 1. Create a course using tape on the floor for a sphero.
2. Clearly label each angle.
3. Use the Sphero to program the robot to travel through the course.

Here is a sample of the challenge. (This one fits Gr. 4 curriculum but it could be adjusted to fit gr. 5 or 6 curriculum easily.)Your course must contain the following components:- at least 1 turn that is half right angle or less. (Label it A)- at least 1 turn that is almost a straight angle but not quite. (Label it B.)- at least two right angles. (Label each C)- at least one angle that is approximately halfway between a right angle and a straight angle. (Label each D)-must have a total distance between **4 and** 5 **metres****What misconceptions or difficulties do you think they might experience?** The most difficulty will be programming the Spheros. I would encourage students to develop a benchmark (ie; this speed, for this time, will go exactly 1 metre.)**How will they demonstrate their understanding of the concept?**Student’s ‘course’ will have met the criteria. Success Criteria1. I have correctly identified and created a half right angle, right angle, and straight angle.
2. I have met the required criteria.
3. All angles are labelled correctly.

**How will you gather your assessment data (e.g., checklist, anecdotal records)?**Observation, notes. **What extension activities will you provide?** Students could be asked to measure each angle using a protractor. Or, students could be asked to program a Sphero through someone else’s course.  |
| **CONSOLIDATION: Reflecting and Connecting** |
| During this phase, the teacher may: • bring students back together to share and analyse strategies; • encourage students to explain a variety of learning strategies; • ask students to defend their procedures and justify their answers; • clarify misunderstandings; • relate strategies and solutions to similar types of problems in order to help students generalize concepts; • summarize the discussion and emphasize key points or concepts.  | During this phase, students may: • share their findings; • use a variety of concrete, pictorial, and numerical representations to demonstrate their understandings; • justify and explain their thinking; • reflect on their learning. |
| **How will you select the individual students or groups of students who are to share their work with the class (i.e., to demonstrate a variety of strategies, to show different types of representations, to illustrate a key concept)?** We will do a gallery walk to see each group’s ‘course’. **What key questions will you ask during the debriefing?** How do you know your angles are correctly labelled? What was the most difficult angle to create? Why? What was the hardest angle to program for your Sphero?  |