

**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. |
| **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) | |
| **Student Accommodations/Modifications:** | **Lesson will be differentiated by:**   * **Content, specifically:** * **Process, specifically:** * **Product, specifically:** * **Environment, specifically:** |
| **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 Criteria   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.   **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? | |