**Robotic Racing**

*Adapted from North Carolina Department of Public Instruction*

**Student Objective:** “I can determine the perimeter of a polygon given the side lengths.”

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| **Common Core Standards to Measure** | **Mathematical Practices Addressed** |
| **3.MD.8** Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters. | #1 Make sense of problems and persevere in solving them.#3 Construct viable arguments and critique the reasoning of others.#6 Attend to precision. |

**Materials:**

Robot example

Opening problem sheet

“Robotic Racing” sheet

Interactive Notebooks (if used)

Computer with projector or computer lab with internet connection

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| G**Engage Students with the Goal** | State and RateObjective: “I can determine the perimeter of a polygon given the side lengths.” Students rate themselves to the goal (1, 2, 3, 4). | Setting Objectives and Providing Feedback |
| A**Access Prior****Knowledge** | Show students a picture of a robot and discuss what they did the day before creating robots with specific perimeters and areas. Tell them today they are going to pretend to use their robots in a perimeter competition.Lantern-Robot-Cropped | Nonlinguistic RepresentationsIdentifying Similarities and Differences |
| N**New Information** | *This lesson transitions students from counting pattern blocks or squares on a grid or to finding the perimeter by adding side lengths.***Opening problem:***Jane’s class is building a robot for a competition. The robot must follow a path around a figure one time. The robot must travel at least 25 units in order to go to the next round. Which path should Jane’s class choose in order to go to the next round?*Turn and talk to a partner about which path Jane’s class should choose and why. Have them take notes in their interactive notebooks as to which path should be chosen and why. Conclude by having students share their answers and strategies with the entire class.  | Identifying Similarities and DifferencesCooperative LearningNonlinguistic RepresentationsSummarizing and Note-Taking |
| A**Application** | The “Robotic Racing” activity can be completed individually or in pairs. Assign just the first three problems for this part of the activity. Distribute “Robotic Racing” sheets and review directions. Students are to use the given side lengths to determine the paths that Jane’s class could use for each round of the competition. Allow time for students to work through problems 1 – 3. As students work, ask them, “How are you finding the perimeter of the shape?”As students are discussing which paths Jane’s class should choose, their reasoning should include the computation of perimeter. If students do not offer perimeter equations, the teacher should ask addition sentences for each figure have been shared.If students worked in pairs, have them choose different partners for checking. Provide time for the pairs to review their answers for questions 1-3.**Discuss as a whole group:**• Which path should Jane’s class choose for Problem #1? How do you know?The perimeter for figure A= 9+12+15=36 units, the perimeter for figure B=11+11+11=33 units• Which path should Jane’s class choose for Problem #2? How do you know?Perimeter A=5+5+6+5+5+6=32 units, Perimeter B= 8+10+8+10=36 units• Which path should Jane’s class choose for Problem #3? How do you know?Perimeter A = 4+4+4+4=12 units, Perimeter B = 6+5+6+3= 20 unitsProblems 4 and 5 include missing side lengths. Students must find the missing lengths, and then find the perimeter. Students may work in pairs or individually to solve the problems. During the discussion, students should clearly state their methods for finding the missing side lengths.**Allow students to solve problems 4 and 5.****Discuss:*** How did you find the missing side length for figure A in Problem #4?

Figure A is a square so all sides are the same length.)* How did you find the missing side length for figure B in Problem #4?

Opposite sides are equal in a rectangle, so if the side across from the missing side is 9 units, the missing side is also 9 units. * Which path should Jane’s class choose? Why?

Perimeter A = 7+7+7+7= 28 units, Perimeter B = 6+9+6+9= 34 units.* How did you find the missing side length for figure A in Problem #5?

Figure A has a line of symmetry, which means the two sides of the triangle are the same length OR in an isosceles triangle, two sides are the same length.* How did you find the missing side length for figure B in Problem #5?

Figure B shows the length of the side across from the missing side as 5 units, so since it is the same length, the missing side should be 5 units long. There is a line of symmetry for Figure B, so the sides are the same length.* Which path should Jane’s class choose? Why?

Perimeter A = 10+10+12=32 units, Perimeter B = 5+7+5+10=27 units | Cues, Questions, and Advance OrganizersCooperative Learning Homework and Practice |
| G**Revisit the Goal** | Allow up to 5 minutes for students to complete their journals. If there is time, have students pair and share. If not, the journals may be shared at the beginning of the next lesson. **Journal Prompt:** Draw a path for the robot that is a polygon. The robot goes 20-30 units.State and RateObjective: “I can determine the perimeter of a polygon given the side lengths.” Students rate themselves to the goal (1, 2, 3, 4). | Setting Objectives and Providing FeedbackSummarizing and Note-Taking |

**Evaluation:**

**Formative**- As students work, pose questions and observe them..

**Plans for Individual Differences:**

**Intervention**- Students may need to physically trace the path the robot travels to ensure they go around the entire figure.

**Extension -**Challenge advanced students to write equations using multiplication for figures with congruent sides. For example, the equation for the perimeter of the square in problem 4 could be written as 4 x 7 = 28 units.



