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| **Synopsis of high-quality task:**  Students will apply their understanding of area and perimeter of a rectangle to the problem of creating a backyard skating rink.    **Anticipated student time spent on task:** 45-60 minutes  **Student task structure(s):** Individual work followed by group discussion/debrief |
| [**Math Content Standards and Practices:**](http://www.doe.mass.edu/frameworks/math/2017-06.pdf)  **4.OA.A.3** - Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.  **4.MD.A.3** - Apply the area and perimeter formulas for rectangles in real world and mathematical problems.  **SMP 1** Make sense of problems and persevere in solving them.  **SMP 2** Reason abstractly and quantitatively.  **SMP 4** Model with mathematics.  **SMP 6** Attend to precision. |
| **Prior Knowledge:**  **3.OA.A.3** Use multiplication and division within 100 to solve word problems.  **3.MD.C.5** Recognize area as an attribute of plane figures and understand concepts of area measurement.  **3.MD.C.7** Relate area to the operations of multiplication and addition.  **3.MD.D.8** Solve real-world and mathematical problems involving perimeters of polygons. |
| **Connections to the real-world:**  Many students play sports year-round, and hockey is a popular winter sport. There are many leagues and teams, but elementary-aged students also love organizing their own games. A backyard rink is a valuable addition to any neighborhood but necessitates a lot of planning! This task engages students by presenting them with an exciting prospect (being the house in the neighborhood that has its own skating rink) while making them aware of the planning and precision needed to build the rink. Non-sports players who possess artistic and spatial awareness skills will also be engaged by the opportunity to design a structure that could realistically be built. With some modifications, this task could ask students to design a fort or clubhouse for their backyard. Lastly, students will be exposed to a real-life situation in which they need to budget an amount of money allotted for a project of their own. While it may not be the student’s own allowance that is being spent, they will be in charge of how to spend the money. |
| **Mastery Goals:**  Learning Objective:   * Students will be able to select and apply a strategy or strategies for finding the area and perimeter of a rectangle. * Students will be able to solve a multistep problem with real-life context by selecting the most efficient operation. * Students will be able to interpret a remainder.   Language Objective:   * Students will be able to use words and labels to **record in writing** their strategies and answers to the task’s questions. Students will be able to provide a justification for their strategies and answers in a whole-group **discussion**. |
| **Teacher instructions**  **Instructional Tips/Strategies/Suggestions:**   1. Present the scenario: Jake’s parents have agreed to make a skating rink in their backyard this winter. Jake has been asking to do this for years and is excited. His mom says that Jake has to draw up the plans for the rink. “Our backyard is 27 feet long and 9 feet wide,” his mom says. “I need the dimensions of the rink to be greater than 10 feet by 5 feet and less than the area of the yard. Oh, and make sure it’s at least a foot away from the fence on all sides so people can still walk around the yard.” Jake sits down at the kitchen table with a pencil and paper to draw what he wants his rink to look like. 2. Present a photograph of a backyard skating to provide visual context. If desired, ask students what they notice and wonder about the photograph. 3. Ask students what information they know thus far. 4. Present the first three questions:    1. Draw Jake’s backyard. Label the length and width. What is the area of Jake’s backyard? What is the perimeter?    2. Draw one possible design for Jake’s skating rink. Label the dimensions and find the area and perimeter to the nearest foot.    3. What are the dimensions of the largest possible skating rink Jake could have? What would be the area and perimeter of this rink? 5. Do not discuss student strategies and answers at this point. Present the remainder of the scenario: “Looks great!” Jake’s mom said when Jake showed her his plans. “Now, we’ll need to put some boards around the outside of the rink. I need you to figure out how many pieces of wood we need to buy at Home Depot. They sell pieces of wood that are 6 feet long.” 6. Present the final question: d) How many pieces of wood does Jake need to go around the outside of his rink? Will there be wood left over? How many feet of wood will be left over? 7. Engage the class in a discussion of efficient strategies for finding the answer to a). Solicit answers to b) and c) and focus on the possibility of different answers, based on how the students interpreted the information provided. 8. Provide the Extension task, if necessary. |
| **Instructional Materials/Resources/Tools:**  Materials:   * Student copy of the task * Teacher copy of the task * Additional paper (graph paper would be beneficial) and pencil * Skating rink photograph for context/notice and wonder   Student directions: Listen to your teacher present the scenario. Then answer the questions below. |
| **Accessibility and Supports:**  **Potential sentence starters:**  “I found the area of Jake’s backyard by…”  “The largest skating rink that Jake could have measures \_\_\_\_ feet by \_\_\_ feet. I know this because in the problem it said…”  **Key academic vocabulary:** Area, perimeter, width, length, dimensions, remainder (“left over”) |

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Jake’s parents have agreed to make a skating rink in their backyard this winter. Jake has been asking to do this for years and is excited. His mom says that Jake has to draw up the plans for the rink.

“Our backyard is 27 feet long and 9 feet wide,” his mom says. “I need the dimensions of the rink to be greater than 10 feet by 5 feet and less than the area of the yard. Oh, and make sure it’s at least a foot away from the fence on all sides so people can still walk around the yard.”

Jake sits down at the kitchen table with a pencil and paper to draw what he wants his rink to look like.

1. Draw Jake’s backyard below. Label the length and width. What is the area of Jake’s backyard? What is the perimeter?
2. Draw one possible design for Jake’s skating rink. Label the dimensions and find the area and perimeter to the nearest foot.
3. What are the dimensions, to the nearest foot, of the largest possible skating rink Jake could have? What would be the area and perimeter of this rink?
4. Draw what Jake’s backyard would look like with the skating rink. Label the dimensions of the backyard and the dimensions of the rink.

“Looks great!” Jake’s mom said when Jake showed her his plans. “Now, we’ll need to put some boards around the outside of the rink. I need you to figure out how many pieces of wood we need to buy at Home Depot. They sell pieces of wood that are 6 feet long.”

e) How many pieces of wood does Jake need to go around the outside of his rink? Will there be wood left over? How many feet of wood will be left over?

**Extension - Jake’s Skating Rink**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Later, at Home Depot…**

“The pieces of wood are 6 feet long and 2 feet tall,” Jake’s mom says. “What will be the total area of the wood we need for the boards?”

“Each 6-foot-by-2-foot piece of wood costs $4.00. I budgeted $50.00 for this project. Will we have enough money to buy the wood we need for your design?”

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| **Sample Student Work:**  **Student work for parts a, b and c. In part a, the student uses diagrams, multiplication and addition to find the area and perimeter of Jake's backyard. In part b, the student uses a diagram as well as subtraction and addition to find the perimeter of the rink. The student found the dimensions of the rink, but did not solve for the area of the rink. In part c, the student draws and labels a diagram with the dimensions of the rink inside of the backyard.** |