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| **Synopsis of high-quality task:**  The students will be presented with an image and a prompt as a hook. In the prompt, student athletes must run around a football field several times at practice. Students know the length of the field and are told that the total distance is less than a mile. To prove that is true, they are asked to write a formula to find the total distance of the run, and then estimate the missing dimension. This task fits into the beginning of the unit, once students understand what an algebraic expression is. This task can be used to assess student ability to write and evaluate expressions.  **Anticipated student time spent on task:** 20 minutes.  **Student task structure(s):** Partners or small groups. |
| [**Math Content Standards and Practices:**](http://www.doe.mass.edu/frameworks/math/2017-06.pdf)  **6.EE.A.2.a.** Write expressions that record operations with numbers and with letters standing for numbers.  **6.EE.A.2.c.** Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order.  **SMP 2**. Reasoning quantitatively and abstractly.  **SMP 4**. Model with mathematics.  **SMP 6**. Attend to precision. |
| **Prior Knowledge:**  **4.MD.A.3.** Apply the area and perimeter formulas for rectangles in real-world and mathematical problems.  **4.MD.A.1**. Know relative sizes of measurement units within one system of units, including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.  **5.MD.A.1**. Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems.  **5.OA.A.2.** Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. |
| **Connections to the real-world:**  This task presents a situation that happens at practices for many sports: students are made to run several laps around a field. Many students at this age play sports and would be able to relate to the prompt. If not, it’s likely that they have had a similar experience running or walking around a track or field during physical education class or on their own personal time. In the prompt, the athletes complain about how far they have to run, but the coach is adamant that the distance is reasonable because it is less than a mile. Students are provided an opportunity to directly connect mathematics to their real world and are presented with enough information to calculate the approximate total distance run at practice. |
| **Mastery Goals:**  **Learning Objective:**  Students will be able to demonstrate their knowledge of algebraic expressions by writing an algebraic expression to represent the formula for perimeter and by using the expression to calculate the perimeter and find missing dimensions.  **Language Objective:**  Students will use appropriate grade level content vocabulary (perimeter, dimensions, formula, expression, etc.) in whole class and partner discussions, building on others’ ideas and expressing their own clearly. |
| **Teacher instructions:**  **Instructional Tips/Strategies/Suggestions:**   1. Show the image and then prompt about the coach (without the 3 questions). You could possibly engage in a notice and wonder. 2. Generate a discussion that will allow students to make sense of the context of the problem (including discussing vocabulary, answering clarifying questions, etc.). If students don’t determine the length of the field, facilitate discussion to ensure that students understand that the length of the field is 120 yards. Possibly ask students to estimate the distance around the field to ground the work they will do in reasonableness. 3. Students will be encouraged to utilize any strategy they prefer to help them determine their solutions. Students should utilize the image and the information given. 4. There are multiple appropriate answers.   Bonus: Challenge students to find dimensions that yield as close to a mile as possible without exceeding it. |
| **Instructional Materials/Resources/Tools:**  Student handout (see below)  **Answer Key:**   1. 5(240 + 2x) 2. Width of the field is needed (x) 3. A football field is 120 yards long, including the end zones, and **53.3 yards wide**.   Using these dimensions, the perimeter is 346.6 yards or 1,039.8 feet. 5 times around the field would be 5,199 feet, just under a mile.  Many students may estimate the width of the field as 50 yards. That yields 340 yds, or 1,020 ft for the perimeter, which makes 5 times around the field 5,100 feet.  All reasonable answers should be accepted. |
| **Accessibility and Supports:**   * + - 1. Support struggling students by asking them to think about a mile as about 5,000 ft. and asking them how long each of the 5 laps run would be. Or, provide a tape diagram:  |  |  |  |  |  | | --- | --- | --- | --- | --- | | Approximately 5, 280 feet | | | | | | 1 lap | 1 lap | 1 lap | 1 lap | 1. lap |  * + - 1. To convert from yards to feet, suggest using a two-column table (4.MD.A.1)       2. Suggest using the image to estimate dimensions and try those to start. Students can then adjust higher or lower based on their calculations.       3. May need to prompt students to think about how many feet are in a yard.   **Potential sentence starters:**  1 yard is the same as \_\_\_\_\_\_feet.  5 laps is about \_\_\_\_\_\_\_\_ feet, so 1 lap is about \_\_\_\_\_\_ feet.  **Key academic vocabulary**: Perimeter, expression, algebraic, evaluate, dimensions, length, width |

Student Handout

Last night, coach made us run the perimeter of the field 5 times for our warm-up. When he heard us complain, he yelled, “The total is not even a mile!”

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| End Zone |  | **10 20 30 40 50 40 30 20 10**  **10 20 30 40 50 40 30 20 10** |  |  |  |  |  |  |  |  | End Zone |

Each end zone is 10 yards

1. Write an algebraic expression that includes the information provided with the image, that could be used as a formula to calculate how far you ran.
2. What additional information would you need to know in order to calculate the distance using your expression?
3. A mile is 5,280 feet. What are possible reasonable dimensions for the field that would make the total amount run at practice less than a mile?

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| **Sample Student Work:**  **Student Work. Part A: (200 + 2x) times 5 equals (2 times 100 plus 2 times x) times 5. Part B: "The value of x would be needed to calculate the distance." Part C: "A possibility of some dimensions could be 100 times 50.  ((200 plus 100) times 5) equals 1500 yards equals 4500 feet** |