**Domain: Ratios And Proportional Relationships Standard Code: RP1 and 3 Teacher Name: Kris Wright and Candace Peters**

Adapted from: Smith, Margaret Schwan, Victoria Bill, and Elizabeth K. Hughes. “Thinking Through a Lesson Protocol: Successfully Implementing High-Level Tasks.”

*Mathematics Teaching in the Middle School 14* (October 2008): 132-138.

**Title: How Tall is Preston Anyway?**

|  |  |
| --- | --- |
| **PART 1: SELECTING AND SETTING UP A MATHEMATICAL TASK** | |
| What are your mathematical goals for the lesson? (i.e., what do you want  students to know and understand about mathematics as a result of this lesson?) | We expect students to use a ratio as a way of expressing relationships between quantities. They should be able to distinguish when a ratio is describing part to part or part to whole comparisons. They need to communicate these relationships in solving a real world problem. This task will need to be implemented after the students have some knowledge of proportions.  Accessibility:   * To make this task more accessible for struggling students, you may give them the height of once student in real life and in the picture if necessary. * To increase the challenge of the task, do not supply any data. Students will eventually discover the need to actually measure one item. They need to be allowed to do so. (This will require you to take a real life photo as described in the teacher preparation notes.) |
| * What are your expectations for students as they work on and complete this task? * What resources or tools will students have to use in their work that will give them entry into, and help them reason through, the task? * How will the students work—   independently, in small groups, or in pairs—to explore this task?   * How will students record and report their work? | We expect students to be writing and illustrating findings in their math journals.  Students are expected to communicate and show respect for others’ ideas.  Students may use rulers, calculators, tape measures, graph paper, number lines, or any other math toll which would be useful.  Students will work in cooperative groups of 4.  Each group will create a poster to show their findings. They must be prepared to share a convincing argument for their solution. |
| How will you introduce students to the activity so as to provide access to *all*  students while maintaining the cognitive demands of the task? | *Special note: A Word document is included in this task file that contains images that you may use instead of taking your own picture.*  Teacher preparation: Choose two or three of your students that vary in height. Take a picture of them outside by the flag pole, soccer standard, a tall tree, etc. Try to include something else in the picture such as a fire hydrant or fence etc. This will provide an opportunity to extend the lesson for fast finishers. When you have the picture, print a 4 x 6 copy for each group.  Launch: Pass out the pictures and let the students have a few minutes to enjoy it. Ask them to identify what they see in the picture. Then say: **How tall is Preston anyway?** (substitute your student’s name) Let the students make some guesses about Seth’s height (or another student). Tell them Seth is 6’2”.  Today I want you to mathematically determine how tall **Preston** is. You may not measure Preston!!  Your group will need to convince the rest of us that you have used sound mathematical reasoning and strategies. Your work and writing need to be recorded in your journals. Create a poster to show your findings and mathematical thinking. |

|  |  |
| --- | --- |
| **PART 2: SUPPORTING STUDENTS’ EXPLORATION OF THE TASK** | |
| As students work independently or in small groups, what questions will you ask to—   help a group get started or make progress on the task?   focus students’ thinking on the  key mathematical ideas in the task?   assess students’ understanding of  key mathematical ideas, problem- solving strategies, or the representations?   advance students’ understanding  of the mathematical ideas? | *These questions are not priority ranked.*   * What are you comparing? * Can you see a relationship between real life and the picture? * Is there a way you can compare his height in real life and in the picture? * Is there a math tool that will help you get started? * Do you think a piece of graph paper may be helpful? * Are you comparing a part to a whole?   Assess:   * Can you explain the items you are comparing? * Should these two items be compared? Why? * How many numbers do you need to work with to solve this problem? * How can you get these numbers? |
| How will you ensure that students remain engaged in the task?   What assistance will you give or what questions will you ask a  student (or group) who becomes  quickly frustrated and requests more direction and guidance in  solving the task?   What will you do if a student (or group) finishes the task almost  immediately? How will you  extend the task so as to provide additional challenge? | * Invite a student/group to share what they have learned so far. * Ask a student to explain his/her thinking to another student. * Ask guiding questions. * Check the student/group’s solution and poster for accuracy and quality. * If you accept the work, challenge them to determine the height of other objects in the picture or students in the class. * Can you show your findings in another way? |

|  |  |
| --- | --- |
| **PART 3: SHARING AND DISCUSSING THE TASK** | |
| How will you orchestrate the class discussion so that you accomplish your mathematical goals?   Which solution paths do you want to have shared during the  class discussion? In what order will the solutions be presented? Why?   What specific questions will you ask so that students will—  1. make sense of the  mathematical ideas that you want them to learn?  2. expand on, debate, and question the solutions being shared?  3. make connections among the different strategies that are presented?  4. look for patterns?  5. begin to form generalizations?  What will you see or hear that lets you know that *all* students in the class  understand the mathematical ideas that  you intended for them to learn? | Possible strategies students could use would be:   * Solve a proportion:   Seth’s height in real life (6’2”) =  *x*  Seth’s height in the picture (2 5/8”) Preston’s height in the picture (1 ¾”)  Substitute your own numbers.   * The concept of scaling could also be used to determine the solution.   + For example: If the soccer standard was 8 ft. high in real life and 4 inches tall in the picture, it would have doubled in size. (The units do not have to be the same in a ratio.)   + Therefore, everything in the picture would be doubled in size in real life.   Look for students to share the following:   * Students who compared Seth’s height to his height in the picture. * Students who used a ruler to measure the height of items in the picture. * Students, without data, who requested to measure real life objects from the picture. * Students who used scaling to solve the problem. * Students who accurately solved the proportions. * Students who set up the proportions incorrectly. * Students who used any other method. * Is your work like the other students or different? * Can you explain that student’s work to me? * Do you agree or disagree with that group? |
|  |  |



