**Domain: Expressions and Equations Standard Code: EE 9 Teacher Name: Jessica Mitchell, Dave Op’thof, Tera Jeffs**

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

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| **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?) | Use variables to represent quantities in real world problems that change in relationship to one another. Write an equation to express the quantity in terms of dependent variable and independent variable. Relate these to an equation. |
| * 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? | \*Problem solving and equations should have already been introduced.  \*Students may work independently or with a partner. No more than 2!  \*They need to stay on task, use appropriate voice, and find an efficient way to solve the problem, and be able to justify their answers.  \*Teachers can decide if they want an online ad, paper copy of newspapers, or magazines.  \*Money, paper and pencils  \*Independently or in pairs  \*Paper and pencil or poster paper |
| How will you introduce students to the activity so as to provide access to *all*  students while maintaining the cognitive demands of the task? | Pose the question to the whole class:  What kinds of items can you buy for $100 or more? Brainstorm with the students. Allow students to perform the first task which is looking for an item they would like to purchase that is $100 or more. Encourage students to shop around. |

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| **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? | What are you looking for? What do you already know? What are some other items that you might like to purchase? Find someone else in the class that you could possibly discuss options with?  What are some ways that you can get what you want? How did you come up with that answer? Is there a faster way to solve the problem? Is there a different way or strategy you could use? Does your work seem reasonable? Show me that what you have works.  \*What parts could you change? What parts have to stay the same in order to solve the problem?  Throughout the tasks, stop at the end of each task and discuss. |
| 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? | What do you know? What are you looking for? Do you have all the information that you need? What information might you be missing? What could you do about that? Where can you look?  You started with $3. How will that change your results? Chose a different job. How long will it take to earn enough money now? Show how to solve the problem in a different way. What if you and your partner combine your efforts. How long will it take you to buy one of the products? How could you change the problem? Write your own problem to solve. Were there any costs involved in your job? How would that change the problem? Have them try to solve the problem with the job of washing cars. Tell them it is $3 per car. |

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| **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? | Notice students who have solved the problem in different ways. Have those students come up and share with the class what they have done to solve the problem. Start with the simplest solutions and more to the more complex solutions. Remind them that all these methods are good and work.  Now having seen all of the different methods, is there one that you would try to use next time?  Ask the students which methods took the least amount of time?  Go back to your desks and chose a different method to solve task 2.   1. What is the most basic part of an equation? What does an equal sign mean? There is something we don’t know. What letter could we use to represent what we don’t know? 2. Does what someone else have match what you have? Does their answer seem reasonable? Which solutions are fastest? What do you like about that solution? Does another method make more sense to you than the first one you tried? 3. Even though items have different costs, if you did the same job, why does it take some longer to earn their item than others? 4. How is it different from week 1 to week 2, etc.? If someone has done a table, be sure to ask if they see a pattern. 5. What other situations might have a pattern like this problem? When could you use an equation like this?   Be sure to use the terms independent and dependent variable. Encourage them to use these terms as well.  They are all able to justify their answers and they are all able to solve the problem using a different method. All are engaged.  Possibly have them write a paragraph explaining their thinking and evaluating how they actually worked. Were they on task? Did they show their work? |

Task Instructions:

Task 1: Find an item from an ad online that you want to purchase. The item must be more than $100.

Task 2: You already have $22. You now need to pick a job opportunity. How long will it take you to earn enough money to buy your item?

Mow lawn: once a week for $15.00

Babysit: twice a week for $5.00 each time

Washing cars: $7.00 per day

Task 3: If you did all 3 jobs, how long will it take you to earn enough money for your item?

Task 4: How much money do you personally have in savings right now? What real life job would you chose to earn this item? How long will it take you to earn enough money to buy your item?

Task 5: Add in the cost of tax and shipping. Now how long will it take you to earn enough money to buy your item?