**Domain: Expressions and Equations Standard Code: 5 - inequalities Teacher Name:**

**See below: Student Handout**

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.

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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?) | Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. |
| * 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? | \*Students will answer equation and inequality questions from a set of values to make it true.  \*Students will choose from a set of values and use substitution to determine if it is true.  \*Possible resources are graph paper, blocks, balance and weights  \*Small groups  \*Write, use visuals, and present justifications |
| How will you introduce students to the activity so as to provide access to *all*  students while maintaining the cognitive demands of the task? | * Teacher introduction to what makes a math sentence true, and show mathematical notation with =, <, >, ≥, ≤, ≠ * Show manipulatives you want students to have access to |

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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 going to do/use to solve that? * What do you know? * What do you need to find out? * How are you going to show that? * What was the process you used to come to your conclusion? * What were some of the problems you found? How did you get around that? * How could you use this to solve real life problems? Add another variable to the scale. |
| 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 is  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? | * Roaming and interaction. * Have them come up with their own ideas for the party recipes—pizza, cookies….. show the possible algorithms and justify their answers. |

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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? | * Start with a group that has a simple solution to a group that has it detailed. * 1. How does that show a solution? * 2. Do you think the answer works?—Justify * 2. How would you have done it differently? * 3. What do the presentations have in common? * 4. Do you see a pattern? * 5. What types of things/ideas/problem solving did they have in common? |

EE8 Inequalities Student handout

Given the following values {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} which make the following equations and inequalities true? Show all possible solutions using

substitution for each true solution.

1. 3 + *x* = 12
2. 4 + *x* > 9
3. *x* + 9 < 18
4. 5*x* = 15
5. 7 – *x* ≤ 8

On the scale below which values {2,4,6,8,10,12,14,16,18,20} will make the scale balanced? Heavier on the left? Lighter on the left? Show all possible solutions with substitution and correct notation (<, >, =, ≤, ≥, ≠).

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Bob is having a party and is going to invite 11 friends. He is going to make punch so that he and each friend can have plenty of punch for all to enjoy. He has several recipes to choose from. One recipe from Yummy Recipes makes 4 cups, another from Tasty Treats makes 12 cups, another from Rockin’ Recipes makes 18 cups, and his grandmother’s recipe makes 24 servings. Which recipes could he use so everyone at the party can have 1 cup of punch? Which recipes could he use if he wanted to serve at least 2 cups to each person? Show and justify your answers.