## Rich Mathematical Task – Algebra I – *Trampoline Party*

**Task Overview/Description/Purpose:**

- In this task students will explore a situation where they must choose a location for a birthday party in order to develop the idea that solving multistep inequalities can be an efficient way to solve problems.
- This task could be used to introduce solving multistep inequalities because it will show students that there are multiple ways of solving the problem, but solving an inequality could be more efficient. It could also be used at the end of a unit as a summative task.
- Note: The anchor papers for this task come from the task being used as an introduction for the unit.

**Standards Alignment: Strand - Functions**

**Primary SOL:**

**A.5** The student will

a) solve multistep linear inequalities in one variable algebraically and represent the solution graphically;

c) solve practical problems involving inequalities;

**Related SOL (within or across grade levels/courses):** 7.13, 8.18, A.1a, A.4a, A.4e, AII.3a

**Learning Intentions:**

- **Content (based on Essential Knowledge and Skills) –** I am learning to apply my understanding of inequalities to make informed decisions about a real world problem.
- **Language –** I am learning to explain my reasoning with mathematical language.
- **Social –** I am working toward mathematical and logical consensus with my collaborative team.

**Success Criteria (Evidence of Student Learning):**

- I can mathematically model a situation with an inequality.
- I can solve a multistep linear equation and inequality.
- I can use the solution set of an inequality as evidence to collaboratively construct a claim about a real-world situation.
- I can logically communicate how my mathematical evidence supports my claim.

**Mathematics Process Goals**

| | |
|---|---|
| Problem Solving | Students will choose an appropriate strategy to reach a solution to the problem. |
| Communication and Reasoning | Students will provide work to show how they used their strategy to reach their solution.<br>Students will explain their reasoning using mathematical vocabulary. |
| Connections and Representations | Students will provide one or more representation of the situation: physical model, table, graph, equation. |

**Task Pre-Planning**

**Approximate Length/Time Frame*:*** 55 minutes

**Grouping of Students:**

Provide some individual think time for students to read the task and come up with a strategy that make sense to them. Then put students in small groups to discuss strategies, decide on a strategy, and solve the problem.

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**Task Pre-Planning**

**Materials and Technology:**
- white boards
- markers
- graph paper
- graphing utility

**Vocabulary:**
- algebraic
- model
- solution

**Anticipate Responses***:* See Planning for Mathematical Discourse Chart (Columns 1-3)

**Task Implementation (Before)**

**Task Launch:**
- Work with your English colleagues to use reading strategies that will be familiar to your students.
- This task could be used as an introduction to solving multistep inequalities, but vocabulary is needed prior to students beginning the task. Specifically, students will need to understand what constitutes an algebraic model.
- Present this task as a problem for students to solve in any manner that makes sense to them.
- Make sure students have access to a variety of materials.
- Allow students to pursue different strategies.

- **Task Implementation (During)**

**Directions for Supporting Implementation of the Task**
- Monitor – Teacher will listen and observe students as they work on task and ask assessing or advancing questions (see chart on next page)
- Select – Teacher will decide which strategies or thinking that will be highlighted (after student task implementation) that will advance mathematical ideas and support student learning
- Sequence – Teacher will decide the order in which student ideas will be highlighted (after student task implementation)
- Connect – Teacher will consider ways to facilitate connections between different student responses

**Suggestions For Additional Student Support**
- Possible use of sentences frames to support student thinking
- I would choose _____ for 10 friends because _____.
- For _____ or more friends, _____ is less expensive because _____.
- _____+_____<_____+_____ (inequality frame)
- Provide highlighters to assist students in interacting with text
- Provide oral instructions
- Allow students to provide oral explanations
- Possible problem solving strategies questions for non-starters:
  - Can you come up with an estimate?
  - How could you organize your thinking?

**Task Implementation (After)**

**Connecting Student Responses (From Anticipating Student Response Chart) and Closure of the Task:**
- Based on the actual student responses, sequence and select particular students to present their mathematical work during class discussion.

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| **Task Pre-Planning** |
| --- |
| • Connect different students' responses and connect the responses to the key mathematical ideas to bring closure to the task. Discuss similarities and differences between two strategies before adding additional strategies.<br>• Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion.<br>• Draw out any pertinent vocabulary, if possible, during the closure discussion and post word wall cards. |
| • **Teacher Reflection About Student Learning:** |
| • What strategies did students use and did they fit with what you expected them to do?<br>• What were the reoccurring student misconceptions?<br>• How will the evidence provided through student work inform further instruction?<br>• Does vocabulary need further development?<br>• Are students able to explain their work verbally (oral or written)? |

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## Planning for Mathematical Discourse

Mathematical Task: Trampoline Party Content Standard(s): A.5a, c

| Teacher Completes Prior to Task Implementation | | | Teacher Completes During Task Implementation | |
|---|---|---|---|---|
| **Anticipated Student Response/Strategy**<br>*Provide examples of possible correct student responses along with examples of student errors/misconceptions* | **Assessing Questions – Teacher Stays to Hear Response**<br>*Teacher questioning that allows student to explain and clarify thinking* | **Advancing Questions – Teacher Poses Question and Walks Away**<br>*Teacher questioning that moves thinking forward* | **List of Students Providing Response**<br>*Who? Which students used this strategy?* | **Discussion Order - sequencing student responses**<br>• *Based on the actual student responses, sequence and select particular students to present their mathematical work during class discussion*<br>• *Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion* |
| **Anticipated Student Response:**<br>Guess and check.<br>*This strategy will obtain a correct solution, but would not be course appropriate for mathematical understanding. | • What assumptions did you make about the number of friends?<br>• What's going on in this situation? | • How can you take your original trial and get closer without trying all options?<br>• What are you noticing? | | |
| **Anticipated Student Response:**<br>Students use the "add on method" to find costs.<br>Possible Misconception: Students might either forget the initial amounts or add on the initial amounts. | • How much has to be paid no<br>• matter the number of friends?<br>• How did you figure out what<br>• number of friends to consider? | • Is there a pattern in the costs?<br>• Is there a way to simplify the process?<br>• What are you noticing? | **Student F** | |
| **Anticipated Student Response:**<br>Students plug into the algebraic expression for each location separatly.<br>Possible Misconception: Students might forget that the first 10 friends are paid for at Sky High. | • How much has to be paid no matter the number of friends?<br>• How did you figure out what number of friends to consider? | • Is there a pattern in the costs?<br>• Is there a way to simplify the process?<br>• What are you noticing? | **Students A, B, C, D, E** | |

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<table>
<tr><th colspan="3">Teacher Completes Prior to Task Implementation</th><th colspan="2">Teacher Completes During Task Implementation</th></tr>
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<tr><td>Anticipated Student Response:<br><table><tr><th># Friends</th><th>Sky High</th><th>Jump It Up</th></tr><tr><td>15</td><td>$75</td><td>$100</td></tr><tr><td>20</td><td>$100</td><td>$110</td></tr><tr><td>21</td><td>$105</td><td>$112</td></tr><tr><td>22</td><td>$110</td><td>$114</td></tr><tr><td>23</td><td>$115</td><td>$116</td></tr><tr><td>24</td><td>$120</td><td>$118</td></tr><tr><td>25</td><td>$125</td><td>$120</td></tr></table>Possible Misconception: students might do multiples of 5 and not realize they have to get down to 21, 22, 23, and 24.</td><td>• How did you decide where to begin your table?<br>• How did you figure out what number of friends to consider?</td><td>• Is there a pattern in the costs?<br>• Is there a way to simplify the process?<br>• What are you noticing?</td><td></td><td></td></tr>
<tr><td>Anticipated Student Response:<br>Solve a multistep inequality.</td><td>• Explain how you came up with the parts of your inequality.<br>• What do you notice about your solution?</td><td>• Is this the only equation that would work?</td><td></td><td></td></tr>
</table>

Name_____ Date_____

## Trampoline Party

For your birthday, you want to take a group of friends to an indoor trampoline center. There are two trampoline parks available on your date.

Pricing Information:

Sky High: $50 for up to 10 people and $5 per person after that.

Jump it Up: $70 for a party set up fee and $2 per person.

1. Which trampoline center would you choose for the following number of friends. Show all work and give justification for your solutions, including any representations you used.

    a. 15 friends

    b. 20 friends

    c. 25 friends

2. What is the minimum number of friends for which Jump it Up is the less expensive choice. Show all work and give justification for your solutions, including any representations you used.

3. Using the pricing information given, model algebraically the situation where Jump it Up is less expensive than Sky High.

# Rich Mathematical Task – Algebra I – Trampoline Party

| | Advanced | Proficient | Developing | Emerging |
|---|---|---|---|---|
| **Mathematical Understanding** | Proficient Plus:<br>• Uses relationships among mathematical concepts | • Demonstrates an understanding of concepts and skills associated with task<br>• Applies mathematical concepts and skills which lead to a valid and correct solution | • Demonstrates a partial understanding of concepts and skills associated with task<br>• Applies mathematical concepts and skills which lead to an incomplete or incorrect solution | • Demonstrates little or no understanding of concepts and skills associated with task<br>• Applies limited mathematical concepts and skills in an attempt to find a solution or provides no solution |
| **Problem Solving** | Proficient Plus:<br>• Problem solving strategy is efficient | • Problem solving strategy displays an understanding of the underlying mathematical concept<br>• Produces a solution relevant to the problem and confirms the reasonableness of the solution | • Chooses a problem solving strategy that does not display an understanding of the underlying mathematical concept<br>• Produces a solution relevant to the problem but does not confirm the reasonableness of the solution | • A problem solving strategy is not evident or is not complete<br>• Does not produce a solution that is relevant to the problem |
| **Communication and Reasoning** | Proficient Plus:<br>• Reasoning is organized and coherent<br>• Consistent use of precise mathematical language and accurate use of symbolic notation | • Communicates thinking process<br>• Demonstrates reasoning and/or justifies solution steps<br>• Supports arguments and claims with evidence<br>• Uses mathematical language to express ideas with precision | • Reasoning or justification of solution steps is limited or contains misconceptions<br>• Provides limited or inconsistent evidence to support arguments and claims<br>• Uses limited mathematical language to partially communicate thinking with some imprecision | • Provides little to no correct reasoning or justification<br>• Does not provide evidence to support arguments and claims<br>• Uses little or no mathematical language to communicate thinking |
| **Representations and Connections** | Proficient Plus:<br>• Uses representations to analyze relationships and extend thinking<br>• Uses mathematical connections to extend the solution to other mathematics or to deepen understanding | • Uses a representation or multiple representations, with accurate labels, to explore and model the problem<br>• Makes a mathematical connection that is relevant to the context of the problem | • Uses an incomplete or limited representation to model the problem<br>• Makes a partial mathematical connection or the connection is not relevant to the context of the problem | • Uses no representation or uses a representation that does not model the problem<br>• Makes no mathematical connections |