Rich Mathematical Task – Grade 6 – *Winning the Game*

Task Overview/Description/Purpose:

- In this task, students will determine the ranking of friends playing a game in order to develop mathematical understanding of representing integers, comparing and ordering integers, and finding the absolute value of integers.
- This task is designed to deepen understanding of representing integers, comparing and ordering integers, and finding the absolute value of integers.

Standards Alignment: Strand – *Computation and Estimation*

Primary SOL: 6.3 The student will a) identify and represent integers, b) compare and order integers, and c) identify and describe absolute value of integers.

Related SOL (within or across grade levels/courses): 6.6ab

Learning Intention(s):

- **Content –** I am learning about the relationship between integers, how to represent integers, and how they can be used to solve practical problems.
- **Language-** I am learning how to represent and describe integers in real world contexts.
- **Social –** I am learning how to explain my strategy and work to others so I can refine my strategies for problem solving.

Success Criteria (Evidence of Student Learning);

- I can represent integers in practical scenarios.
- I can compare and order integers to solve a practical problem.
- I can determine and represent the absolute value of integers to solve a practical problem.
- I can justify my thinking using appropriate mathematical vocabulary and report my conclusions.
- I can make suggestions and utilize suggestions made by my peers to make revisions to my work and thinking.

Mathematics Process Goals

Problem Solving	• Students will use integer representations, comparisons, and absolute value to model a practical situation.
Communication and Reasoning	• Students will justify verbally and with mathematical vocabulary and evidence how they know the standings of the game after the first round. • Students will determine a conclusion as to the order of the players and explain whether their conclusion is valid.
Connections and Representations	• Students will make connections to ordering whole numbers through this task as well as connect integers to playing a game like Jeopardy. • Students will use number lines, words, tiles, or other models to model the standings of the friends in the game.

Task Pre-Planning

Approximate Length/Time Frame: 25-30 minutes

Grouping of Students: This task would be best completed with students working collaboratively first to discuss their problem solving process, and then work independently to determine their solution.

Materials and Technology:

- Virtual Implementation Google Slides
- Integer Number Line from -20 to 20.
- Two-Color Counters
- Algebra Tiles
- Linking Cubes

Vocabulary:

- Integer
- Ascending
- Descending
- Positive
- Negative
- Absolute value

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

Task Implementation (Before)

Task Launch

- Ask students who likes to win when playing games. Ask them what games they play and how they know what place they are in.
- Continue the conversation by asking students if they have ever watched Jeopardy. How do they know who is in 1st place, 2nd place, etc.? What does a score of -100 mean? Consider showing an image of the Jeopardy podiums with a negative score. Also ask students if they have played any games that are scored similarly to Jeopardy.

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 as necessary (see attached *Planning for Mathematical Discourse Chart*)
- 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) during the closure discussion. One suggestion is to look for one common misconception and two correct responses.
- Connect – Teacher will consider ways to facilitate connections between different student responses

Suggestions For Additional Student Support

- Have all of the manipulatives out on a central table so that students can get what they need, as they need it.
- Some students get stuck at one way of thinking and using one method. Asking questions like "How confident are you?" and "What would convince someone?" will help students get past this point.
- For students with motor processing difficulties, allow them to communicate the reasoning in other ways such as video recording or typing answers.
- Kinesthetic learners may benefit from the use of two-color counters to pair with the number line visual representation.
- For students with attention challenges ask student to restate the problem or important information.
- For students who need academic language support, consider the use of a visual word wall or reference sheet for students to use identifying integer, absolute value, and words that represent positive numbers, negatives, and zero.
- For students who need more support in justifying their thinking, you may choose to provide them with the sentence frames below.

Task Implementation (Before)

- What I know about the problem is…
- My method for solving the problem was…
- I know that ____ was in first place because …..
- A possible description for the sixth friend is that she…
- Jose's score impacts the standings by…

- For ELs with first language literacy, try to provide prompt, or parts of prompt, in their home language.

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. Some possible big mathematical ideas to highlight could include:
  - Common misconceptions
  - Concrete to representational to abstract
- Connect different students' responses and connect the responses to the key mathematical ideas to bring closure to the task. Possible questions and sentence frames to connect student strategies:
  - How are these strategies alike? How are they different?
  - Where do you see _____'s strategy in _____'s strategy?
  - How does _____'s picture relate to _____'s symbols?
  - Why is this important?
- Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion. Some possible ways to do this are to-
  - Assign roles like time keeper, task master, material fetcher, and recorder of strategies to each member of the group.
  - Do a "whip around" when you put students in groups. Students will each be given one minute to explain their thinking about the problem.

Teacher Reflection About Student Learning:

- Teacher should use the chart on the next page with the anticipated student solutions to monitor which students are using each strategy as well as record any additional strategies encountered. The sequence of tasks will inform what will come next in instruction to further student ideas and thinking. Form small groups to address misconceptions that are not addressed in the class debrief.
- Information gathered from the task rubric could identify small groups for later instruction, identifying specific students to partner with one another, and/or identifying students who need more teacher modeling and think alouds.

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Planning for Mathematical Discourse

Mathematical Task: Winning the Game

Content Standard(s): SOL 6.3

Anticipated Student Response/Strategy *Provide examples of possible correct student responses along with examples of student errors/misconceptions*	**Assessing Questions:** *Teacher questioning that allows student to explain and clarify thinking*	**Advancing Questions:** *Teacher questioning that moves thinking forward*	**List of Students Providing Response** *Who? Which students used this strategy?*	**Discussion Order - sequencing student responses** • *Based on the actual student responses, sequence and select particular students to present their mathematical work during class discussion* • *Connect different students' responses and connect the responses to the key mathematical ideas.* • *Consider ways to ensure that each student will have an equitable opportunity to share his/her thinking during task discussion*
Anticipated Student Response: I don't know what to do?	• What is the question asking you? • What information do you have? • What do you notice? • What do you wonder?	• What could you use to model the problem? • What do you predict the solution might look like?		
Anticipated Student Response: Student orders all numbers as if they are positive.	• What does it mean to have gained 13 points? • What does it mean to have lost 13 points?	• How might we represent those amounts?		
Anticipated Student Response: Student orders the negative integers in reverse order.	• Can you explain how you determined this order? • Can you show a picture each of these amounts?	• Is it colder is the temperature drops by 3 degrees or descends by 7 degrees?		

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Anticipated Student Response: Student identifies the student with the greatest change as the student in 1st place or least change as the student in 5th place.	• Can you explain to us your thinking? • How did you represent the standings of the friends?	• Is the greatest change in points the same as the greatest score?		
Anticipated Student Response: Student identifies Jose's score change as only positive 6.	• Does this approach seem reasonable to you? Why? • How confident in your answer are you?	• In what ways can you represent a change of 6 points?		
Anticipated Student Response: Student correctly places students into the correct order and reports both ways that Jose's change could affect the standings.	• What do you mean by saying Jose's score can affect the standings in two ways?	• Did you have a picture in your mind when you read part D? Can you share it with us so we can see what you saw?		

Winning the Game

Name_____ Date_____

Some friends were playing a game. At the end of the first round,

- Breonna earned 4 points.
- Thomas lost 13 points.
- Jamal's points dropped by 3.
- Gavin's points increased by 11.
- Tiffany's points descended by 7.

A. If the goal of the game is to the get the most points, who is in 1st place, 2nd place, etc. at the end of the first round? Provide evidence and explain your thinking.

B. Who had the greatest change in points at the end of the first round? Who had the least change in points at the end of the first round? Provide evidence and explain your thinking.

C. A sixth friend was in the game. She said that she was in last place at the end of the first round. Give a possible description that could explain her change in points. Explain your thinking.

D. Jose was also in the game. He said that his score changed by 6 points. How does his score impact the standings at the end of the first round? Provide evidence and explain your thinking.

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