

Wk 3 Authentic Assessment with AI

First Draft

Grade level

8th Grade | Algebra I

Learning Objective:

The learner will evaluate the solution set of linear inequalities two variables on the coordinate plane as demonstrated by a game of battleship.

Instructions and materials

You will use a battleship game to apply your understanding of a half-plane as the set of solutions to an inequality with two variables. You will define an inequality and graph it on a coordinate plane. You will then place all your ships on the half-plane solutions. This will simulate a real world scenario of naval battleship.

Feedback from Generative AI

Sent by you:

I am an 8th grade math/Algebra I teacher and I am planning a lesson/unit on solving and graphing system of inequalities. At the end of my lesson/unit, I want to use an authentic assessment that uses PBL parameters. Please review my authentic assessment plan written for my students, and give me specific feedback to help me improve it. Please format the feedback so that you tell me if 1) the objective fits the assessment, 2) if the assessment follows PBL parameters, 3) if it fits the topic or lesson, and 4) if it is grade level appropriate. Please do not show me a revised assessment but provide me feedback that allows me to revise it myself.



Wk 3 Authentic Assessment with AI.pdf

Copilot

Sent by Copilot:

I've reviewed your authentic assessment plan. Here is the feedback based on the criteria you provided:

1. Objective Fit

Objective: The learner will evaluate the solution set of linear inequalities in two variables on the coordinate plane as demonstrated by a game of battleship.

- **Fit:** The objective aligns well with the assessment. Using a battleship game to apply understanding of half-planes as solution sets to inequalities is a creative and engaging way to meet the learning objective. It requires students to define and graph inequalities, then use these graphs to place ships, which directly ties into evaluating solution sets.

2. PBL Parameters

Project-Based Learning (PBL) Parameters:

- **Real-World Relevance:** The battleship game simulates a real-world scenario, making the task more engaging and meaningful.
- **Student-Centered:** The assessment allows students to take an active role in their learning by applying mathematical concepts in a game format.
- **Inquiry-Based:** Students must use critical thinking and problem-solving skills to determine where to place their ships based on the inequalities they graph.
- **Collaboration:** If the game is played in pairs or groups, it encourages collaboration and communication among students.
- **Reflection:** Ensure there is a component where students reflect on their strategies and the mathematical concepts they applied.

3. Topic/Lesson Fit

- **Fit:** The assessment fits well with the topic of solving and graphing systems of inequalities. It requires students to apply their knowledge in a practical and interactive way, reinforcing the concepts taught during the unit.

4. Grade Level Appropriateness

- **Appropriateness:** The assessment is appropriate for 8th grade Algebra I students. The use of a game like battleship is likely to be engaging for this age group and provides a hands-on way to understand abstract concepts. Ensure that the instructions are clear and that students have had sufficient practice with graphing inequalities before the assessment.

Additional Suggestions

- **Clarity:** Make sure the instructions for the game are clear and detailed. Provide examples of how to graph inequalities and place ships.
- **Differentiation:** Consider ways to differentiate the assessment for students who may struggle with the concepts or need more of a challenge.
- **Assessment Criteria:** Clearly define how students will be assessed. Will it be based on accuracy, strategy, or both? Provide a rubric if possible.

I hope this feedback helps you refine your assessment plan! If you have any further questions or need more specific advice, feel free to ask.

1utrgv-my.sharepoint.com

You

Sent by you:

How can I make it clearer? Also, tell me more about assessment criteria



Wk 3 Authentic Assessment with AI.pdf

Copilot

Sent by Copilot:

Making Instructions Clearer

To ensure your instructions are clear, consider the following tips:

1. Step-by-Step Instructions:

- Break down the instructions into clear, numbered steps. This helps students follow along without missing any details.
- Example:
 1. Define an inequality and graph it on the coordinate plane.
 2. Identify the half-plane that represents the solution set.
 3. Place your ships within the solution set on the graph.

2. Visual Aids:

- Include diagrams or examples of a completed graph with ships placed on it. Visuals can help students understand what their final product should look like.

- Example: Show a coordinate plane with an inequality graphed and ships placed within the solution set.

3. Clear Definitions:

- Ensure all mathematical terms and game-related terms are clearly defined. For instance, explain what a “half-plane” is and how it relates to the inequality.
- Example: “A half-plane is the region of the graph that represents all the solutions to an inequality. For example, if your inequality is $(y > 2x + 3)$, the half-plane is the area above the line $(y = 2x + 3)$.”

4. Check for Understanding:

- Include a few practice problems or a mini-quiz to check for understanding before students start the main assessment.
- Example: “Before you begin the battleship game, solve these two inequalities and graph their solution sets.”

Assessment Criteria

To create clear assessment criteria, consider the following components:

1. Accuracy:

- Assess whether students correctly define and graph the inequalities.
- Example: “Did the student correctly graph the inequality and shade the correct half-plane?”

2. Strategy:

- Evaluate the placement of ships based on the solution set. Are the ships placed logically within the solution set?
- Example: “Are all ships placed within the correct half-plane? Did the student use the entire solution set effectively?”

3. Understanding:

- Check for a demonstration of understanding of the concepts. This can be assessed through a reflection or explanation.
- Example: “Did the student provide a clear explanation of why they placed their ships in certain locations?”

4. Presentation:

- Assess the clarity and neatness of the graph and overall presentation.
- Example: “Is the graph neat and easy to read? Are the ships clearly marked?”

5. Reflection:

- Include a reflection component where students explain their thought process and what they learned.

- Example: "Did the student reflect on their strategy and explain what they learned about graphing inequalities?"

Example Rubric

Table

Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
Accuracy	Inequalities are correctly graphed and shaded.	Minor errors in graphing or shading.	Several errors in graphing or shading.	Incorrect graphing or shading.
Strategy	Ships are logically placed within the solution set.	Ships are mostly within the solution set.	Some ships are outside the solution set.	Ships are not placed within the solution set.
Understanding	Clear and thorough explanation of strategy.	Good explanation with minor gaps.	Basic explanation with several gaps.	Little to no explanation provided.
Presentation	Graph is neat and easy to read.	Graph is mostly neat with minor issues.	Graph is somewhat messy but readable.	Graph is messy and hard to read.
Reflection	Thoughtful and insightful reflection.	Good reflection with minor gaps.	Basic reflection with several gaps.	Little to no reflection provided.

I hope these suggestions help you refine your assessment plan! If you need further assistance, feel free to ask.

You

Sent by you:

What are some common misconceptions students might have during this activity?

Copilot

Sent by Copilot:

When working on solving and graphing systems of inequalities, students might encounter several common misconceptions. Here are a few to watch out for:

1. Misunderstanding the Inequality Symbols

- **Misconception:** Students often confuse the inequality symbols ($>$, $<$, \geq , \leq) and their meanings.
- **Clarification:** Emphasize that " $>$ " and " $<$ " represent strict inequalities (not including the boundary line), while " \geq " and " \leq " include the boundary line.

2. Incorrect Shading of the Solution Set

- **Misconception:** Students may shade the wrong side of the boundary line.
- **Clarification:** Teach students to test a point (usually the origin, if it's not on the boundary) to determine which side of the line to shade.

3. Graphing the Boundary Line Incorrectly

- **Misconception:** Students might graph the boundary line incorrectly, either by plotting points inaccurately or by misunderstanding the slope-intercept form.
- **Clarification:** Reinforce the process of converting inequalities to slope-intercept form ($y = mx + b$) and accurately plotting the y-intercept and slope.

4. Confusing Systems of Inequalities with Systems of Equations

- **Misconception:** Students might treat systems of inequalities like systems of equations, looking for a single point of intersection rather than a region.
- **Clarification:** Highlight that the solution to a system of inequalities is a region where the shaded areas overlap, not just a single point.

5. Overlapping Regions

- **Misconception:** Students may struggle to identify the overlapping region when graphing multiple inequalities.
- **Clarification:** Use different colors or shading patterns for each inequality to clearly show the overlapping region.

6. Boundary Line Inclusion

- **Misconception:** Students might not understand when to use a solid line (for \geq or \leq) versus a dashed line (for $>$ or $<$).
- **Clarification:** Reinforce that solid lines include the boundary as part of the solution set, while dashed lines do not.

7. Real-World Application

- **Misconception:** Students might not see the connection between the mathematical concept and the real-world scenario (e.g., the battleship game).
- **Clarification:** Provide clear examples and explanations of how the inequalities represent real-world constraints and solutions.

8. Misinterpreting the Coordinate Plane

- **Misconception:** Students might misinterpret the axes or the scale of the coordinate plane.
- **Clarification:** Ensure students understand how to read and plot points accurately on the coordinate plane, including understanding the scale and units used.

Strategies to Address Misconceptions

- **Practice Problems:** Provide ample practice problems with immediate feedback to help students correct their misunderstandings.
- **Visual Aids:** Use visual aids and interactive tools to help students visualize the concepts.
- **Peer Teaching:** Encourage students to explain their reasoning to peers, which can help reinforce their understanding.
- **Reflection:** Include reflection questions where students explain their thought process and identify any areas of confusion.

By addressing these misconceptions proactively, you can help your students develop a stronger understanding of solving and graphing systems of inequalities. If you need more specific strategies or examples, feel free to ask!

You

Sent by you:

I can assess the students understanding of using a coordinate pair to test if the half-plane is a solution set for the system of inequalities, but how can i test for whether the system of inequalities has a $<$ or a \leq symbol (or vice versa).

Sent by Copilot:

To assess whether students understand the difference between strict inequalities ($<$, $>$) and inclusive inequalities (\leq , \geq), you can incorporate specific tasks and questions into your assessment. Here are some strategies:

1. Boundary Line Identification

- **Task:** Ask students to graph an inequality and clearly indicate whether the boundary line should be solid or dashed.
- **Assessment:** Check if students use a solid line for \leq or \geq and a dashed line for $<$ or $>$. This directly tests their understanding of the inequality symbols.

2. Testing Boundary Points

- **Task:** Provide students with an inequality and ask them to test a point on the boundary line to determine if it satisfies the inequality.
- **Assessment:** If the inequality is \leq or \geq , the boundary point should satisfy the inequality. If it is $<$ or $>$, the boundary point should not satisfy the inequality. This helps students understand the inclusion or exclusion of the boundary.

3. Explanation Questions

- **Task:** Include questions that require students to explain why they used a solid or dashed line for a given inequality.
- **Assessment:** Evaluate their explanations to ensure they understand that solid lines include boundary points (\leq , \geq) and dashed lines do not ($<$, $>$).

4. Real-World Scenarios

- **Task:** Present real-world scenarios where students must decide whether to use a strict or inclusive inequality. For example, "A company can produce up to 100 units of a product. Write an inequality to represent this situation."
- **Assessment:** Check if students correctly use \leq for "up to" or $<$ for "less than."

5. Multiple-Choice Questions

- **Task:** Create multiple-choice questions where students choose the correct inequality symbol based on a given graph or scenario.

- **Assessment:** This can quickly assess their ability to distinguish between $<$, $>$, \leq , and \geq .

6. Peer Review

- **Task:** Have students graph inequalities and then review each other's work, focusing on the use of solid and dashed lines.
- **Assessment:** Peer review can help reinforce the concepts as students explain their reasoning to each other.

Example Questions

1. Graphing and Identifying Boundaries:

- "Graph the inequality ($y \leq 2x + 3$). Should the boundary line be solid or dashed? Explain your reasoning."
- "Graph the inequality ($y > -x + 1$). Should the boundary line be solid or dashed? Explain your reasoning."

2. Testing Boundary Points:

- "Given the inequality ($y \geq x - 2$), test the point (0, -2). Does it satisfy the inequality? What does this tell you about the boundary line?"

3. Real-World Scenario:

- "A park can hold no more than 500 people. Write an inequality to represent this situation and explain why you chose that inequality symbol."

By incorporating these tasks and questions into your assessment, you can effectively evaluate whether students understand the difference between strict and inclusive inequalities. If you need more specific examples or further assistance, feel free to ask!

You

Sent by you:

But how can I do that in terms of the assessment scenario with the battleship?

Copilot

Sent by Copilot:

Integrating the assessment of strict and inclusive inequalities into your battleship game scenario can be both engaging and educational. Here are some strategies to incorporate this into your assessment:

1. Boundary Line Identification in the Game

- **Task:** When students graph their inequalities to place their ships, require them to clearly indicate whether the boundary line should be solid or dashed.
- **Assessment:** Check if students use a solid line for \leq or \geq and a dashed line for $<$ or $>$. This directly tests their understanding of the inequality symbols.

2. Testing Boundary Points with Ships

- **Task:** Ask students to place a ship on the boundary line and test if it satisfies the inequality.
- **Assessment:** If the inequality is \leq or \geq , the ship on the boundary should be considered "hit" if it satisfies the inequality. If it is $<$ or $>$, the ship on the boundary should not be considered "hit."

3. Explanation Questions within the Game

- **Task:** Include questions that require students to explain why they used a solid or dashed line for a given inequality as part of their game strategy.
- **Assessment:** Evaluate their explanations to ensure they understand that solid lines include boundary points (\leq , \geq) and dashed lines do not ($<$, $>$).

4. Real-World Scenarios in the Game

- **Task:** Present scenarios within the game where students must decide whether to use a strict or inclusive inequality. For example, "Your ship can be placed up to but not including the line ($y = 2x + 3$). Write the inequality and explain your choice."
- **Assessment:** Check if students correctly use $<$ for "up to but not including" or \leq for "up to and including."

5. Multiple-Choice Questions within the Game

- **Task:** Create multiple-choice questions related to the game where students choose the correct inequality symbol based on a given graph or scenario.
- **Assessment:** This can quickly assess their ability to distinguish between $<$, $>$, \leq , and \geq .

Example Game Instructions

1. Graphing and Identifying Boundaries:

- "Graph the inequality ($y \leq 2x + 3$). Should the boundary line be solid or dashed? Explain your reasoning."
- "Graph the inequality ($y > -x + 1$). Should the boundary line be solid or dashed? Explain your reasoning."

2. Testing Boundary Points:

- "Place a ship on the boundary line of the inequality ($y \geq x - 2$). Test the point (0, -2). Does it satisfy the inequality? What does this tell you about the boundary line?"

3. Real-World Scenario:

- "Your ship can be placed up to but not including the line ($y = 2x + 3$). Write the inequality and explain why you chose that inequality symbol."

Example Rubric for the Battleship Game

Table

Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
Boundary Line Identification	Correctly identifies and uses solid or dashed lines for all inequalities.	Minor errors in identifying or using solid/dashed lines.	Several errors in identifying or using solid/dashed lines.	Incorrectly identifies or uses solid/dashed lines.
Testing Boundary Points	Accurately tests boundary points and explains results.	Minor errors in testing boundary points or explanations.	Several errors in testing boundary points or explanations.	Incorrectly tests boundary points or provides no explanation.
Explanation of Strategy	Provides clear and thorough explanations for all decisions.	Good explanations with minor gaps.	Basic explanations with several gaps.	Little to no explanation provided.
Real-World Scenario Application	Correctly applies inequality symbols in real-world scenarios.	Minor errors in applying inequality symbols.	Several errors in applying inequality symbols.	Incorrectly applies inequality symbols.

By incorporating these tasks and questions into your battleship game assessment, you can effectively evaluate whether students understand the difference between strict and inclusive inequalities. If you need more specific examples or further assistance, feel free to ask!

You

Sent by you:

Asking students to have the ship on the boundary line wouldn't work because the ship would have to be diagonal. Right?

Copilot

Sent by Copilot:

You're correct. Placing a ship directly on the boundary line would indeed be impractical since the boundary line could be diagonal, and ships are typically represented as horizontal or vertical segments. Here are some alternative strategies to assess students' understanding of strict and inclusive inequalities within the battleship game context:

Alternative Strategies

1. Boundary Line Testing with Points:

- **Task:** Instead of placing ships on the boundary line, ask students to test specific points on the boundary line to determine if they satisfy the inequality.
- **Example:** "For the inequality ($y \geq 2x + 3$), test the point (1, 5). Does it satisfy the inequality? Explain why this point is or isn't part of the solution set."

2. Ship Placement Near the Boundary:

- **Task:** Have students place ships near the boundary line and then test points just inside and just outside the boundary to determine if they satisfy the inequality.
- **Example:** "Place your ship in the region defined by ($y > 2x + 3$). Test the points (1, 6) and (1, 4). Which points are in the solution set?"

3. Graphing and Identifying Boundaries:

- **Task:** Require students to graph the inequality and clearly indicate whether the boundary line should be solid or dashed.
- **Example:** "Graph the inequality ($y \leq -x + 2$). Should the boundary line be solid or dashed? Explain your reasoning."

4. Reflection Questions:

- **Task:** Include reflection questions where students explain their reasoning for using solid or dashed lines.
- **Example:** "Why did you use a solid line for the inequality ($y \leq 2x + 3$)? What does this tell you about the points on the boundary line?"

5. Scenario-Based Questions:

- **Task:** Present scenarios where students must decide whether to use a strict or inclusive inequality.
- **Example:** "In a naval battle, your ship can be placed up to and including the line ($y = 2x + 3$). Write the inequality and explain why you chose that symbol."

Example Rubric for the Battleship Game

Table

Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
Boundary Line Identification	Correctly identifies and uses solid or dashed lines for all inequalities.	Minor errors in identifying or using solid/dashed lines.	Several errors in identifying or using solid/dashed lines.	Incorrectly identifies or uses solid/dashed lines.
Testing Boundary Points	Accurately tests boundary points and explains results.	Minor errors in testing boundary points or explanations.	Several errors in testing boundary points or explanations.	Incorrectly tests boundary points or provides no explanation.
Explanation of Strategy	Provides clear and thorough explanations for all decisions.	Good explanations with minor gaps.	Basic explanations with several gaps.	Little to no explanation provided.
Real-World Scenario Application	Correctly applies inequality symbols in real-world scenarios.	Minor errors in applying inequality symbols.	Several errors in applying inequality symbols.	Incorrectly applies inequality symbols.

By using these strategies, you can effectively assess students' understanding of strict and inclusive inequalities within the context of your battleship game. If you need further assistance or more specific examples, feel free to ask!

You

Sent by you:

how much would be lost if I asked students to just use a closed inequality as opposed to open to avoid the complexity?

Copilot

Sent by Copilot:

If you decide to have students use only closed inequalities (\leq , \geq) instead of open inequalities ($<$, $>$) to simplify the assessment, here are some considerations regarding what might be lost and what could be gained:

What Might Be Lost

1. Understanding of Strict Inequalities:

- **Conceptual Understanding:** Students might miss out on understanding the difference between strict and inclusive inequalities. This distinction is important in higher-level math and real-world applications where boundaries can be exclusive.
- **Graphing Skills:** Students won't practice using dashed lines to represent strict inequalities, which is a key skill in graphing.

2. Critical Thinking:

- **Problem-Solving:** The complexity of deciding whether to include or exclude boundary points encourages deeper critical thinking and problem-solving skills.
- **Precision:** Understanding and applying strict inequalities requires precision in mathematical reasoning, which is a valuable skill.

3. Real-World Applications:

- **Accuracy in Modeling:** Many real-world scenarios require the use of strict inequalities. For example, "less than" versus "less than or equal to" can have significant implications in fields like economics, engineering, and science.

What Could Be Gained

1. Simplified Assessment:

- **Focus on Core Concepts:** By using only closed inequalities, you can focus more on the core concepts of graphing and solving systems of inequalities without the added complexity.
- **Clarity:** Instructions and tasks might be clearer and easier for students to follow, reducing potential confusion.

2. Reduced Cognitive Load:

- **Accessibility:** Simplifying the task can make it more accessible for all students, especially those who might struggle with the additional complexity of strict inequalities.
- **Confidence Building:** Students might feel more confident in their abilities if they can master the basics before moving on to more complex concepts.

Balancing Complexity and Simplicity

To strike a balance, you might consider the following approaches:

1. Gradual Introduction:

- Start with closed inequalities to build a strong foundation, then gradually introduce strict inequalities as students become more comfortable with the concepts.

2. Differentiated Instruction:

- Provide options for students to choose between tasks involving closed or strict inequalities based on their comfort level. This allows for differentiation and meets students where they are.

3. Supplemental Activities:

- Include supplemental activities or practice problems that specifically focus on strict inequalities, even if the main assessment uses closed inequalities.

Conclusion

While simplifying the assessment to use only closed inequalities can make the task more accessible and reduce complexity, it does come at the cost of missing out on important mathematical concepts and skills. Balancing simplicity with opportunities for deeper learning can help ensure that students still gain a comprehensive understanding of inequalities.

If you need more specific strategies or examples, feel free to ask!

You

Sent by you:

Could we modify the game to have different kind of "bombs" and one can be a "ghost bomb". Here's my thinking, if a ship is in a boundary but the boundary is open, is the ship hit? The ship wouldn't, because it's not part of the solution, but then the student could drop a "ghost bomb" to see if the ship is part of the open boundary? Would a better alternative be to figure out how to make the ships go diagonal?

Copilot

Sent by Copilot:

Your idea of using different kinds of "bombs," including a "ghost bomb," is a creative way to address the challenge of assessing strict inequalities within the battleship game. Here's how you could implement this idea, along with some considerations for making ships go diagonal:

Using Different Kinds of Bombs

1. Standard Bombs:

- **Purpose:** These bombs are used to test points within the solution set of closed inequalities (\leq , \geq).
- **Mechanics:** When a standard bomb is dropped, it checks if the point (representing a ship) is within the shaded region, including the boundary if it's a closed inequality.

2. Ghost Bombs:

- **Purpose:** These bombs are used to test points on the boundary of strict inequalities ($<$, $>$).
- **Mechanics:** When a ghost bomb is dropped, it checks if the point is on the boundary line of the inequality. If the boundary is open, the ship is not hit, but the ghost bomb can reveal if the point is part of the boundary line.

Implementing Ghost Bombs

- **Instructions:** Clearly explain to students the difference between standard bombs and ghost bombs. Provide examples of when to use each type.
- **Example:** "If your inequality is ($y > 2x + 3$), use a ghost bomb to test points on the boundary line ($y = 2x + 3$). If the point is on the boundary but not within the solution set, the ship is not hit."

Making Ships Go Diagonal

If you prefer to allow ships to be placed diagonally, here are some considerations:

1. Graphing Diagonal Ships:

- **Instructions:** Teach students how to place ships diagonally by aligning them with the slope of the boundary line.
- **Example:** "If your boundary line is ($y = 2x + 3$), you can place a ship diagonally along this line."

2. Complexity:

- **Consideration:** Allowing diagonal ships adds complexity to the game, which might be challenging for some students. Ensure they have a strong understanding of graphing lines and slopes before introducing this option.

Balancing Both Approaches

You can combine both approaches to provide a comprehensive assessment:

- **Use Different Bombs:** Implement the ghost bomb concept to test understanding of strict inequalities.
- **Optional Diagonal Ships:** Allow diagonal ships as an advanced option for students who

are comfortable with graphing lines and slopes.

Example Instructions for the Game

1. Graphing Inequalities:

- "Graph your inequality on the coordinate plane. Use a solid line for \leq or \geq and a dashed line for $<$ or $>$."

2. Placing Ships:

- "Place your ships within the solution set. You can place ships horizontally, vertically, or diagonally along the boundary line if you choose."

3. Using Bombs:

- "Use standard bombs to test points within the solution set. Use ghost bombs to test points on the boundary line of strict inequalities."

4. Testing Points:

- "For each bomb, indicate whether the point is a hit or miss based on the inequality. Reflect on your strategy and explain your reasoning."

Example Rubric

Table

Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
Graphing Inequalities	Correctly graphs all inequalities with appropriate lines.	Minor errors in graphing or line types.	Several errors in graphing or line types.	Incorrectly graphs inequalities or uses wrong line types.
Ship Placement	Ships are logically placed within the solution set, including diagonal options.	Ships are mostly within the solution set with minor errors.	Some ships are outside the solution set.	Ships are not placed within the solution set.
Bomb Usage	Correctly uses standard and ghost bombs with clear reasoning.	Minor errors in bomb usage or reasoning.	Several errors in bomb usage or reasoning.	Incorrectly uses bombs or provides no reasoning.
Explanation of Strategy	Provides clear and thorough	Good explanations	Basic explanations	Little to no explanation

Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
	explanations for all decisions.	with minor gaps.	with several gaps.	provided.

By incorporating these elements, you can create a more engaging and comprehensive assessment that effectively evaluates students' understanding of both strict and inclusive inequalities. If you need further assistance or more specific examples, feel free to ask!

You

Sent by you:

Would it be a better assessment to only drop ghost bombs so that kids can try to figure out the boundary line first? Each team has to figure out each other's boundary line, come up with an inequality. The game could be expanded when it's a system of inequalities?

Copilot

Sent by Copilot:

Using only ghost bombs to figure out the boundary line first is an innovative approach that can deepen students' understanding of inequalities. Here's how this modified assessment could work and its potential benefits:

Modified Assessment Plan

1. Objective:

- Students will determine the boundary lines of inequalities by using ghost bombs to test points and then formulate the corresponding inequalities.

2. Game Setup:

- Each team creates a hidden inequality and graphs it on their coordinate plane, using a dashed line for strict inequalities.
- Teams place their ships within the solution set of their inequality.

3. Gameplay:

- Teams take turns dropping ghost bombs on specific points to determine if those points lie on the boundary line of the opponent's inequality.
- After several ghost bomb attempts, teams use the information gathered to hypothesize the boundary line and formulate the inequality.

4. Expansion to Systems of Inequalities:

- Once students are comfortable with single inequalities, introduce systems of inequalities.
- Teams create and graph systems of inequalities, placing ships within the overlapping solution set.
- The gameplay remains the same, but students now need to determine multiple boundary lines and the region of overlap.

Benefits of This Approach

1. Deepened Understanding:

- **Boundary Identification:** Students focus on identifying boundary lines, reinforcing their understanding of how inequalities are represented graphically.
- **Formulating Inequalities:** By hypothesizing and formulating inequalities, students practice converting graphical information into algebraic expressions.

2. Critical Thinking and Problem-Solving:

- **Strategic Thinking:** Students must strategically choose points to test with ghost bombs, enhancing their critical thinking and problem-solving skills.
- **Hypothesis Testing:** Formulating and testing hypotheses about the boundary lines encourages scientific thinking and reasoning.

3. Engagement and Collaboration:

- **Teamwork:** Working in teams to figure out each other's inequalities fosters collaboration and communication.
- **Interactive Learning:** The game format keeps students engaged and motivated to learn.

4. Scaffolding Complexity:

- **Single to Systems:** Starting with single inequalities and expanding to systems of inequalities provides a scaffolded learning experience, gradually increasing complexity.

Implementation Tips

1. Clear Instructions:

- Provide detailed instructions on how to use ghost bombs and how to record the results of each test point.
- Example: "Drop a ghost bomb at point (2, 3). If the point lies on the boundary line, mark it as a potential boundary point."

2. Reflection and Explanation:

- Include reflection questions where students explain their reasoning for choosing test points and formulating inequalities.

- Example: "Explain why you think the boundary line is ($y = 2x + 3$). What points did you test to come to this conclusion?"

3. **Assessment Criteria:**

- Develop a rubric that assesses students on their ability to identify boundary lines, formulate inequalities, and explain their reasoning.
- Example Rubric:

Table

Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
Boundary Identification	Accurately identifies boundary lines using ghost bombs.	Minor errors in identifying boundary lines.	Several errors in identifying boundary lines.	Incorrectly identifies boundary lines.
Formulating Inequalities	Correctly formulates inequalities based on boundary lines.	Minor errors in formulating inequalities.	Several errors in formulating inequalities.	Incorrectly formulates inequalities.
Explanation of Reasoning	Provides clear and thorough explanations for all decisions.	Good explanations with minor gaps.	Basic explanations with several gaps.	Little to no explanation provided.

By focusing on boundary lines first and using ghost bombs, you can create a more engaging and educational assessment that helps students develop a deeper understanding of inequalities. If you need further assistance or more specific examples, feel free to ask!

You

Sent by you:

so can you show me an example of the set of instructions that I would give them?

Copilot

Sent by Copilot:

Certainly! Here's an example of a set of instructions for your students to follow during the battleship game using ghost bombs to determine boundary lines and formulate inequalities:

Battleship Game Instructions: Identifying Boundary Lines with Ghost Bombs

Objective:

Determine the boundary lines of inequalities by using ghost bombs to test points and then formulate the corresponding inequalities.

Materials Needed:

- Graph paper
- Pencils
- Rulers
- Colored pencils or markers
- Ghost bomb markers (could be small stickers or different colored pens)

Game Setup:

1. Create Your Inequality:

- Each team secretly creates an inequality and graphs it on their coordinate plane using a dashed line for strict inequalities ($<$, $>$).
- Place your ships within the solution set of your inequality. Ships can be placed horizontally, vertically, or diagonally.

2. Prepare Your Graph:

- Draw a coordinate plane on your graph paper.
- Label the x-axis and y-axis with appropriate scales.

Gameplay:

1. Taking Turns:

- Teams take turns dropping ghost bombs on specific points to determine if those points lie on the boundary line of the opponent's inequality.
- Record the coordinates of each ghost bomb dropped.

2. Testing Points:

- Drop a ghost bomb at a chosen point (e.g., $(2, 3)$).
- The opposing team will check if this point lies on the boundary line of their inequality.

- If the point is on the boundary line, mark it as a potential boundary point. If not, mark it as outside the boundary.

3. Formulating the Inequality:

- After several ghost bomb attempts, use the information gathered to hypothesize the boundary line.
- Formulate the inequality based on the boundary points identified.

4. Verifying the Inequality:

- Once you think you have identified the boundary line, write down the inequality.
- Test additional points to verify if your inequality correctly represents the boundary line.

Example Turn:

1. Drop a Ghost Bomb:

- Team A drops a ghost bomb at (2, 3).
- Team B checks if (2, 3) lies on their boundary line.

2. Mark the Point:

- If (2, 3) is on the boundary line, Team B confirms it, and Team A marks it as a boundary point.
- If (2, 3) is not on the boundary line, Team B says "miss," and Team A marks it as outside the boundary.

3. Hypothesize the Boundary Line:

- After several turns, Team A hypothesizes that the boundary line is ($y = 2x + 3$).

4. Formulate the Inequality:

- Team A writes the inequality ($y > 2x + 3$) if they believe the boundary is a strict inequality.

5. Verify the Inequality:

- Team A tests additional points to ensure their inequality is correct.

Reflection:

- After the game, each team will reflect on their strategy and explain their reasoning for the points tested and the inequality formulated.
- Answer the following questions:
 1. Why did you choose the points you tested with ghost bombs?
 2. How did you determine the boundary line?
 3. What challenges did you face in formulating the inequality?
 4. How did you verify your inequality?

Expansion to Systems of Inequalities:

- Once you are comfortable with single inequalities, you can expand the game to systems of inequalities.
 - Create and graph systems of inequalities, placing ships within the overlapping solution set.
 - Use ghost bombs to determine the boundary lines of each inequality in the system.
-

By following these instructions, students will engage in a hands-on activity that reinforces their understanding of inequalities and boundary lines. If you need further adjustments or additional details, feel free to ask!

You

Sent by you:

how would they know if it's an open boundary or closed boundary when dropping the bombs?

Copilot

Sent by Copilot:

To help students determine whether a boundary is open or closed when dropping ghost bombs, you can incorporate specific instructions and clues into the game. Here's how you can guide them through this process:

Instructions for Determining Open or Closed Boundaries

1. Initial Setup:

- Each team secretly decides whether their inequality is strict ($<$, $>$) or inclusive (\leq , \geq) and graphs it accordingly with a dashed or solid line.
- Teams place their ships within the solution set of their inequality.

2. Dropping Ghost Bombs:

- When a team drops a ghost bomb on a point, the opposing team must indicate whether the point lies on the boundary line.
- If the point is on the boundary, the opposing team will also indicate whether the boundary is open or closed.

Example Turn:

1. Drop a Ghost Bomb:

- Team A drops a ghost bomb at point (2, 3).
- Team B checks if (2, 3) lies on their boundary line.

2. Indicate Boundary Status:

- If (2, 3) is on the boundary line, Team B confirms it and indicates whether the boundary is open or closed.
- Example Response: "Point (2, 3) is on the boundary line, and the boundary is open."

3. Mark the Point:

- Team A marks the point as a boundary point and notes whether it is part of an open or closed boundary.

Reflection and Explanation:

- After several turns, teams use the information gathered to hypothesize the boundary line and formulate the inequality.
- Include reflection questions where students explain their reasoning for determining whether the boundary is open or closed.

Example Reflection Questions:

1. Boundary Identification:

- "How did you determine whether the boundary line was open or closed based on the points tested with ghost bombs?"
- "What clues did you use to decide if the boundary was open or closed?"

2. Formulating Inequalities:

- "Explain why you chose a strict inequality ($<$, $>$) or an inclusive inequality (\leq , \geq) for your boundary line."
- "How did the information about open or closed boundaries help you formulate the correct inequality?"

Example Rubric for Boundary Determination:

Table

Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
Boundary Identification	Accurately identifies whether	Minor errors in identifying boundary status.	Several errors in identifying boundary status.	Incorrectly identifies boundary status.

Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
	boundaries are open or closed.			
Formulating Inequalities	Correctly formulates inequalities based on boundary status.	Minor errors in formulating inequalities.	Several errors in formulating inequalities.	Incorrectly formulates inequalities.
Explanation of Reasoning	Provides clear and thorough explanations for all decisions.	Good explanations with minor gaps.	Basic explanations with several gaps.	Little to no explanation provided.

By incorporating these steps and instructions, students will be able to determine whether boundaries are open or closed when dropping ghost bombs, enhancing their understanding of inequalities. If you need further adjustments or additional details, feel free to ask!

You

Sent by you:

Ideally, they only need 2 points of the inequality boundary line to figure out the equation with slope formula?

Copilot

Sent by Copilot:

Yes, you're correct! To determine the equation of the boundary line for an inequality, students only need two points on the line. They can use these points to calculate the slope and then use the slope-intercept form to write the equation of the line. Here's how you can incorporate this into your battleship game instructions:

Instructions for Using Two Points to Determine the Boundary Line

Objective:

Determine the boundary lines of inequalities by using ghost bombs to test points, calculate the slope, and formulate the corresponding inequalities.

Materials Needed:

- Graph paper
- Pencils
- Rulers
- Colored pencils or markers
- Ghost bomb markers (could be small stickers or different colored pens)

Game Setup:

1. Create Your Inequality:

- Each team secretly creates an inequality and graphs it on their coordinate plane using a dashed line for strict inequalities ($<$, $>$).
- Place your ships within the solution set of your inequality. Ships can be placed horizontally, vertically, or diagonally.

2. Prepare Your Graph:

- Draw a coordinate plane on your graph paper.
- Label the x-axis and y-axis with appropriate scales.

Gameplay:

1. Taking Turns:

- Teams take turns dropping ghost bombs on specific points to determine if those points lie on the boundary line of the opponent's inequality.
- Record the coordinates of each ghost bomb dropped.

2. Testing Points:

- Drop a ghost bomb at a chosen point (e.g., (2, 3)).
- The opposing team will check if this point lies on the boundary line of their inequality.
- If the point is on the boundary line, the opposing team confirms it and indicates whether the boundary is open or closed.

3. Identifying Two Points:

- After identifying two points on the boundary line, use these points to calculate the slope.
- Example: Points (2, 3) and (4, 7) are on the boundary line.

4. Calculating the Slope:

- Use the slope formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$
- Example: For points (2, 3) and (4, 7), the slope (m) is $m = \frac{7 - 3}{4 - 2} = \frac{4}{2} = 2$

5. Formulating the Equation:

- Use the slope and one of the points to write the equation in slope-intercept form ($y = mx + b$).
- Example: Using point (2, 3) and slope ($m = 2$):
 - Substitute into ($y = mx + b$): ($3 = 2(2) + b$)
 - Solve for (b): ($3 = 4 + b \rightarrow b = -1$)
 - The equation is ($y = 2x - 1$)

6. Formulating the Inequality:

- Based on the boundary type (open or closed), write the inequality.
- Example: If the boundary is open and above the line, the inequality is ($y > 2x - 1$).

7. Verifying the Inequality:

- Test additional points to ensure the inequality correctly represents the boundary line.

Reflection:

- After the game, each team will reflect on their strategy and explain their reasoning for the points tested and the inequality formulated.
- Answer the following questions:
 1. Why did you choose the points you tested with ghost bombs?
 2. How did you determine the boundary line?
 3. What challenges did you face in formulating the inequality?
 4. How did you verify your inequality?

Example Rubric for Boundary Determination:

Table

Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
Boundary Identification	Accurately identifies boundary points using ghost bombs.	Minor errors in identifying boundary points.	Several errors in identifying boundary points.	Incorrectly identifies boundary points.
Slope Calculation	Correctly calculates the slope using two points.	Minor errors in slope calculation.	Several errors in slope calculation.	Incorrectly calculates the slope.

Criteria	Excellent (4)	Good (3)	Satisfactory (2)	Needs Improvement (1)
Formulating Equations	Correctly formulates the equation of the boundary line.	Minor errors in formulating the equation.	Several errors in formulating the equation.	Incorrectly formulates the equation.
Formulating Inequalities	Correctly formulates inequalities based on boundary status.	Minor errors in formulating inequalities.	Several errors in formulating inequalities.	Incorrectly formulates inequalities.
Explanation of Reasoning	Provides clear and thorough explanations for all decisions.	Good explanations with minor gaps.	Basic explanations with several gaps.	Little to no explanation provided.

By following these instructions, students will be able to determine the boundary lines of inequalities using two points, calculate the slope, and formulate the corresponding inequalities. This approach reinforces their understanding of graphing and solving inequalities in a practical and engaging way. If you need further adjustments or additional details, feel free to ask!

Revised Objectives with Critical Analysis

Grade level

8th Grade | Algebra I

Learning Objective:

The learner will evaluate the solution set of linear inequalities two variables on the coordinate plane as demonstrated by a game of battleship.

Instructions and materials

You will engage in a battleship game to apply your understanding of a half-plane as the set of solutions to an inequality with two variables. Form teams of two. Each team will create an inequality that can be graphed on a coordinate plane, with the option of having an open or closed boundary. The team will determine a half-plane that represents the solution set for their inequality.

The opposing team will begin by guessing the location of the boundary line. For instance, if they ask whether the point $(2,3)$ lies on the boundary line, your team must respond truthfully with a "yes" or "no." If it does, be sure to inform them whether it's a closed or open boundary.

Once two ghost bombs have hit the boundary line, your team will formulate the equation that models this boundary. The objective then shifts to hitting the ships located in the half-plane that represents the solution set. The game concludes when one team has successfully sunk all the ships of the opposing team.

3.2 Critical Analysis

- The recommendations seemed to be unbiased. I tried to ask objective questions about the material.
- When I asked if removing the assessment of the boundary line as open or closed was based on my subjective feeling that students would not gain much but as the Copilot mentioned, there was much to lose.
- To ensure that my assessment met the stated purpose and format, I looked at the three PBL's and tried to match them to one of them.