

Inequalities on the Number Line

CLASS CODE

30-45 minutes | Introduction

In this activity, students explore linear inequalities and make connections among multiple representations (including algebraic expressions, verbal statements, number line graphs, and solution sets).

RELATED ACTIVITIES

This is the first activity in a series of three. Here are links to the others:

2. Compound Inequalities on the Number Line

<https://teacher.desmos.com/activitybuilder/custom/57b7f808ce9904f705558c4e>

3. Absolute Value Inequalities on the Number Line

<https://teacher.desmos.com/activitybuilder/custom/57b8df55301844f605b76506>

This activity was inspired by Stefan Fritz.

French translation courtesy of Jocelyn Dagenais:

<https://teacher.desmos.com/activitybuilder/custom/58f6b4bc0a9e8b0e9df3a232>

Activity Checklist

- Complete the activity using student preview.
- Identify your learning targets for the activity.
- Determine the screens where you'll bring the class together using Teacher Pacing and Pause Class. What will you discuss on those screens?
- Anticipate screens where students will struggle, then plan your response.
- Plan a challenge for students who finish the activity quickly and successfully.
- Make yourself available during the activity to students for individual help and questions when appropriate.
- Write out your summary of the activity's main ideas. How will you pull student work into that summary? Which parts of the activity can you skip to ensure that summary receives sufficient time?

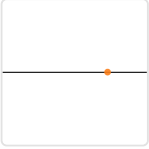
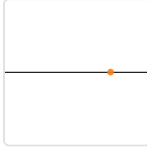





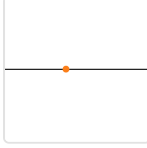










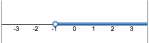




My Learning Targets:

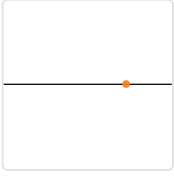
Activity Screens: Teacher Pacing and Pause Class

Use this page to plan your use of Teacher Pacing and Pause Class. Teacher Pacing lets you restrict students to a single screen or a range of screens. Pause Class keeps students from interacting with whatever screens they are currently viewing. Use these two tools to create conversations in your classroom.

Consider these questions as you plan:

- Which screen(s) should everyone work on at the same time? Why?
- Which screen(s) do you want to keep students from seeing until you're ready for the class to see them together? (Perhaps because they reveal answers or require a whole class conversation for introduction.)
- Are there any points in the lesson where you will want to make sure students aren't playing with the screens while you discuss something as a class?

<p>1 Plot a number.</p>  <p>Drag the orange point to a place on the number line indicating a number that</p>	<p>2 Plot another number.</p>  <p>Drag the orange point to ANOTHER place on the number line indicating a</p>	<p>3 Plot one more nu...</p>  <p>Drag the orange point to ONE MORE place on the number line</p>	<p>4 Predict #1</p>  <p>What would the graph look like if all</p> 
<p>5 Reveal #1</p>  <p>How does the actual graph compare to</p> 	<p>6 Plot three points.</p>  <p>Drag each orange point to a place on the number line indicating a number that</p>	<p>7 Predict #2</p>  <p>What would the graph look like if all</p> 	<p>8 Reveal #2</p>  <p>How does the actual graph compare to</p> 
<p>9 Challenge #3</p>  <p>Here are class results from another</p> 	<p>10 Challenge #4</p>  <p>Here are class results from another</p> 	<p>11 Sort the cards int...</p> 	<p>12 All the Numbers</p>  <p>Earlier, you and your classmates showed LOTS of numbers that are</p>
<p>13 Compare</p>  <p>Here are two number line diagrams.</p> 	<p>14 Open vs Closed</p>  <p>The open dot (above) means that -1 isn't included.</p> <p>The closed</p>	<p>15 Match each expr...</p> 	<p>16 Which One Does...</p> <p>Which one of these relationships seems different from the rest?</p> 

1 Plot a number.

Drag the orange point to a place on the number line indicating a number that is...

...less than 3.

Drag the orange point to a place on the number line indicating a number that is...

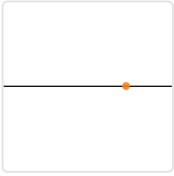
...less than 3.

Move to the next screen when you're done.

Teacher Tip:

Use "Responses" mode in the teacher dashboard to identify students who may need additional support, both here and on Screens 2-3.

My Notes:

2 Plot another number.

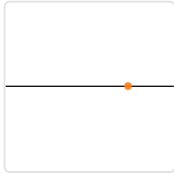
Drag the orange point to ANOTHER place on the number line indicating a number that is...

Drag the orange point to ANOTHER place on the number line indicating a number that is...

...less than 3.

Move to the next screen when you're done.

My Notes:

3 Plot one more number.

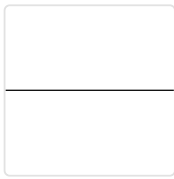
Drag the orange point to ONE MORE place on the number line indicating a number that is...

Drag the orange point to ONE MORE place on the number line indicating a number that is...

...less than 3.

(Place it where you think none of your classmates will.)

My Notes:

4 Predict #1

What would the graph look like if all of your



What would the graph look like if all of your classmates' points were shown along with yours?

Teacher Tip:

On Screen 4, students make a prediction. On Screen 5, they see how their prediction compares to the actual graph.

This cycle of "predict" and then "verify" (which also occurs on Screens 7-8) is a key point in the development of the activity.

Spend some time highlighting several student responses for the class. Start with informal math language and reasoning, then move to more formal responses.

Sample Answer: "I think there will be a bunch of points, all to the left of 3."

My Notes:

5 Reveal #1

How does the actual graph compare to

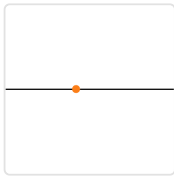


How does the actual graph compare to your prediction?

Teacher Tip:

Again, highlight several student responses for the class, this time to draw out the differences between their predictions (Screen 4) and what they actually saw (Screen 5).

My Notes:

6 Plot three points.

Drag each orange point to a place on the number line indicating a number that is...

Drag each orange point to a place on the number line indicating a number that is...

...greater than -1 .

(Place one where you think none of your classmates will.)


Teacher Tip:

Use "Responses" mode in the teacher dashboard to identify students who may need additional support.

My Notes:

7 Predict #2

What would the graph look like if all of your



What would the graph look like if all of your classmates' points were shown along with yours?

Teacher Tip:


Highlight several student responses for the class. Start with informal math language and reasoning, then move to more formal responses.

Sample Answer: "All the points should be to the right of -1 ."

My Notes:

8 Reveal #2

How does the actual graph compare to



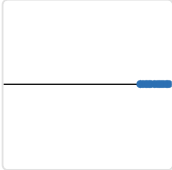
How does the actual graph compare to your prediction?

Teacher Tip:


Again, highlight several student responses for the class, this time to draw out the differences between their predictions (Screen 7) and what they actually saw (Screen 8).

My Notes:

9 Challenge #3



Here are class results from another



Here are class results from another challenge.

"Drag each point to a place on the number line indicating a number that is..."

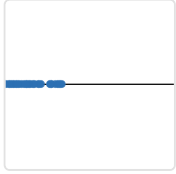
How would you finish those directions so a group of students would produce a graph similar to this one?

Teacher Tip:

Highlight unique answers for the class. Ask students to justify their responses and critique each others' reasoning.

Sample Answer: "Drag each point to a place on the number line indicating a number that is greater than 4."

My Notes:

10 Challenge #4

Here are class results from another



Here are class results from another challenge.

"Drag each point to a place on the number line indicating a number that is..."

How would you finish those directions so a group of students would produce a graph similar to this one?

Teacher Tip:

Highlight unique answers for the class. Ask students to justify their responses and critique each others' reasoning.

Sample Answer: "Drag each point to a place on the number line indicating a number that is less than -2 ."

My Notes:

11 Sort the cards into g...**Teacher Tip:**

Use the teacher dashboard to monitor student progress, and to look for common sorting strategies. The dashboard may also help you pair students together for conversations about how they sorted the cards.

Make sure you complete this card sort yourself, in the role of a student, to acquaint yourself with the cards, questions, and conceptions that may arise in class.

My Notes:

12 All the Numbers

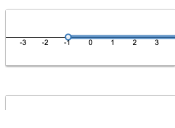
Earlier, you and your classmates showed LOTS of numbers that are greater than -1 .

Earlier, you and your classmates showed LOTS of numbers that are greater than -1 .

If you wanted to show ALL numbers greater than -1 , you would shade the number line like this.

Move on to the next screen.

My Notes:

13 Compare

Here are two number line diagrams.



Here are two number line diagrams.

How are they similar? How are they different?

Teacher Tip:

Sample Answer: The top graph has an empty/open circle. The bottom graph has a filled-in/closed circle.

My Notes:

14 Open vs Closed

The open dot (above) means that -1 isn't included.

The closed dot (below) means

The open dot (above) means that -1 isn't included.

The closed dot (below) means that it is.

Move to the next screen.

Teacher Tip:

Success on Screen 14 depends on students understanding this subtle-yet-meaningful distinction.

My Notes:

15 Match each expressi...**Teacher Tip:**

Use the teacher dashboard to monitor student progress, and to look for common sorting strategies. The dashboard may also help you pair students together for conversations about how they sorted the cards.

Make sure you complete this card sort yourself, in the role of a student, to acquaint yourself with the cards, questions, and conceptions that may arise in class.

My Notes:

16 Which One Doesn't ...

Which one of these relationships seems different from the rest?



Which one of these relationships seems different from the rest?

In other words, which one doesn't belong?

Teacher Tip:

Discuss this slide with the class. Encourage creativity and noticing new things. Challenge the class to find a reason for each expression not to belong.

Use the histogram view in the teacher dashboard to see a summary of student responses.

Sample Answers

- Top left ($x > -2$): The only one that includes zero and all positive numbers.
- Top right ($3 < x$): The only one that has the variable on the right.
- Bottom left ($x \leq 4$): The only one that includes its endpoint.
- Bottom right ($5 > 6$): The only one that is always false.

My Notes:

Summary Notes:
