Domain and Range Introduction

CLASS CODE

30-45 minutes | Introduction

In this activity, students practice finding the domain and range of piecewise functions. They begin with an informal exploration of domain and range using a graph, and build up to representing the domain and range of piecewise functions using inequalities.

This activity was adapted from Domain and Range Practice by Suzanne von Oy.
https://teacher.desmos.com/activitybuilder/custom/569eba68560ed8a709fd2c62

French translation courtesy of Litissia Abi Abdallah et Joce:
https://teacher.desmos.com/activitybuilder/custom/592eb20734fb5d060e8635eb

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?

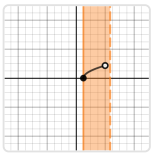
My Learning Targets:

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:

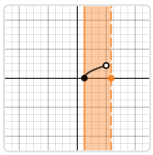
- Which screen(s) should everyone work on at the same time? Why?
- Which screen(s) do you want to keep students from seeing until you're ready for the class to see them together? (Perhaps because they reveal answers or require a whole class conversation for introduction.)
- Are there any points in the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

1 Exploring Domain



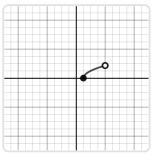
A mathematician says

2 Fix it.



Mathematician use this this type of shading to represent the domain of a

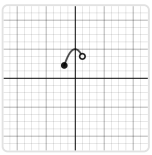
3 Write the inequality.



You haven't fixed the domain quite

f(x)

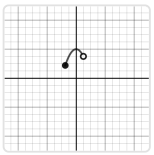
4 Write the inequality.



Fix the inequality below to

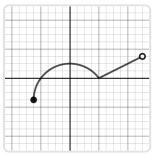
f(x)

5 Strict or Non-Strict?



Four possible answers for Screen 4 are

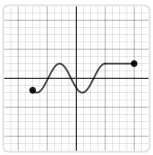
6 Domain Challenge…



What is the domain of the function?

f(x)

7 Domain Challenge…



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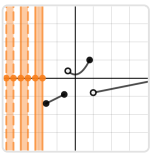
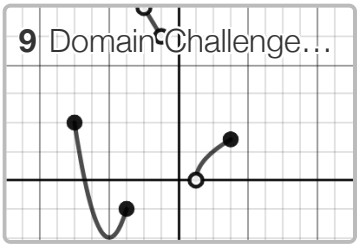
8 Domain Challenge…

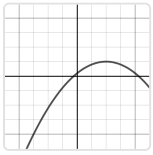


A piecewise function will have more than one piece for its domain.

9 Domain Challenge…



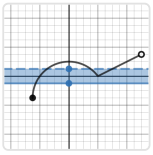
10 Exploring Range



Now we will identify the range of functions.

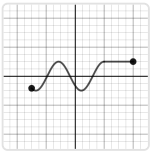
The range is

11 Range Challenge…



Drag the blue points to identify the range of the function.

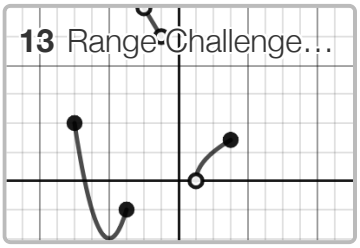
12 Range Challenge…



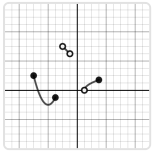
Fix the inequality below to

f(x)

13 Range Challenge…



14 Agree or disagree?

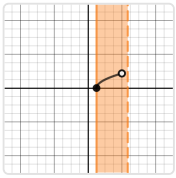


Zeke claims that the function to

15 Congratulations!

You've made it to the end of the activity. In a moment, your teacher will lead a

1 Exploring Domain



A mathematician says something

A mathematician says something is wrong with the shading on this graph.

What do you think it is?

Teacher Moves

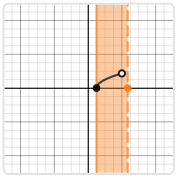
The purpose of this screen is to draw on student intuition or prior knowledge of the domain of a function.

Sample Responses

The shaded part of the graph extends too far to the right. It should stop at $x = 4$.

My Notes:

2 Fix it.



Mathematicians use this this type of shading to represent the domain of a function. To

Mathematicians use this this type of shading to represent the domain of a function. To exactly measure the domain of a function, we include all of the x-values that the graph crosses.

Drag the orange point to fix the shading for this graph.

Continue to the next screen when you are finished.

Teacher Moves

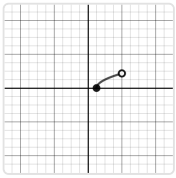
Use "Responses" mode in the teacher dashboard to identify students who may need additional support.

Sample Responses

The x-values go from 1 to 4. The x-value of 1 is also included in the domain.

My Notes:

3 Write the inequality.



You haven't fixed the domain quite

$f(x)$

You haven't fixed the domain quite yet. That's okay. It's hard to get the domain exactly right by moving points.

Mathematicians use inequalities to describe domain because they are more precise.

Here are the inequalities for the graph you created on screen 2. Fix the inequalities to correctly represent the domain of the function.

Teacher Moves

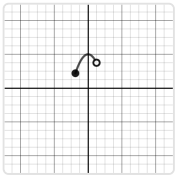
Use "Responses" mode in the teacher dashboard to identify students who may need additional support.

Sample Responses

$1 \leq x < 4$

My Notes:

4 Write the inequality.



Fix the inequality below to correctly

f(x)

Fix the inequality below to correctly show the domain of the function.

Teacher Moves

This is a great place to check student progress. Offer individual support where needed, or lead a brief whole-class discussion if enough students are struggling. At this point in the activity students may be challenged with strict vs non-strict inequalities. Screen 5 will give students a chance address possible misconceptions.

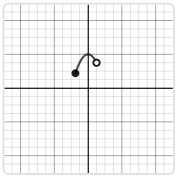
Technical note: to type an inequality like $\leq$, type $<$ then $=$.

Sample Responses

$-1.5 \leq x < 1$

My Notes:

5 Strict or Non-Strict?



Four possible answers for Screen 4 are

Four possible answers for Screen 4 are below.

Which best represents the domain shown to the left?

You can adjust the inequality on Screen 4 if this helps with your thinking.

Teacher Moves

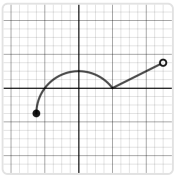
This is a great place to check student progress. Offer individual support where needed, or lead a brief whole-class discussion if enough students are struggling. Encourage students to go back to Screen 4 and explore the differences in each of the graphs listed on this screen so that they are aware of the difference between strict and non-strict inequalities.

Sample Responses

$-1.5 \leq x < 1$

My Notes:

6 Domain Challenge #1



What is the domain of the function?

f(x)

What is the domain of the function?

Enter your answer in the box below.

Be careful about $\leq$ vs. $<$ and $\geq$ vs. $>$

Teacher Moves

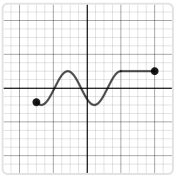
Use "Responses" mode in the teacher dashboard to identify students who may need additional support.

Sample Responses

$-5 \leq x < 10$

My Notes:

7 Domain Challenge #2



What is the domain of the function?

f(x)

What is the domain of the function?

Enter your answer in the box below.

Teacher Moves

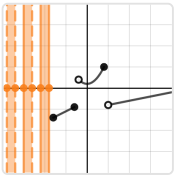
Use "Responses" mode in the teacher dashboard to identify students who may need additional support.

Sample Responses

$-6 \leq x \leq 8$

My Notes:

8 Domain Challenge #3



A piecewise function will have more than one piece for its domain.

Drag the points...

A piecewise function will have more than one piece for its domain.

Drag the points on the x-axis to adjust the domain for this function.

Continue to the next screen when you are finished.

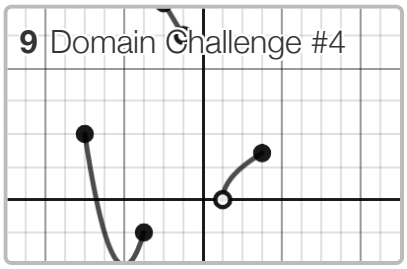
Teacher Moves

Highlight several student responses for the class. Discuss with students possible sources of error, which may include assuming that the function is bounded on the right where it touches the edge of the screen, using solid boundary lines for strict inequalities, or using dashed boundary lines for non-strict inequalities.

Sample Responses

$-8 \leq x \leq -3\,,\ -2 < x \leq 4\,,\ x > 5$

My Notes:



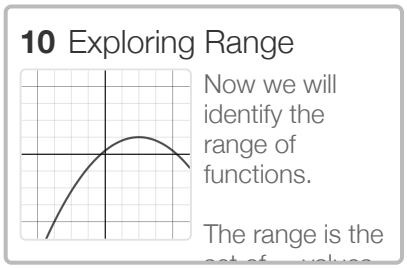
Teacher Moves

This is a great place to check student progress. Offer individual support where needed, or lead a brief whole-class discussion if enough students are struggling.

Sample Responses

$-6 \leq x \leq -3$, $-2 < x < -1$, $1 < x \leq 3$

My Notes:



Now we will identify the range of functions.

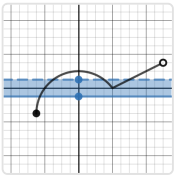
The range is the set of y-values we get after substituting all the possible x-values into a function.

Notice that the range of this function is $y \leq 1$, not $y < 1$.

Even though there is not a closed dot placed at $(2,1)$, EVERY point along the curve is a closed dot unless you actually see an open dot.

My Notes:

11 Range Challenge #1



Drag the blue points to identify the range of the function.

Continue to the next screen when you are finished.

Drag the blue points to identify the range of the function.

Continue to the next screen when you are finished.

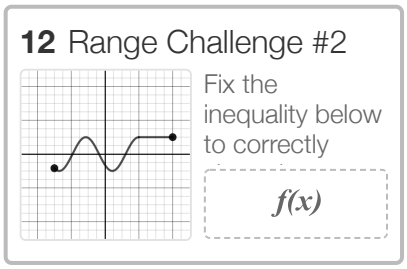
Teacher Moves

Use "Responses" mode in the teacher dashboard to identify students who may need additional support. Discuss with students possible sources of error, which may include assuming that the function is bounded on the right where it touches the edge of the screen, using solid boundary lines for strict inequalities, or using dashed boundary lines for non-strict inequalities.

Sample Responses

$-3 \leq y < 3$

My Notes:



Fix the inequality below to correctly show the range of the function.

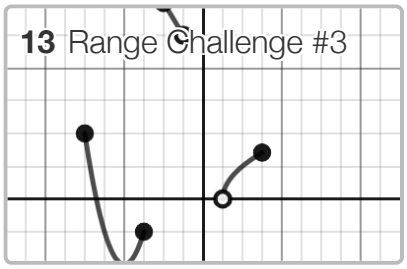
Teacher Moves

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

Sample Responses

$-2 \leq y \leq 2$

My Notes:



Teacher Moves

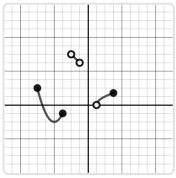
Use "Responses" mode in the teacher dashboard to identify students who may need additional support. Some students will include a separate inequality for $0 < y \leq 1.5$. Screen 14 offers an opportunity to confront this challenge.

Sample Responses

$-2 \leq y \leq 2,\ 5 < y < 6$

My Notes:

14 Agree or disagree?



Zeke claims that the function to the left should

Zeke claims that the function to the left should have three shaded regions for its range because it is a three-piece piecewise function.

Is Zeke correct?

Teacher Moves

Though three separate shadings are needed to represent the domain of this function, only two separate shadings are needed to represent the range. Discuss with students this possible source of error, which includes writing a separate inequality for $0 < y \leq 1.5$.

Sample Responses

The inequalities that make up the range of this function are $-2 \leq y \leq 2$ and $5 < y < 6$.

My Notes:

15 Congratulations!

You've made it to the end of the activity. In a moment, your teacher will lead a brief class discussion

You've made it to the end of the activity. In a moment, your teacher will lead a brief class discussion about the key mathematical ideas from this activity.

Teacher Moves

Possible points for discussion include:

- When do we need to include more than one inequality to describe the domain or range of a function?
- When is it important to use a strict inequality vs a non-strict inequality?
- What is the difference between how we write the domain of an inequality vs how we write the range of an inequality?
- How can we write the domain and range for a function that is not piece-wise such as $y = x$?

My Notes:

Summary Notes: