Put the Point on the Line

CLASS CODE

30-45 minutes | Development

This activity's focus is slope. The goal is to sharpen students' focus on slope. In particular, the activity asks students to estimate first, then to calculate, then to notice proportionality as they place points on an imaginary line.

Use student ideas here to define slope as a ratio of change in y-coordinates to change in x-coordinates. By the time students get to the end of the activity, they should have a number of ways of talking about this, but it's unlikely they'll write a fraction with Δy in the numerator and Δx in the denominator. They'll be ready for you to introduce this idea.

French translation courtesy of Maryse LeBouthillier:
https://teacher.desmos.com/activitybuilder/custom/58ebdaab6f8f4e0c724c9167

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 Introduction

On each of the next three screens, you'll see two blue

2 Challenge #1: Pu…

Put the black point on an imaginary line through the

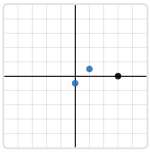
3 Challenge #2: Pu…

Put the black point on an imaginary line through the

4 How can we do b…

What would make putting the point directly on the line easier? How could

5 Challenge #3: Pu…



Put the black point on an imaginary line through the

6 Here's how you …

Your error for each challenge is

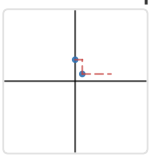
7 Here's how your …

Each point represents one

8 Strategy

Is it easier to be accurate when there is a grid, or when there is not a grid?

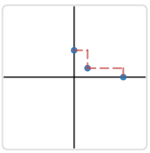
9 Make it precise.



Use the values of a, b, and c

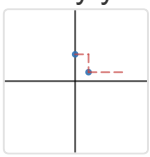
$f(x)$

10 Challenge a Cla…



Move the three blue points so that a single line CAN'T go through

11 Try your classm…



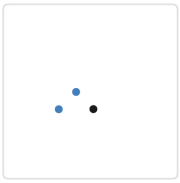
Swap devices with a classmate.

$f(x)$

12 Summarize

Is the black point exactly on the line

1 Introduction



On each of the next three screens, you'll see two blue points and a black one.

On each of the next three screens, you'll see two blue points and a black one.

Imagine a line going through the blue points. Your task will be to put the black point on that line.

Don’t spend too much time on any one screen. Move along, and trust your instincts to place the black dot where it seems to go.

My Notes:

2 Challenge #1: Put th…

Put the black point on an imaginary line through the blue points.

Put the black point on an imaginary line through the blue points.

Teacher Tip:

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

My Notes:

3 Challenge #2: Put th…

Put the black point on an imaginary line through the blue points.

Put the black point on an imaginary line through the blue points.

Teacher Tip:

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

My Notes:

4 How can we do better?

What would make putting the point directly on the line easier? How could you be more accurate?

What would make putting the point directly on the line easier? How could you be more accurate?

(Without actually seeing the line, that is!)

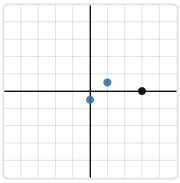
Teacher Tip:

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

Sample Answer: A coordinate grid would help because then we could know exactly where each point it.

My Notes:

5 Challenge #3: Put th…



Put the black point on an imaginary line through the blue points.

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My Notes:

6 Here's how you did.

Your error for each challenge is how many units your

Your error for each challenge is how many units your point is above or below the actual line through the given points.

In challenges 1 and 2, your average error was 3.

In challenge 3, your error was 2.

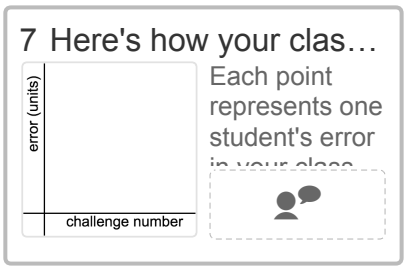
Why do you think your error was less in challenge 3?

Teacher Tip:

Be prepared to help students interpret this bar graph. It shows the ABSOLUTE VALUE of each point from the line, not a signed distance. This means that points above their respective lines do not cancel out points below their lines (which some students may expect).

Sample Answer: My error was less in challenge 3 because I counted the spaces the line would go up and over instead of just eyeballing where to put the black point.

My Notes:



Each point represents one student's error in your class.

In general, did your class do better or worse on challenge 3 than on challenge 1?

Explain.

Teacher Tip:

This is a good place to stop to discuss the graph. Importantly, if there are multiple points with the same value you cannot see this—they just appear as a single point. For example, you may have many students with zero error on screen 6, but it will just look like one student.

Sample Answer: It wasn't just me! The class did better when there was a grid. I can see this because the points are lower down on the graph.

My Notes:

8 Strategy

Is it easier to be accurate when there is a grid, or when there is not a grid? Explain.

Is it easier to be accurate when there is a grid, or when there is not a grid? Explain.

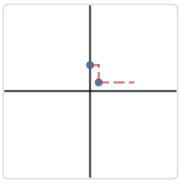
Teacher Tip:

By this point, your students ought to have noticed the power of the grid. Asking the question here ensures everyone has the opportunity to move beyond eyeballing the black point's location. This is also an opportunity to discuss strategy for using the grid to precisely place the black point.

Sample Answer: It is easier to be accurate with a grid—just count the number of spaces over and up, between the two blue points, then scale that up to account for the spaces over that the black point is.

My Notes:

9 Make it precise.



Use the values of a, b, and c below to

$f(x)$

Use the values of a, b, and c below to calculate the value of d that will put the black point precisely on a line through the blue points.

Then watch and check your answer.

Teacher Tip:

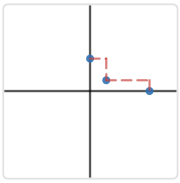
Discuss with students how they made their calculations. For example, students may say they paid attention to the value of c in comparison to the value of a.

Listen for opportunities to discuss the relationship between d and the y-coordinate of the black point; some students may confuse the two.

Sample Answer: $d = -8$ The horizontal segment is four times as long as the other horizontal segment, so I made the vertical segment four times as long also.

My Notes:

10 Challenge a Classm…



Move the three blue points so that a single line CAN'T go through all three of them.

Move the three blue points so that a single line CAN'T go through all three of them.

Then continue to the next screen for instructions on challenging a classmate.

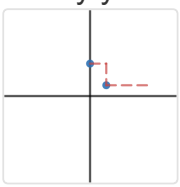
Teacher Tip:

Help students who are creating challenges find others who are ready to swap. Point out particularly challenging scenarios to students and ask them to state their strategies. Use this opportunity to focus students' attention on the ratio of vertical change to horizontal change.

For simplicity, you may wish to have students switch seats rather than move devices around.

My Notes:

11 Try your classmate'…



Swap devices with a classmate.

$f(x)$

Swap devices with a classmate.

Each of you will try to calculate d so that a single line CAN go through all three points in the other person's challenge.

Teacher Tip:

Point out particularly challenging scenarios to students and ask them to state their strategies. Use this opportunity to focus students' attention on the ratio of vertical change to horizontal change.

My Notes:

12 Summarize

Is the black point exactly on the line through the

Is the black point exactly on the line through the two blue points? How can you be sure?

Use the sketch tools to illustrate your thinking, then press "Submit" to check your work.

Teacher Tip:

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

Sample Answers:

• I used the line tool, and it went right through the point.
• The black point is on the line because the two blue points have are 2 units apart on the x-axis and 4.5 units apart on the y-axis. Those numbers are doubled to get the x and y distances between the second blue point and the black point.

My Notes:

Summary Notes: