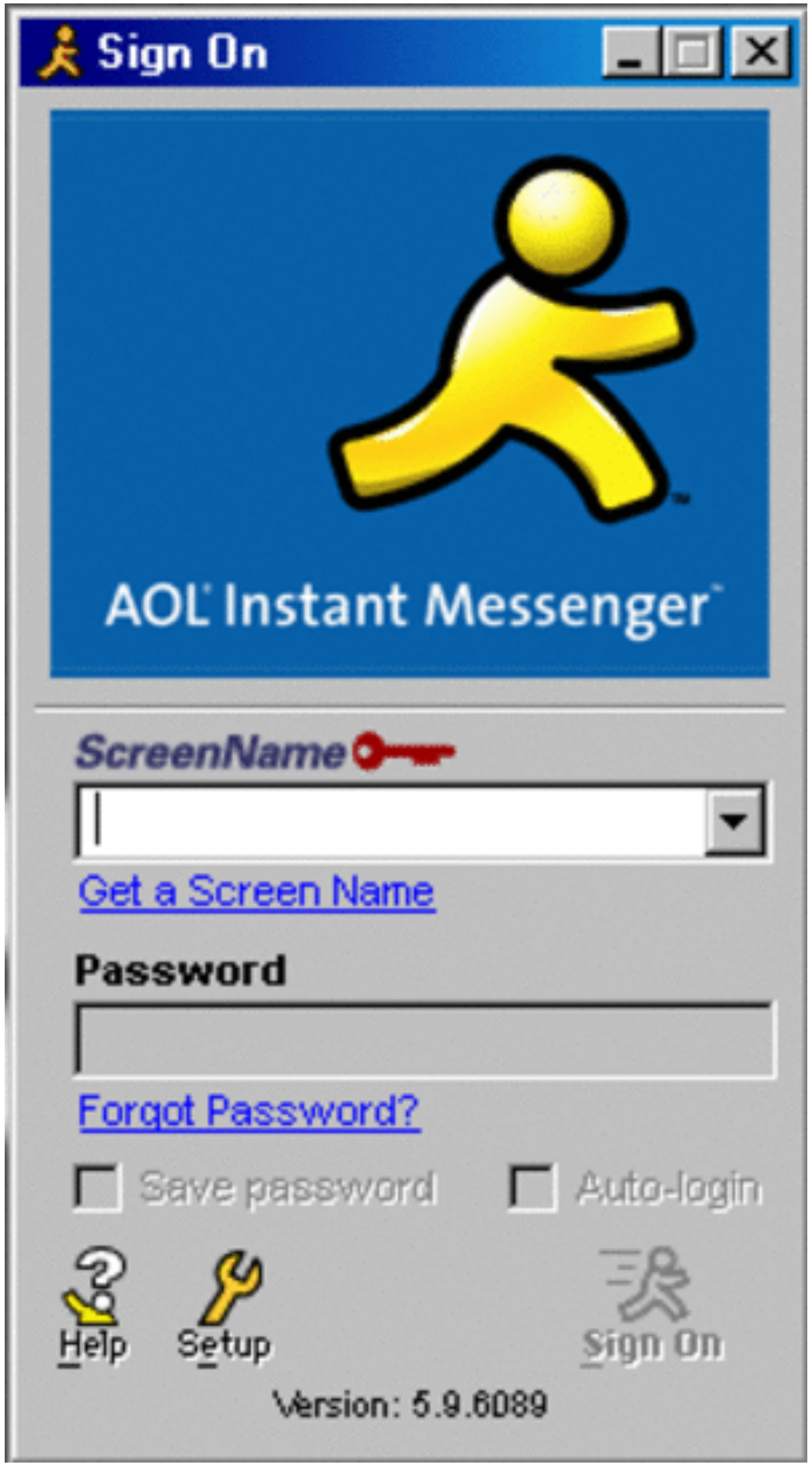
Principles for Building and Using Effective Digital Tasks

Michael Fenton

@mjfenton


Sign On
AOL Instant Messenger
ScreenName
Get a Screen Name
Password
Forgot Password?
☐ Save password
☐ Auto-login
Help
Setup
Sign On
Version: 5.9.6089

@mjfenton

Source: Babycakes Romero

Source: edweek.org

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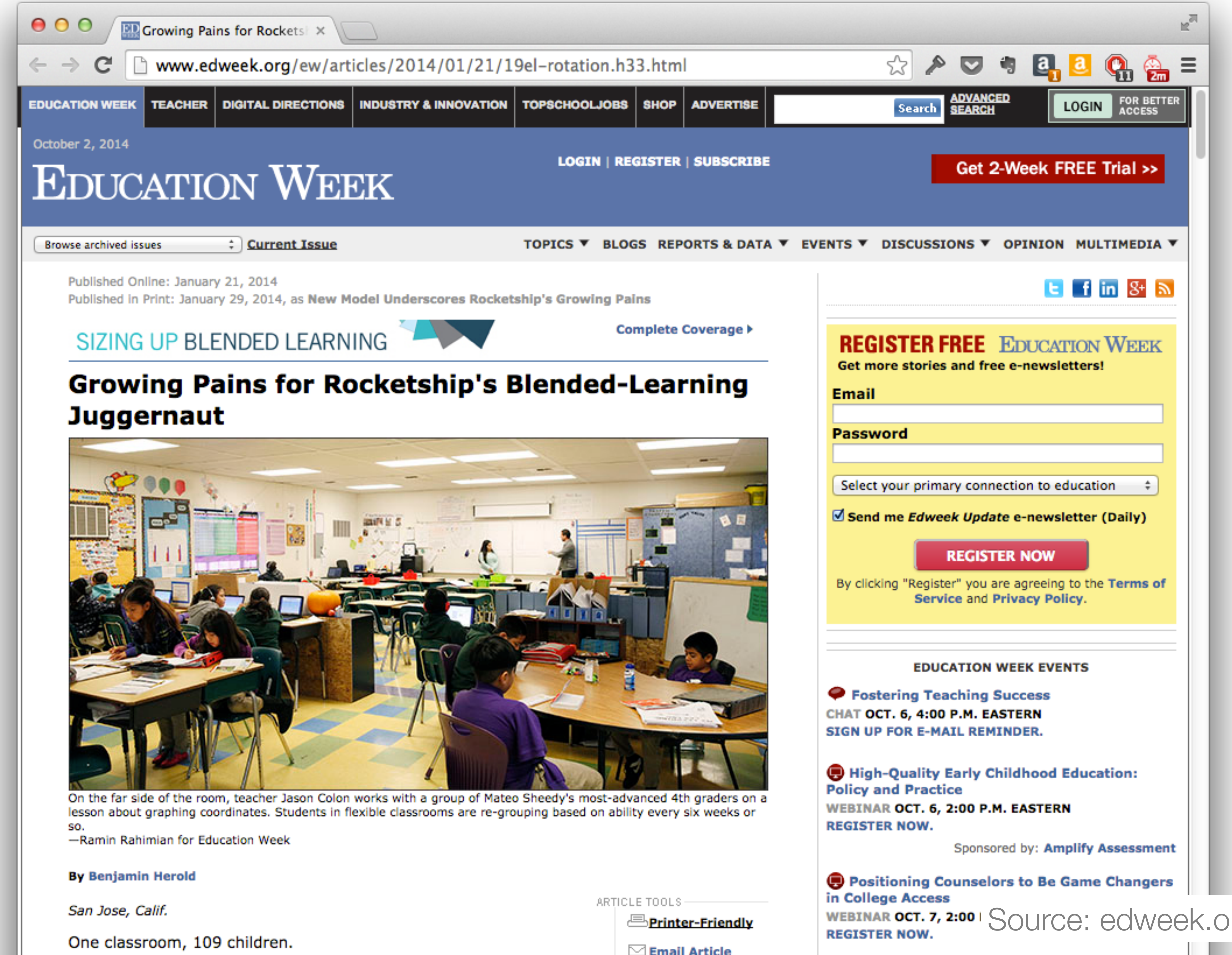

October 2, 2014

EDUCATION WEEK

Published Online: January 21, 2014
Published in Print: January 29, 2014, as **New Model Underscores Rocketship's Growing Pains**

SIZING UP BLENDED LEARNING

Growing Pains for Rocketship's Blended-Learning Juggernaut

On the far side of the room, teacher Jason Colon works with a group of Mateo Sheedy's most-advanced 4th graders on a lesson about graphing coordinates. Students in flexible classrooms are re-grouping based on ability every six weeks or so.
—Ramin Rahimian for Education Week

By **Benjamin Herold**

San Jose, Calif.

One classroom, 109 children.

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EDUCATION WEEK EVENTS

Fostering Teaching Success
CHAT **OCT. 6, 4:00 P.M. EASTERN**
SIGN UP FOR E-MAIL REMINDER.

High-Quality Early Childhood Education: Policy and Practice
WEBINAR **OCT. 6, 2:00 P.M. EASTERN**
REGISTER NOW.
Sponsored by: **Amplify Assessment**

Positioning Counselors to Be Game Changers in College Access
WEBINAR **OCT. 7, 2:00**
REGISTER NOW.

Source: edweek.org

“One classroom,

109 children.”

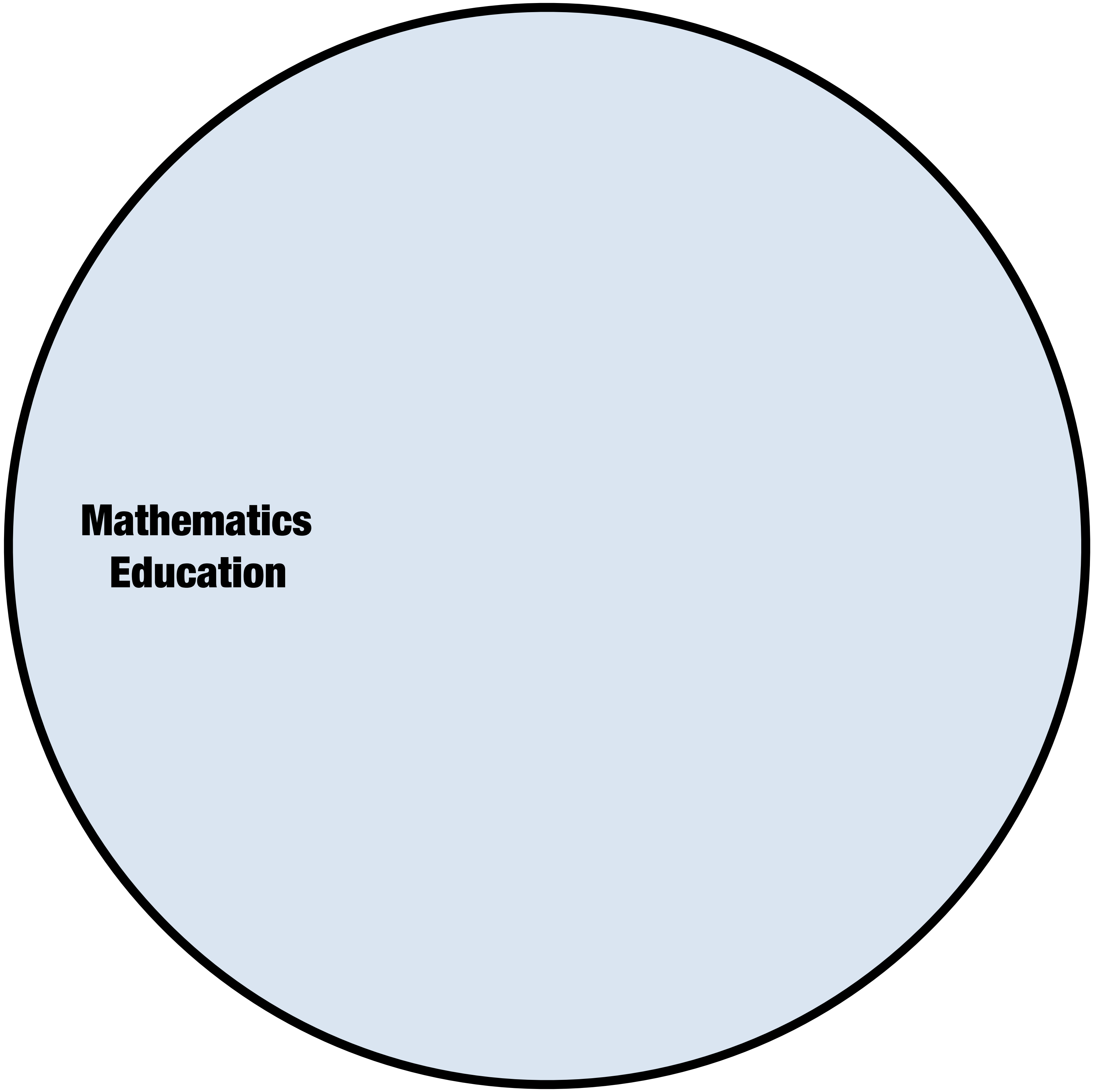
Source: edweek.org *(January 21, 2014)*

Let’s build
something better.

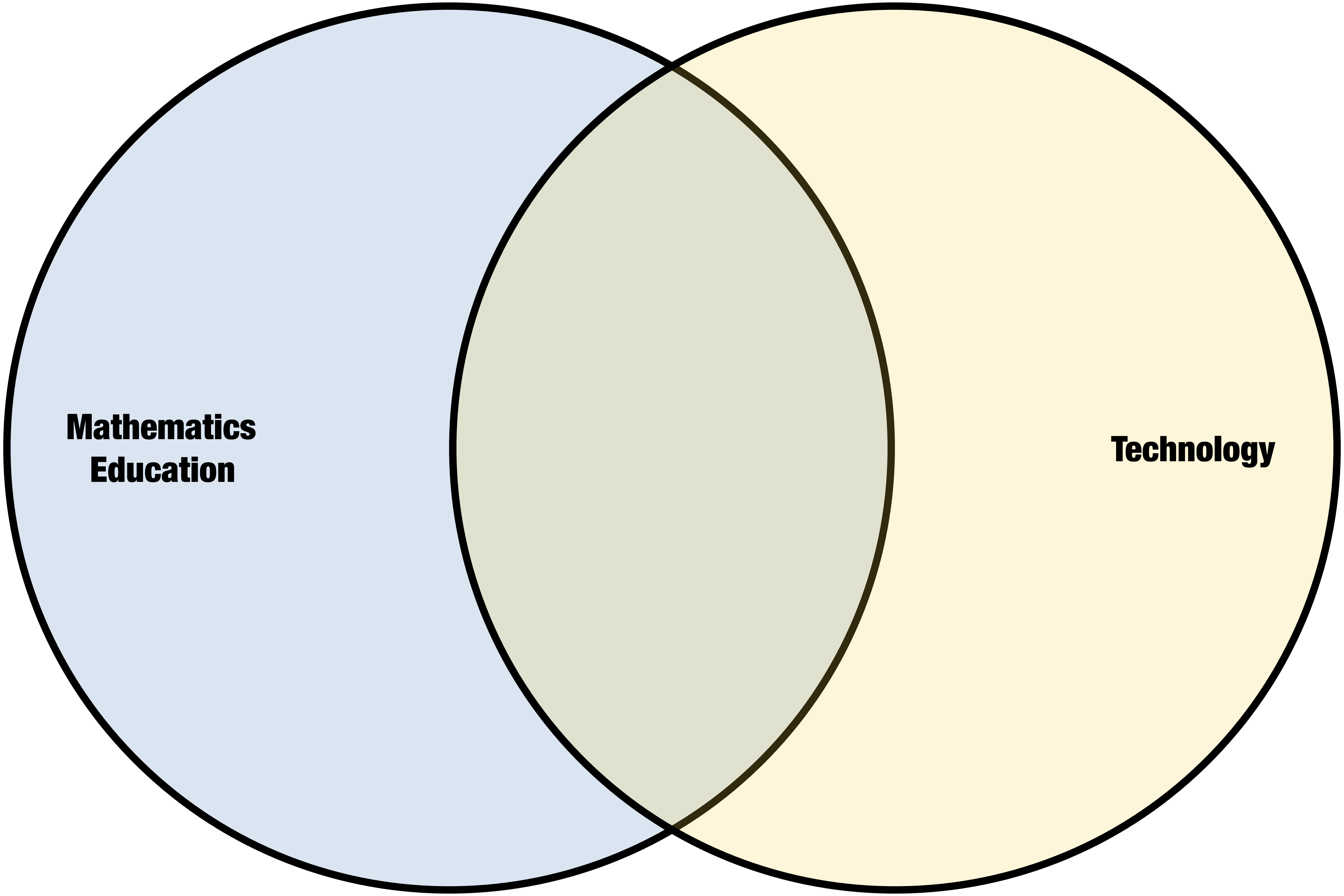
Principles for

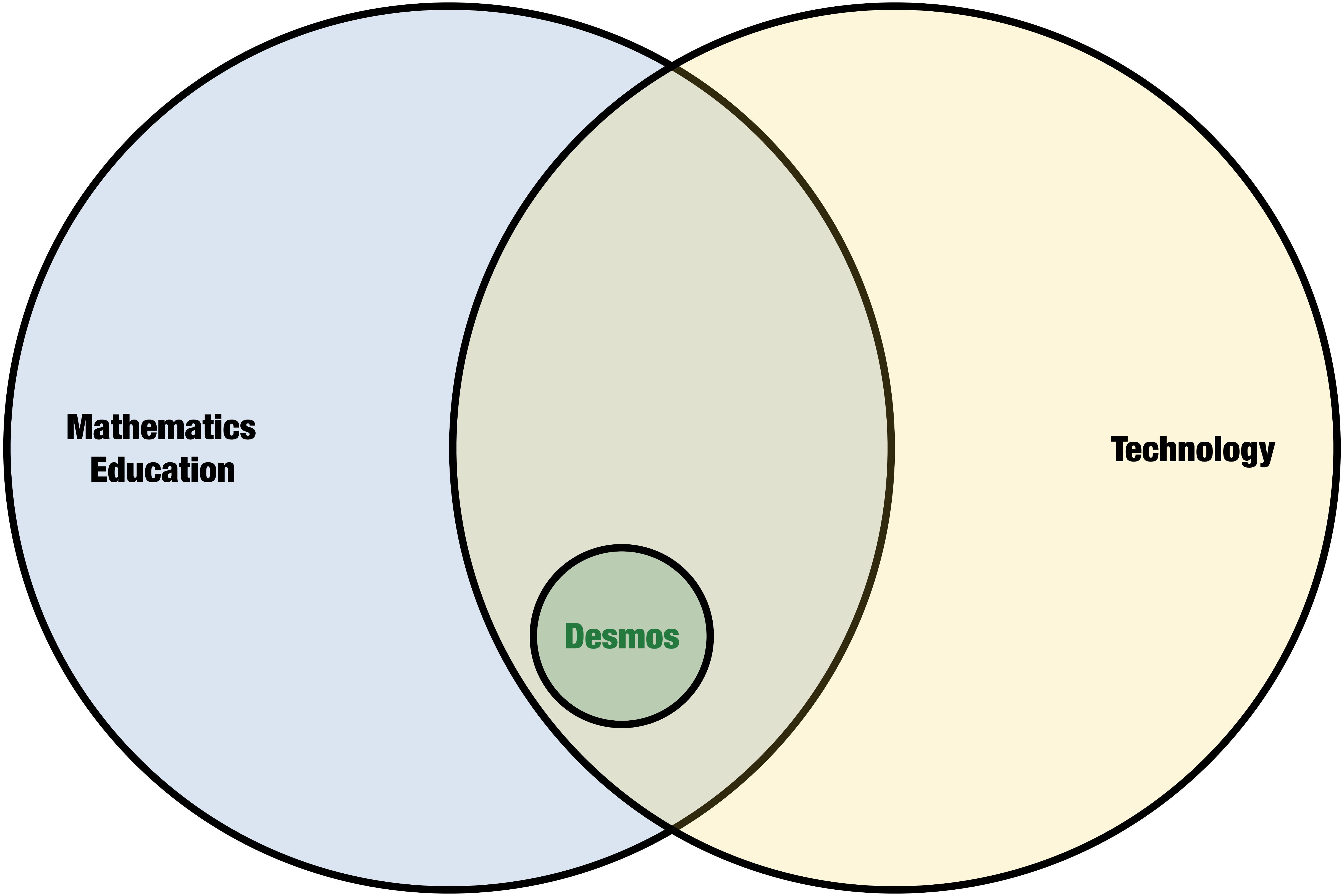
Building

Facilitating



Mathematics Education

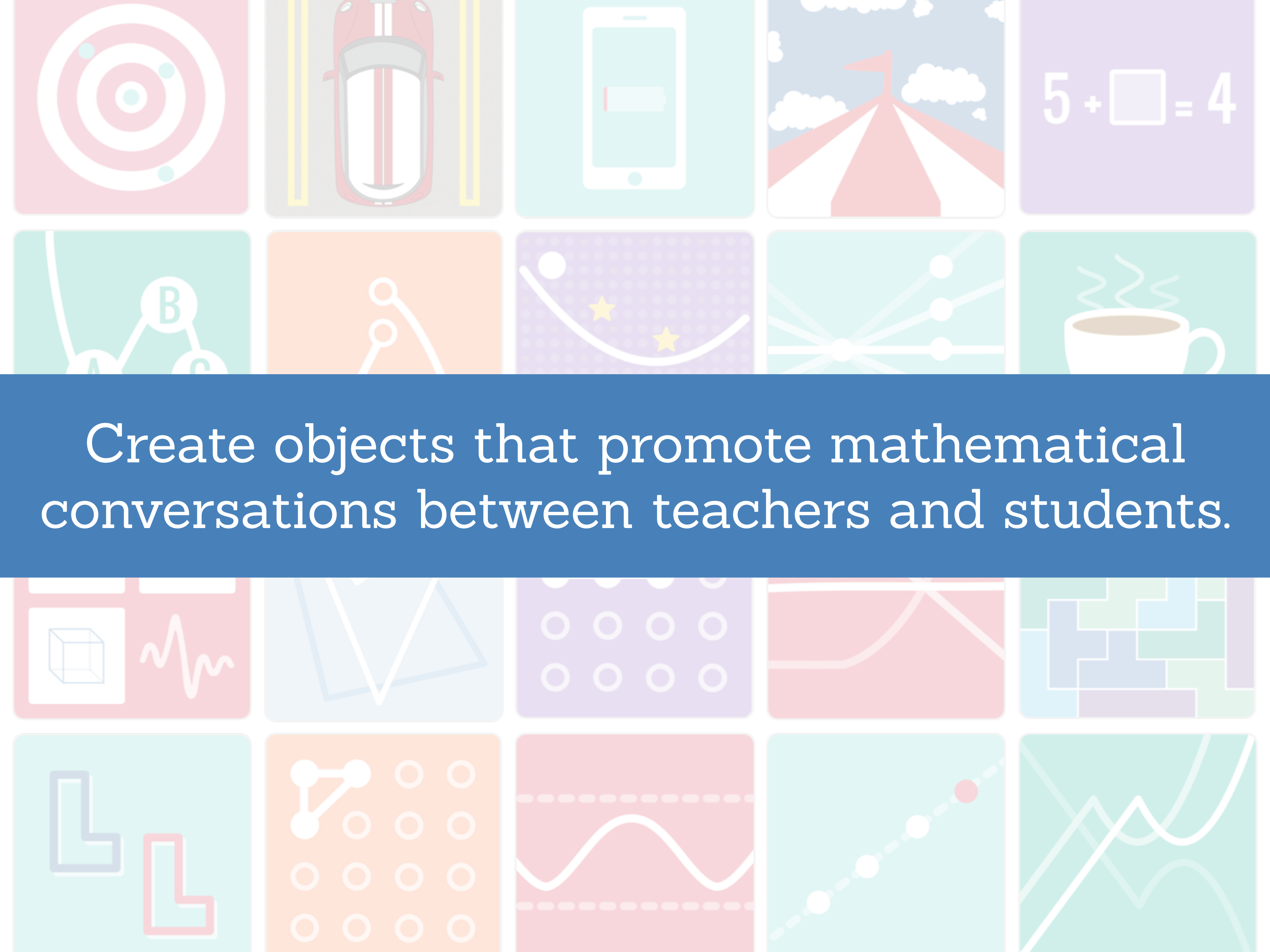

Mathematics Education
Technology


Mathematics
Education
Technology
Desmos

Principles for

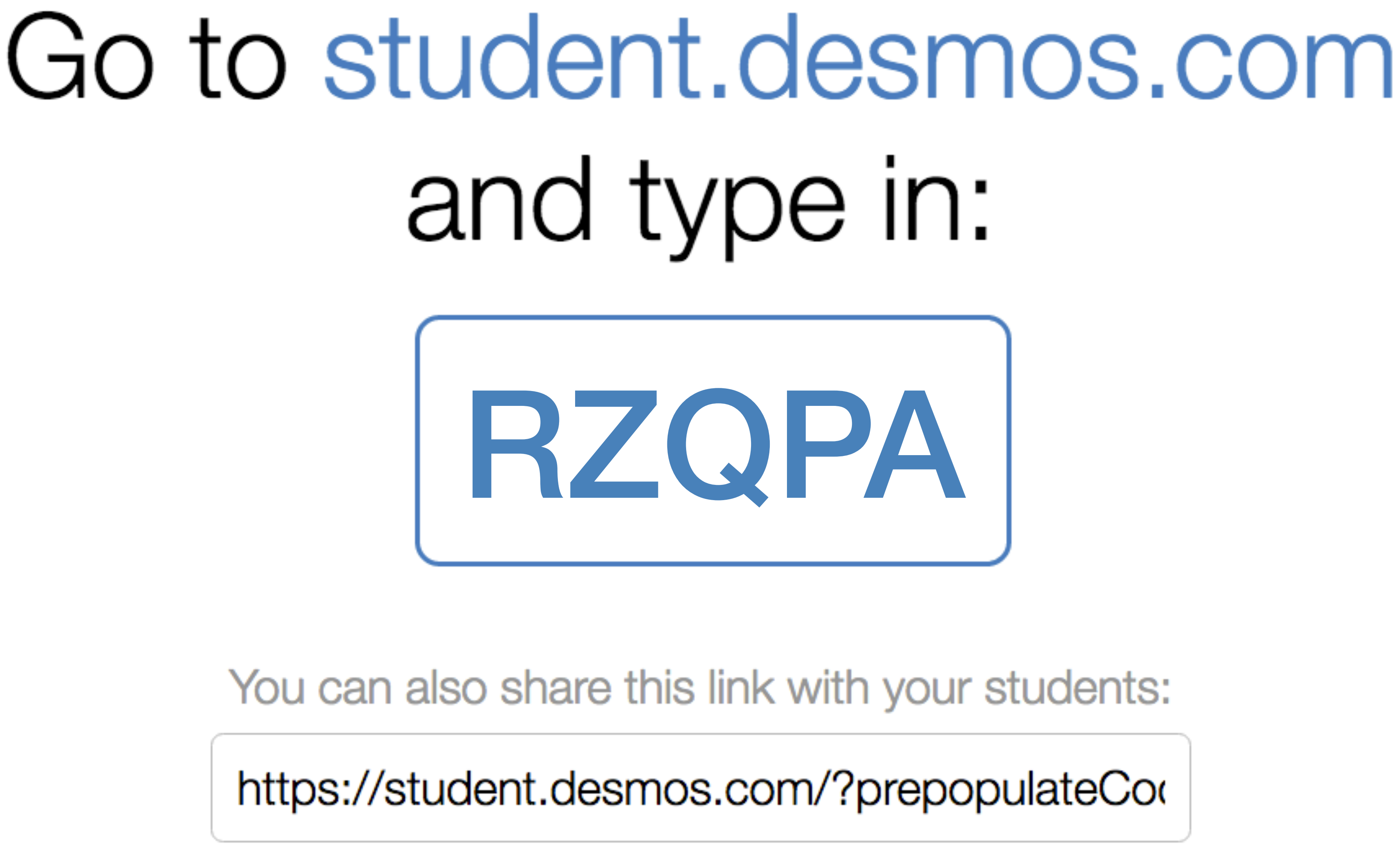
Building

Facilitating



Create objects that promote mathematical conversations between teachers and students.

Let's Play



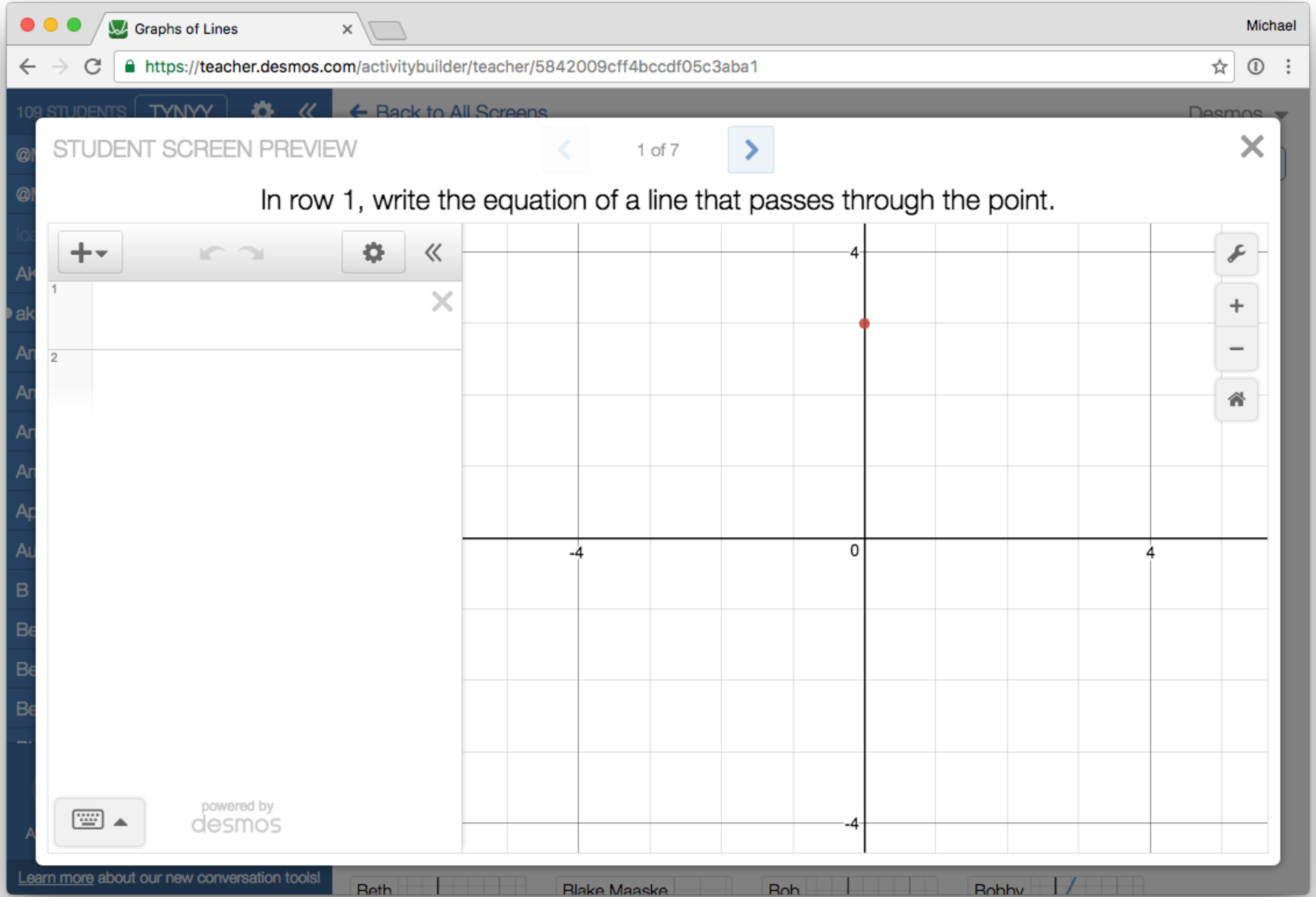
Go to student.desmos.com

and type in:

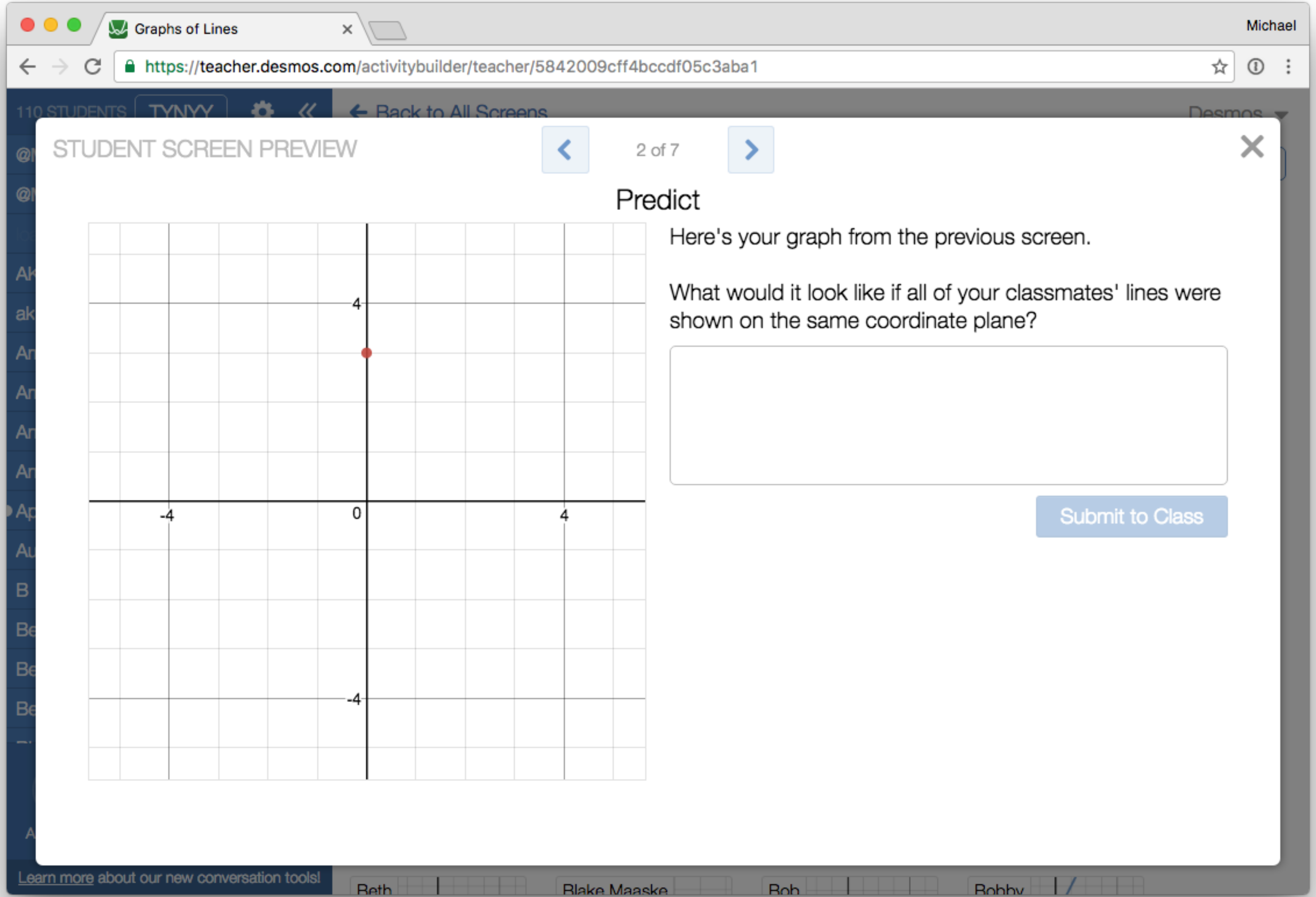
RZQPA

You can also share this link with your students:

https://student.desmos.com/?prepopulateCo



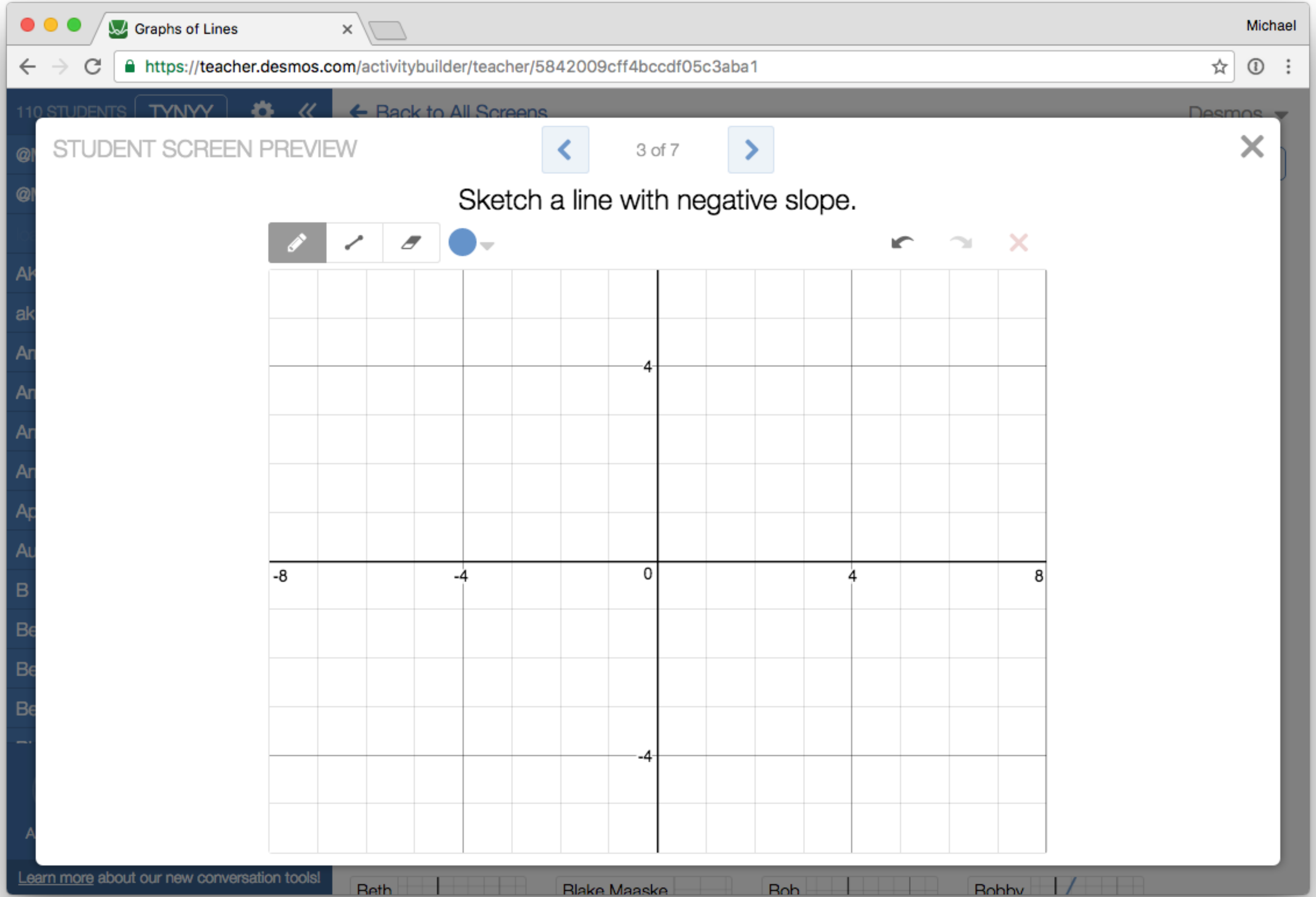
In row 1, write the equation of a line that passes through the point.



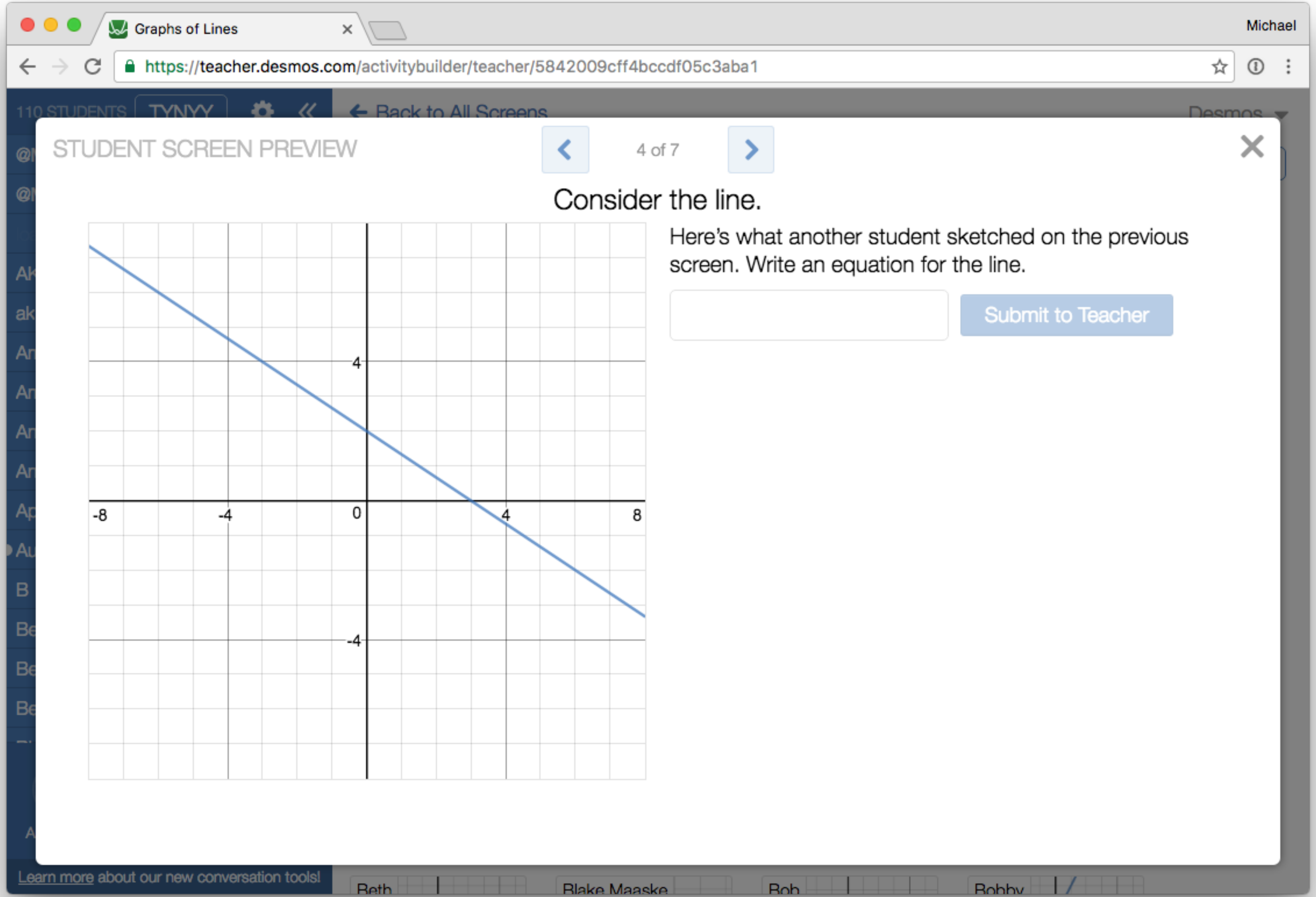
Predict

Here's your graph from the previous screen.

What would it look like if all of your classmates' lines were shown on the same coordinate plane?

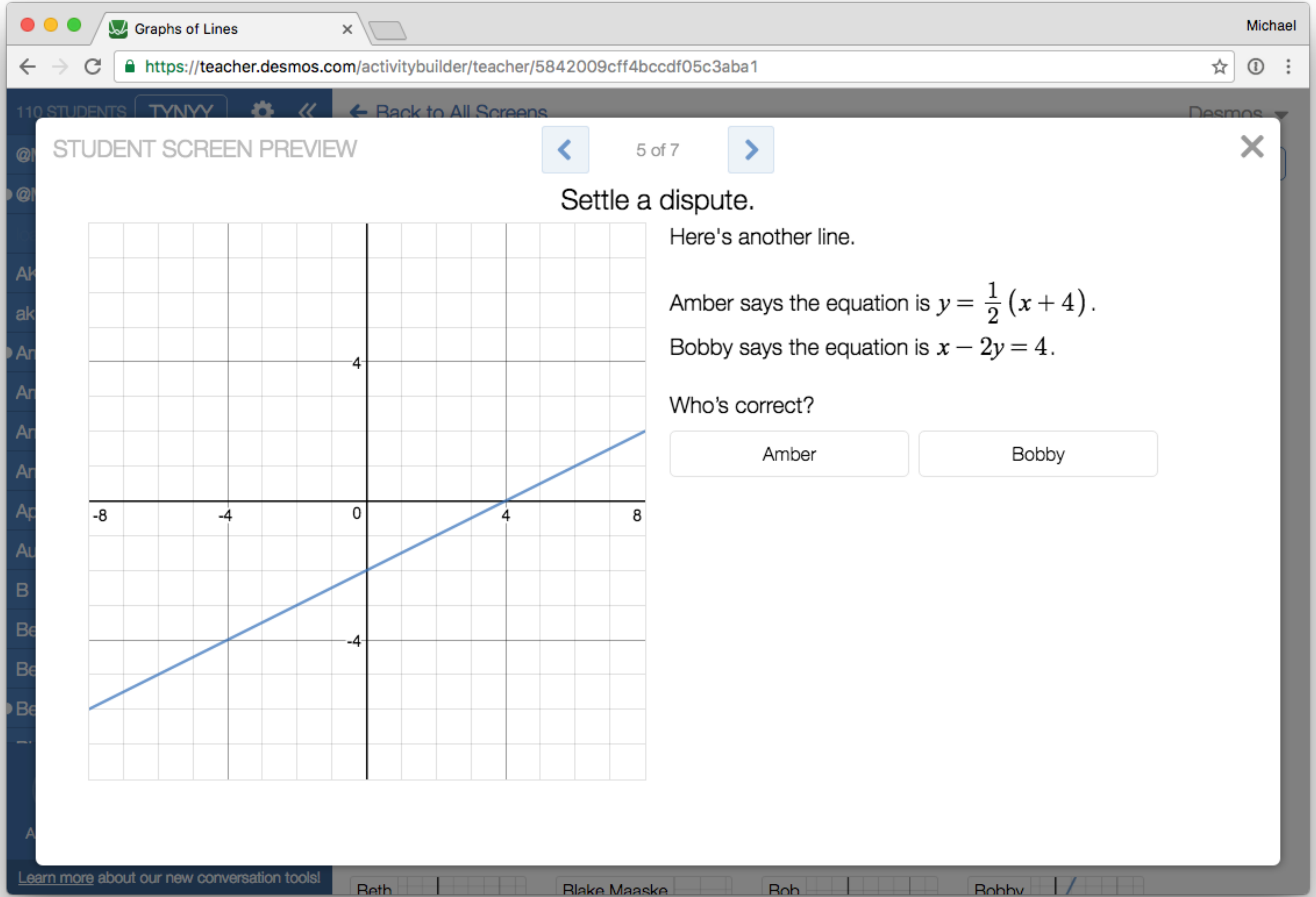


Sketch a line with negative slope.



Consider the line.

Here's what another student sketched on the previous screen. Write an equation for the line.



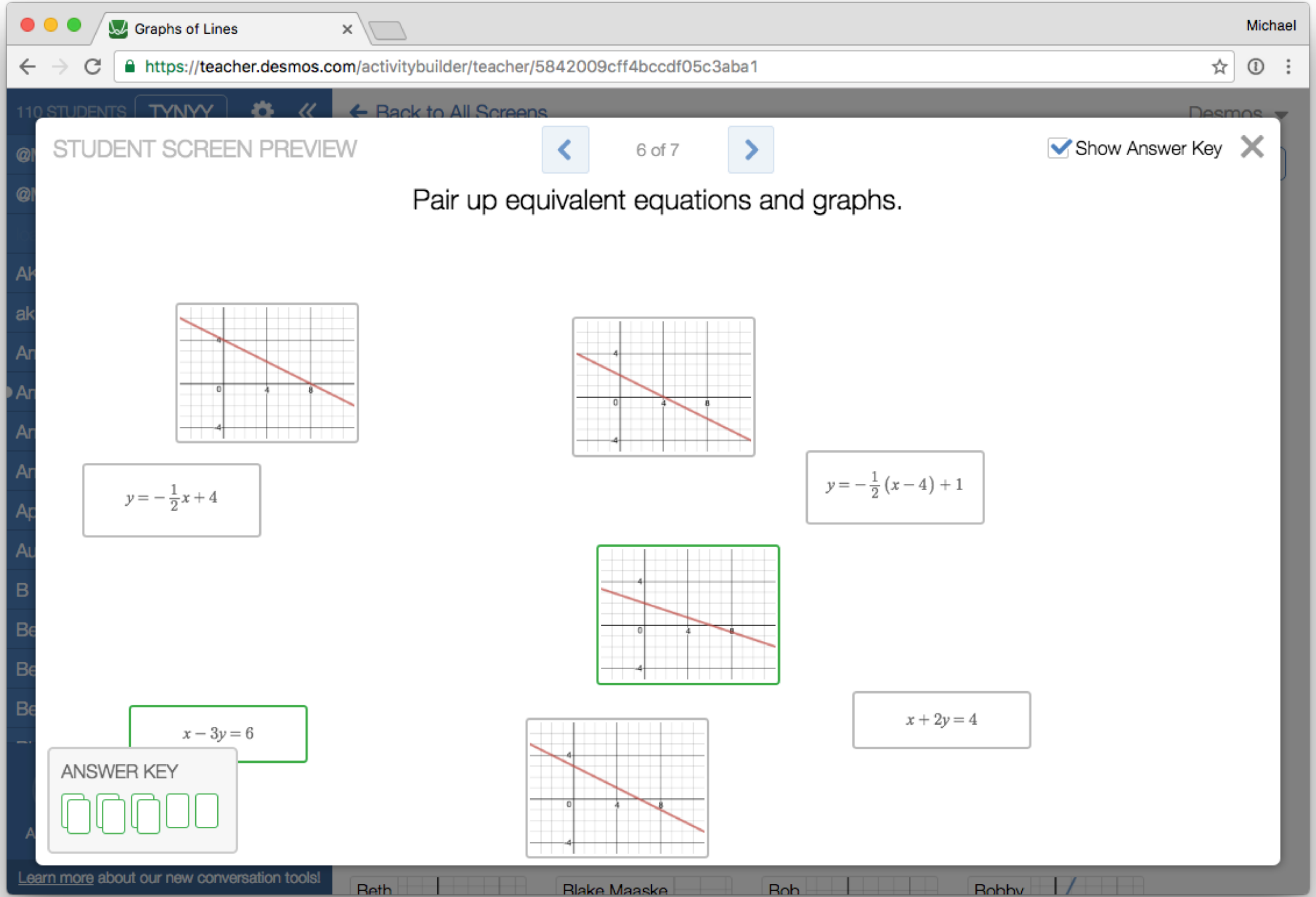
Settle a dispute.

Here's another line.

Amber says the equation is $y = \frac{1}{2}(x + 4)$.

Bobby says the equation is $x - 2y = 4$.

Who's correct?



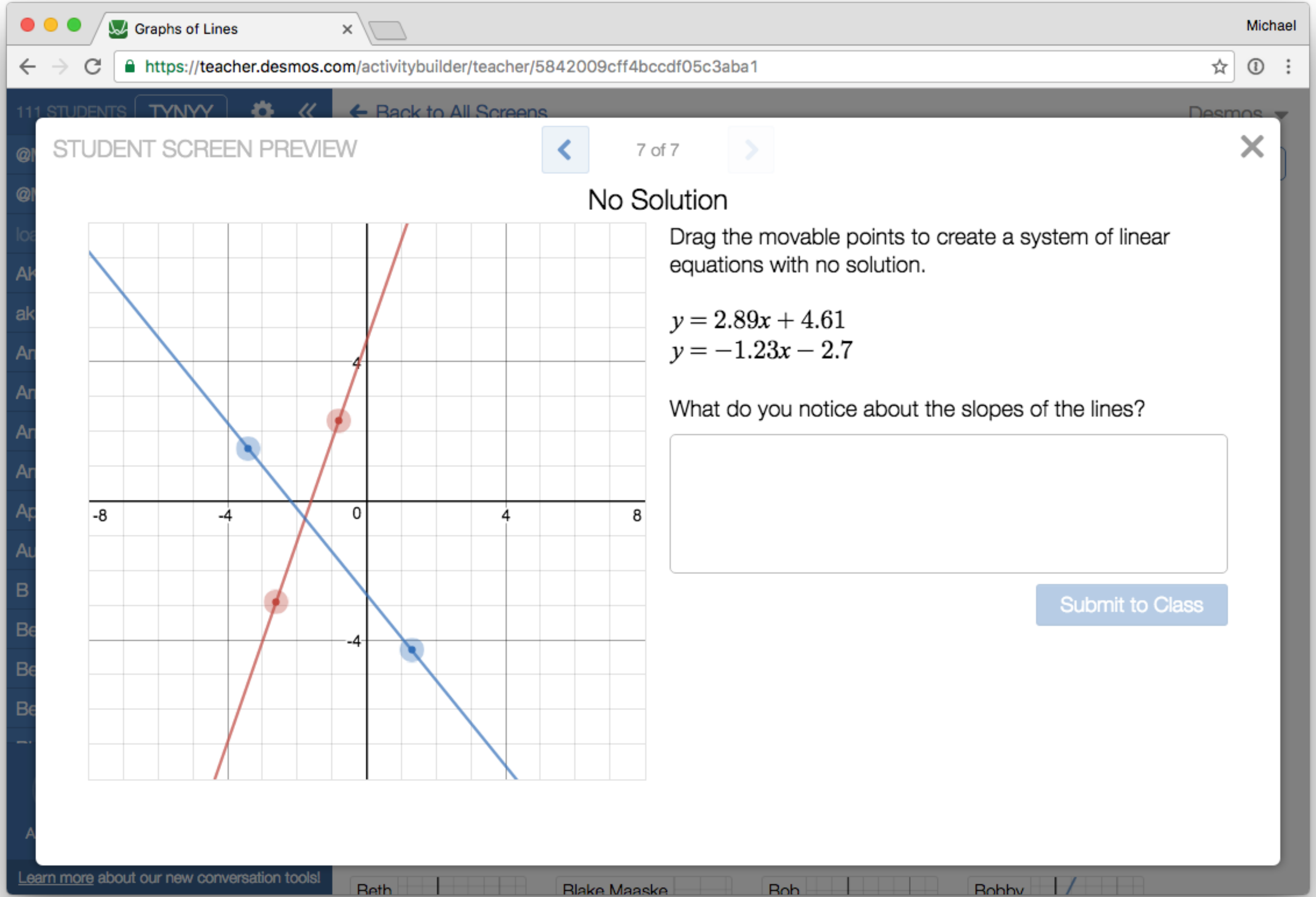
Pair up equivalent equations and graphs.

$y=-\frac{1}{2}x+4$

$y=-\frac{1}{2}(x-4)+1$

$x-3y=6$

$x+2y=4$

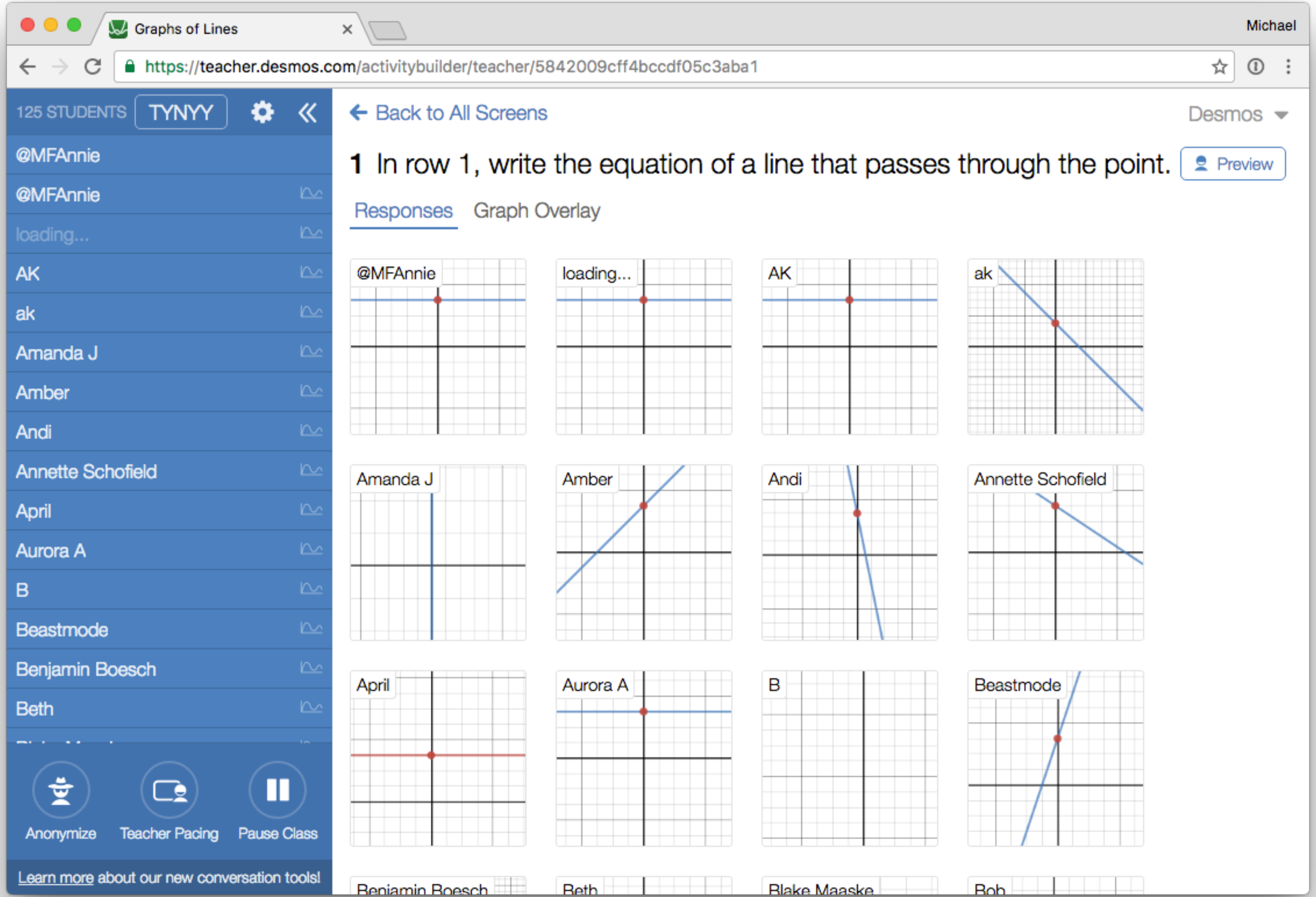


No Solution

Drag the movable points to create a system of linear equations with no solution.

$$y = 2.89x + 4.61$$
$$y = -1.23x - 2.7$$

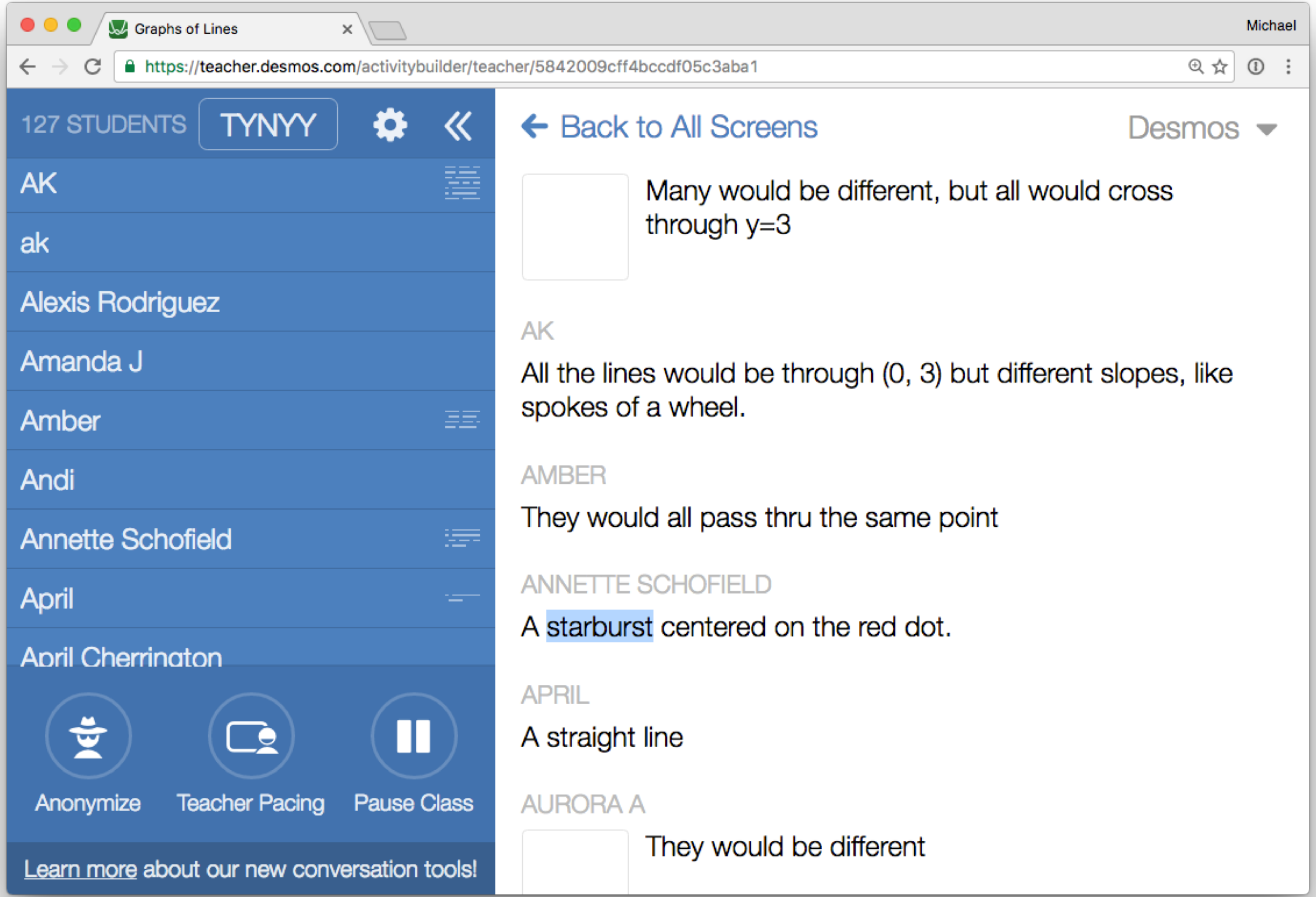
What do you notice about the slopes of the lines?



1 In row 1, write the equation of a line that passes through the point.

@MFAnnie
@MFAnnie
loading...
AK
ak
Amanda J
Amber
Andi
Annette Schofield
April
Aurora A
B
Beastmode
Benjamin Boesch
Beth

[Learn more](#) about our new conversation tools!



Many would be different, but all would cross through y=3

AK

All the lines would be through (0, 3) but different slopes, like spokes of a wheel.

AMBER

They would all pass thru the same point

ANNETTE SCHOFIELD

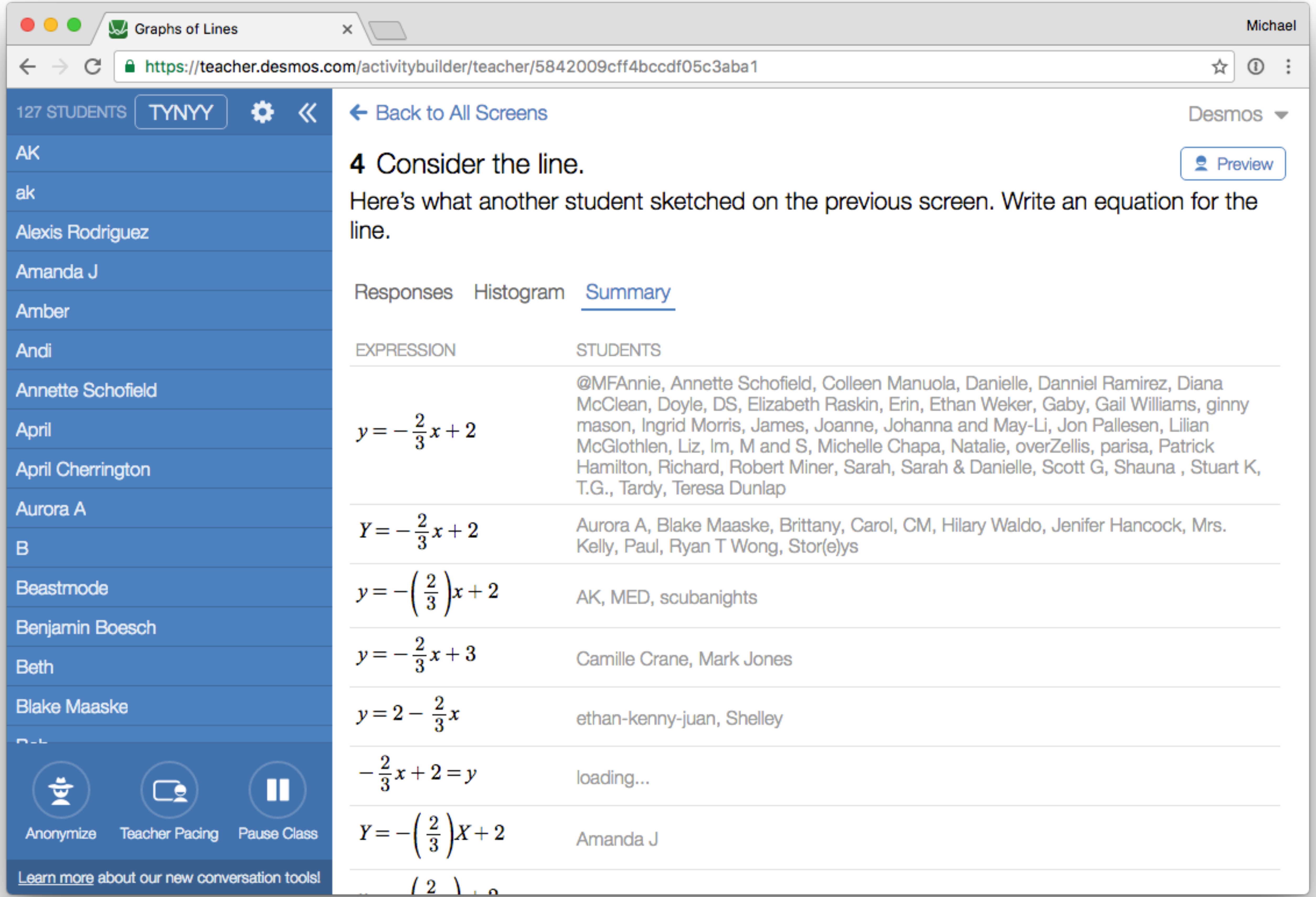
A starburst centered on the red dot.

APRIL

A straight line

AURORA A

They would be different


Graphs of Lines
Michael
https://teacher.desmos.com/activitybuilder/teacher/5842009cff4bccdf05c3aba1
127 STUDENTS
TYNYY
Back to All Screens
Desmos
Preview
Anonymize
Teacher Pacing
Pause Class
Learn more about our new conversation tools!

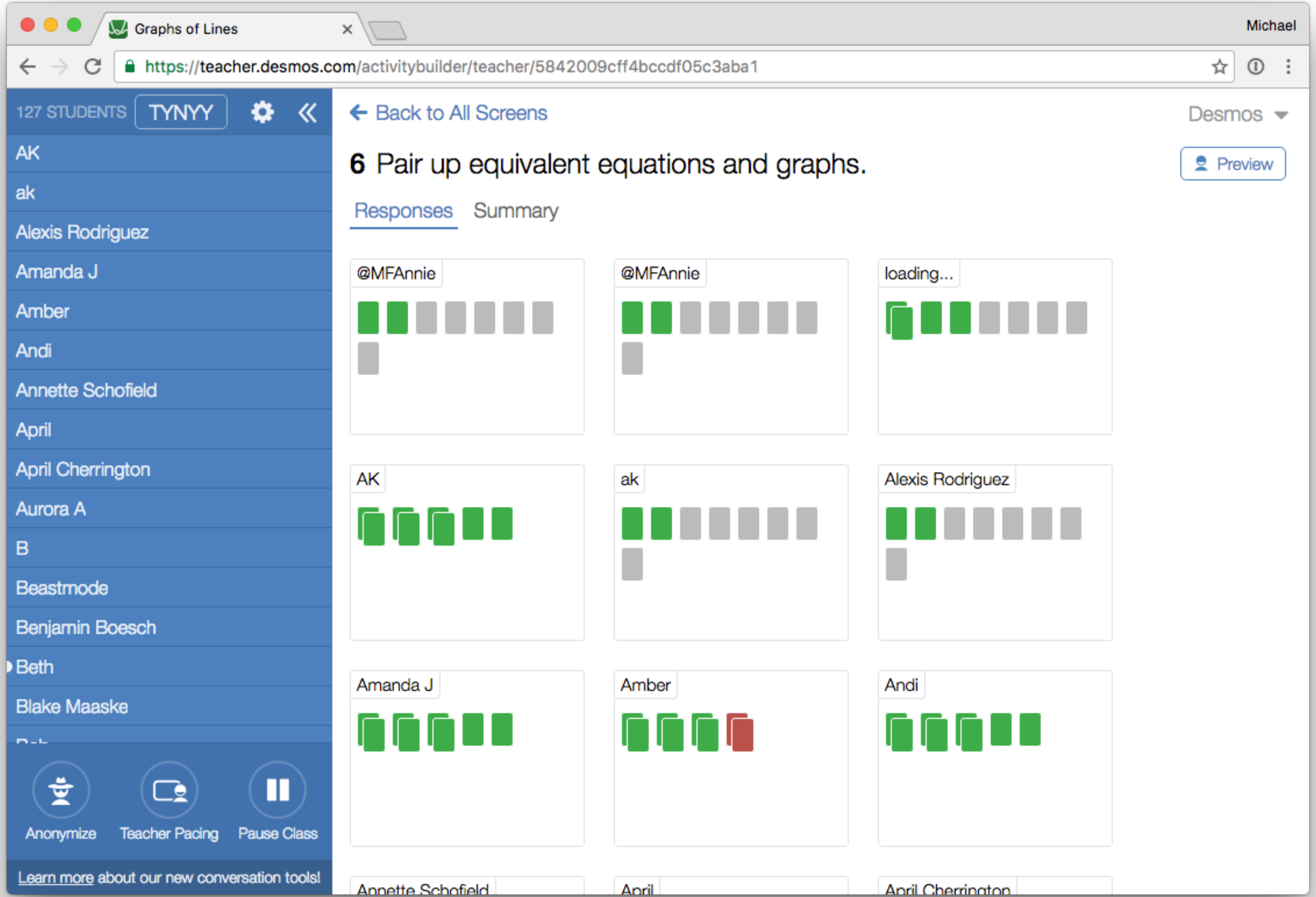
- AK
- ak
- Alexis Rodriguez
- Amanda J
- Amber
- Andi
- Annette Schofield
- April
- April Cherrington
- Aurora A
- B
- Beastmode
- Benjamin Boesch
- Beth
- Blake Maaske

4 Consider the line.

Here's what another student sketched on the previous screen. Write an equation for the line.

Responses Histogram Summary

EXPRESSION	STUDENTS
$y=-\frac{2}{3}x+2$	@MFAnnie, Annette Schofield, Colleen Manuola, Danielle, Danniel Ramirez, Diana McClean, Doyle, DS, Elizabeth Raskin, Erin, Ethan Weker, Gaby, Gail Williams, ginny mason, Ingrid Morris, James, Joanne, Johanna and May-Li, Jon Pallesen, Lilian McGlothlen, Liz, Im, M and S, Michelle Chapa, Natalie, overZellis, parisa, Patrick Hamilton, Richard, Robert Miner, Sarah, Sarah & Danielle, Scott G, Shauna , Stuart K, T.G., Tardy, Teresa Dunlap
$Y=-\frac{2}{3}x+2$	Aurora A, Blake Maaske, Brittany, Carol, CM, Hilary Waldo, Jenifer Hancock, Mrs. Kelly, Paul, Ryan T Wong, Stor(e)ys
$y=-\left(\frac{2}{3}\right)x+2$	AK, MED, scubanights
$y=-\frac{2}{3}x+3$	Camille Crane, Mark Jones
$y=2-\frac{2}{3}x$	ethan-kenny-juan, Shelley
$-\frac{2}{3}x+2=y$	loading...
$Y=-\left(\frac{2}{3}\right)X+2$	Amanda J

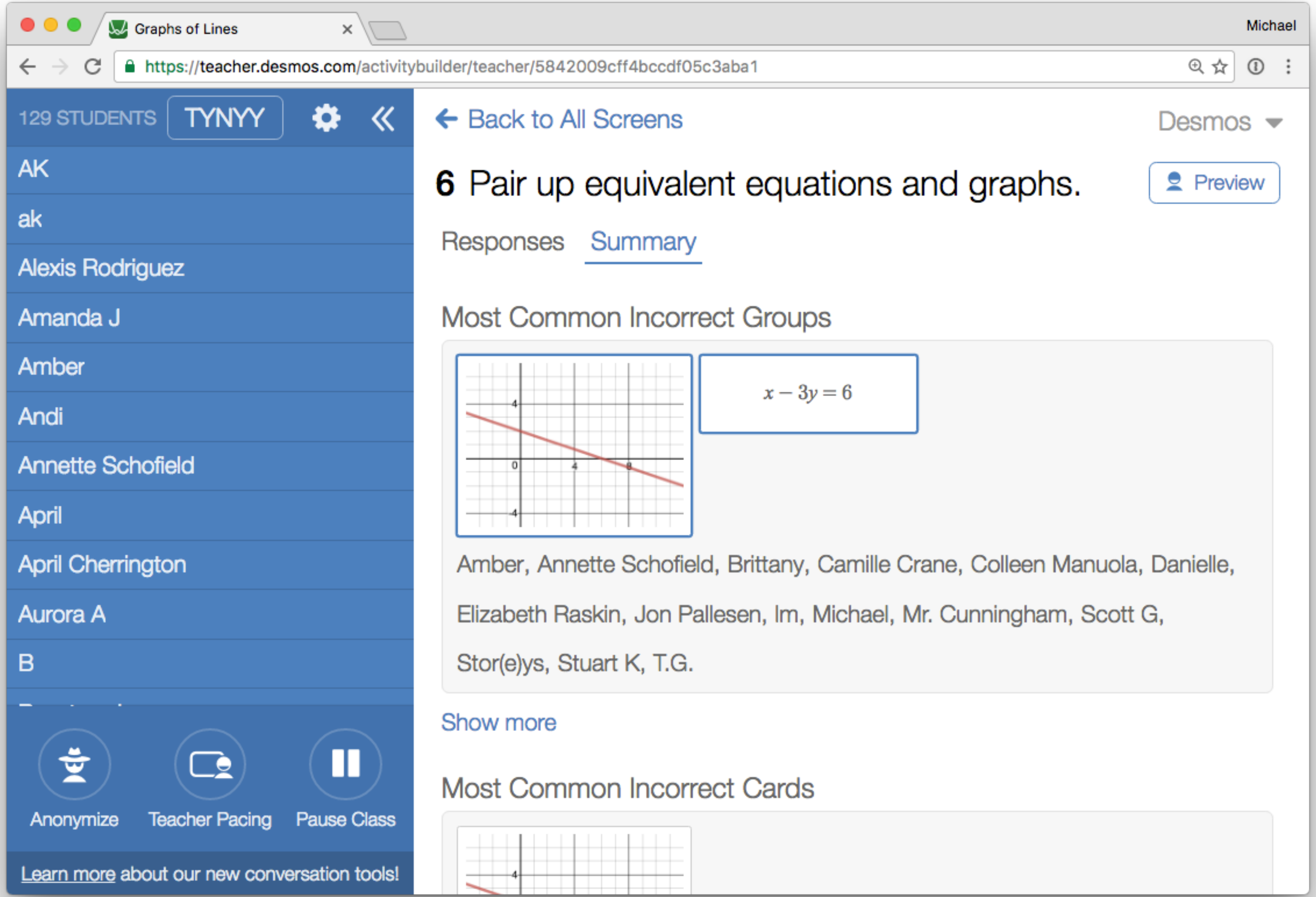


6 Pair up equivalent equations and graphs.

- AK
- ak
- Alexis Rodriguez
- Amanda J
- Amber
- Andi
- Annette Schofield
- April
- April Cherrington
- Aurora A
- B
- Beastmode
- Benjamin Boesch
- Beth
- Blake Maaske

Learn more about our new conversation tools!

@MFAnnie	@MFAnnie	loading...
AK	ak	Alexis Rodriguez
Amanda J	Amber	Andi
Annette Schofield	April	April Cherrington



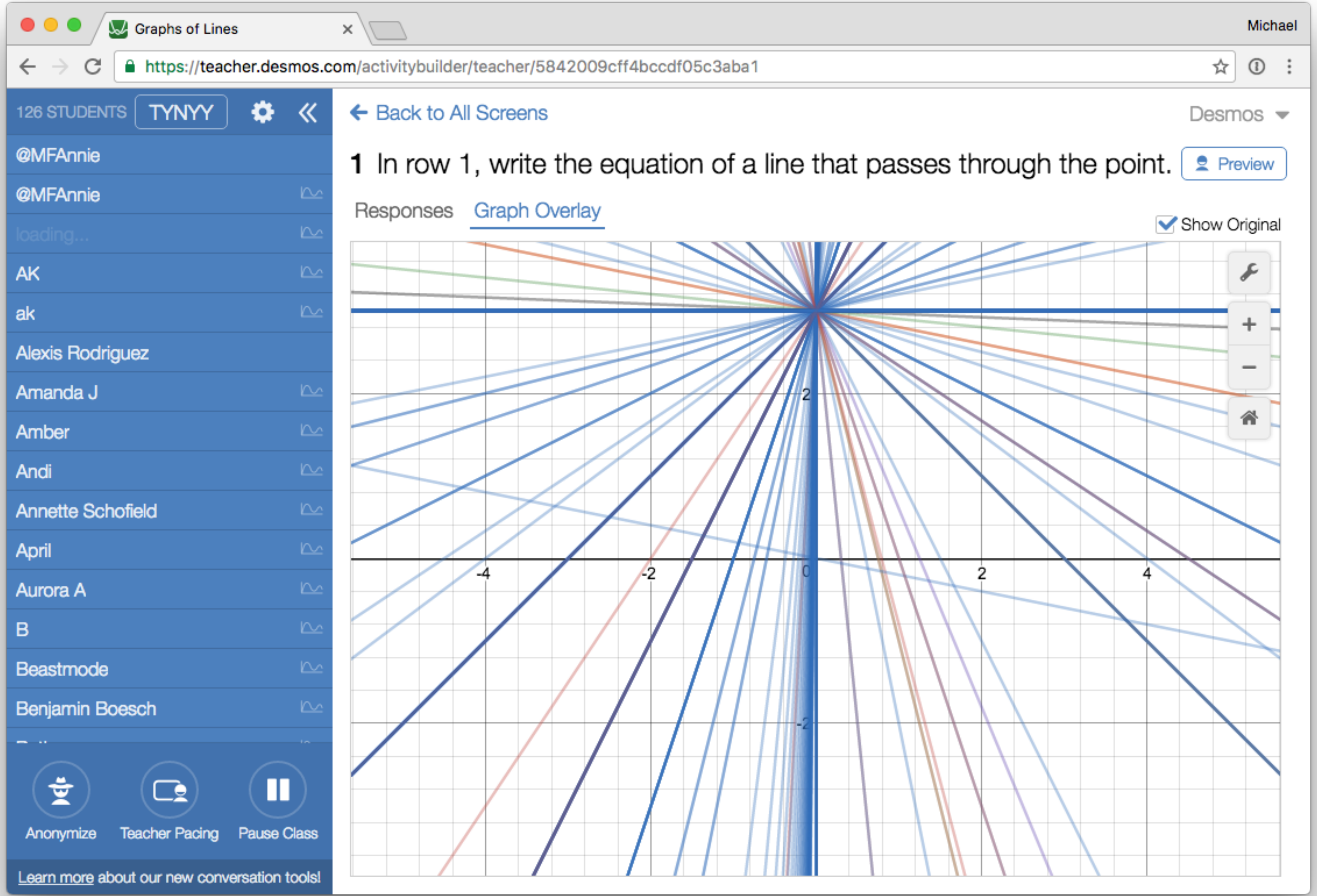
6 Pair up equivalent equations and graphs.

Most Common Incorrect Groups

$x - 3y = 6$

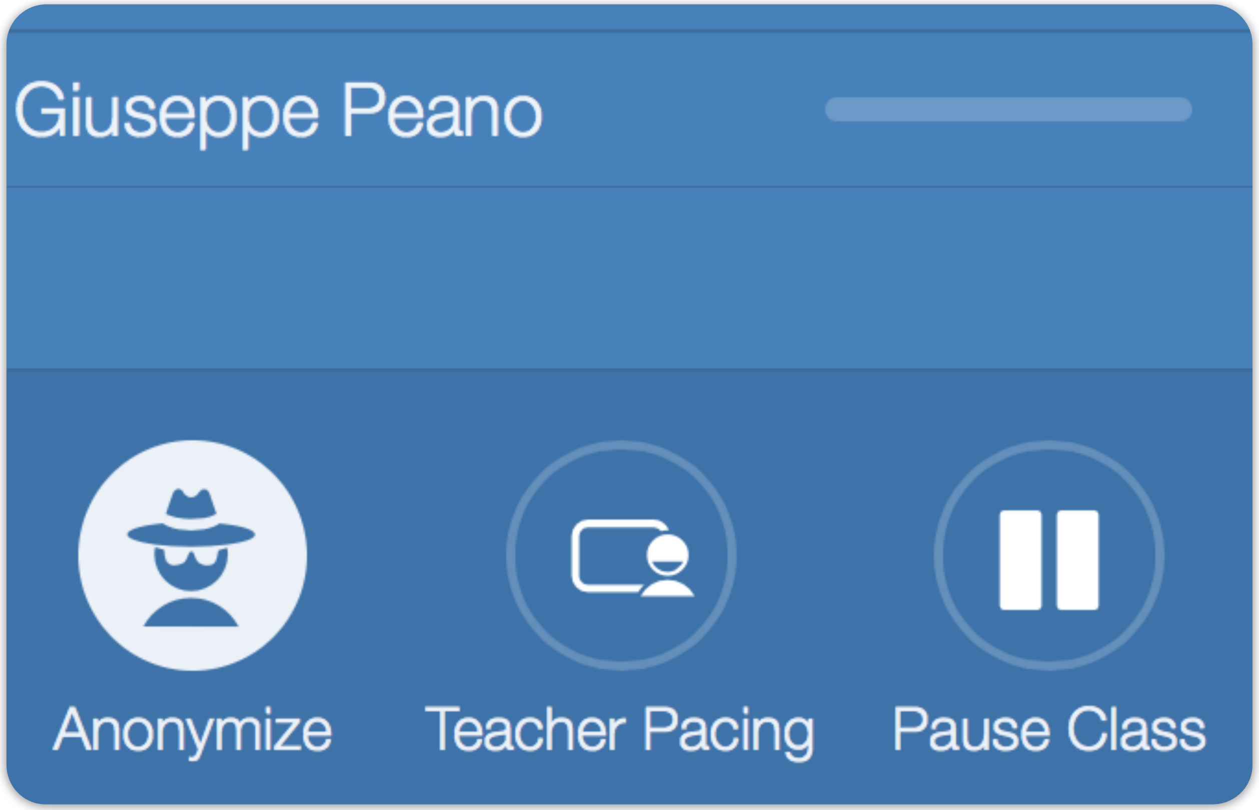
Amber, Annette Schofield, Brittany, Camille Crane, Colleen Manuola, Danielle, Elizabeth Raskin, Jon Pallesen, Im, Michael, Mr. Cunningham, Scott G, Stor(e)ys, Stuart K, T.G.

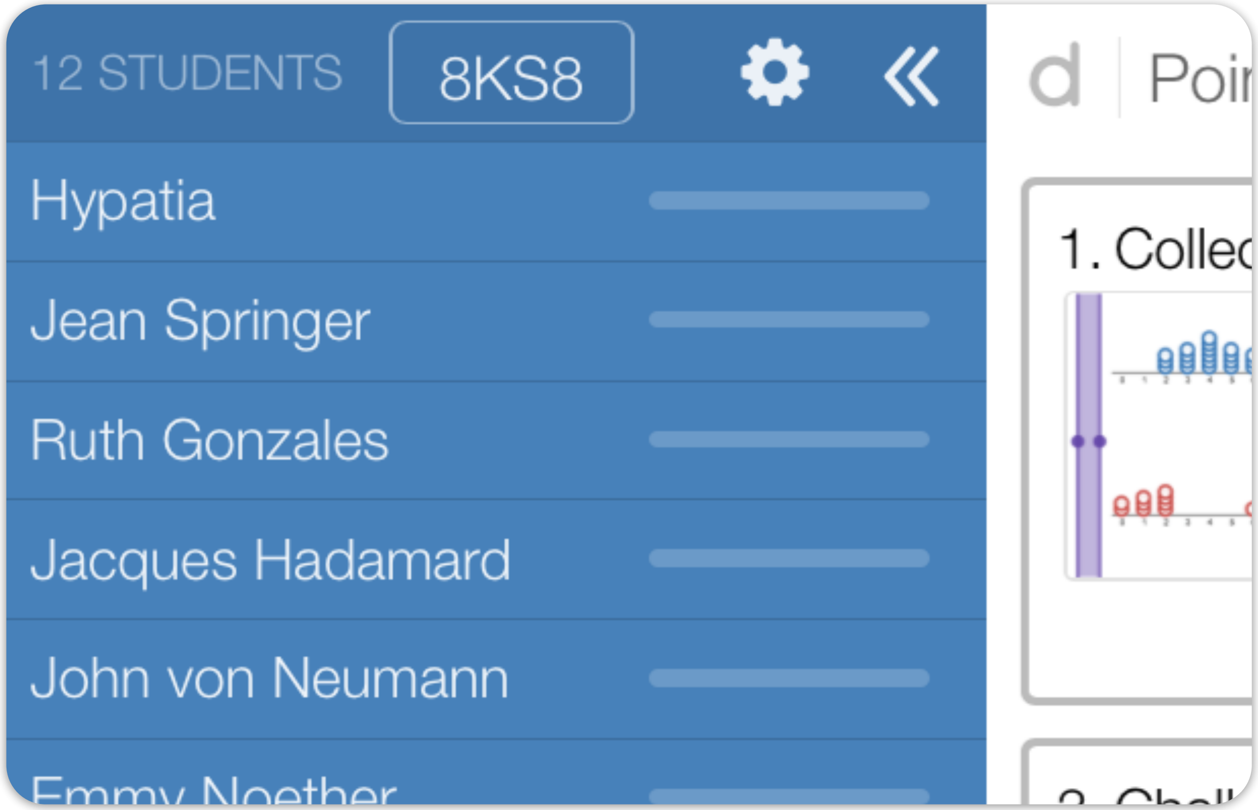
Most Common Incorrect Cards



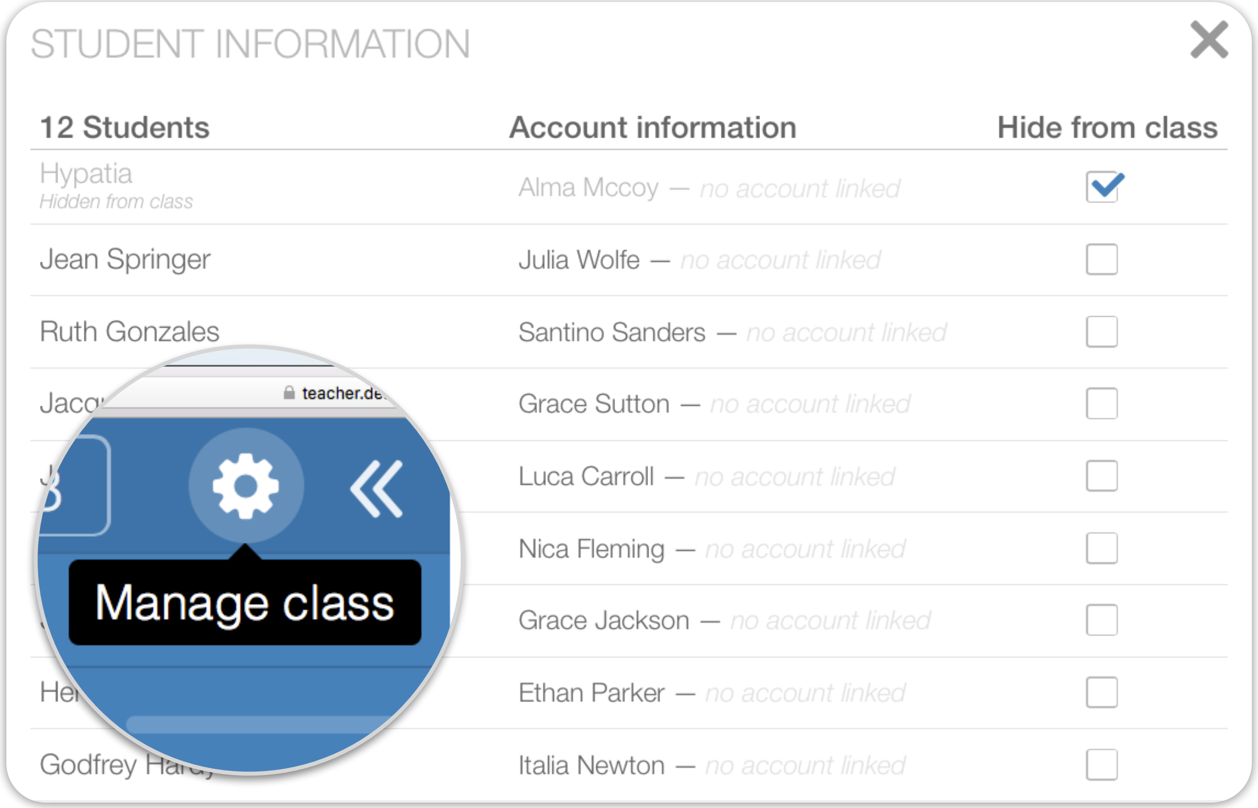
1 In row 1, write the equation of a line that passes through the point.

Classroom Conversation Tools





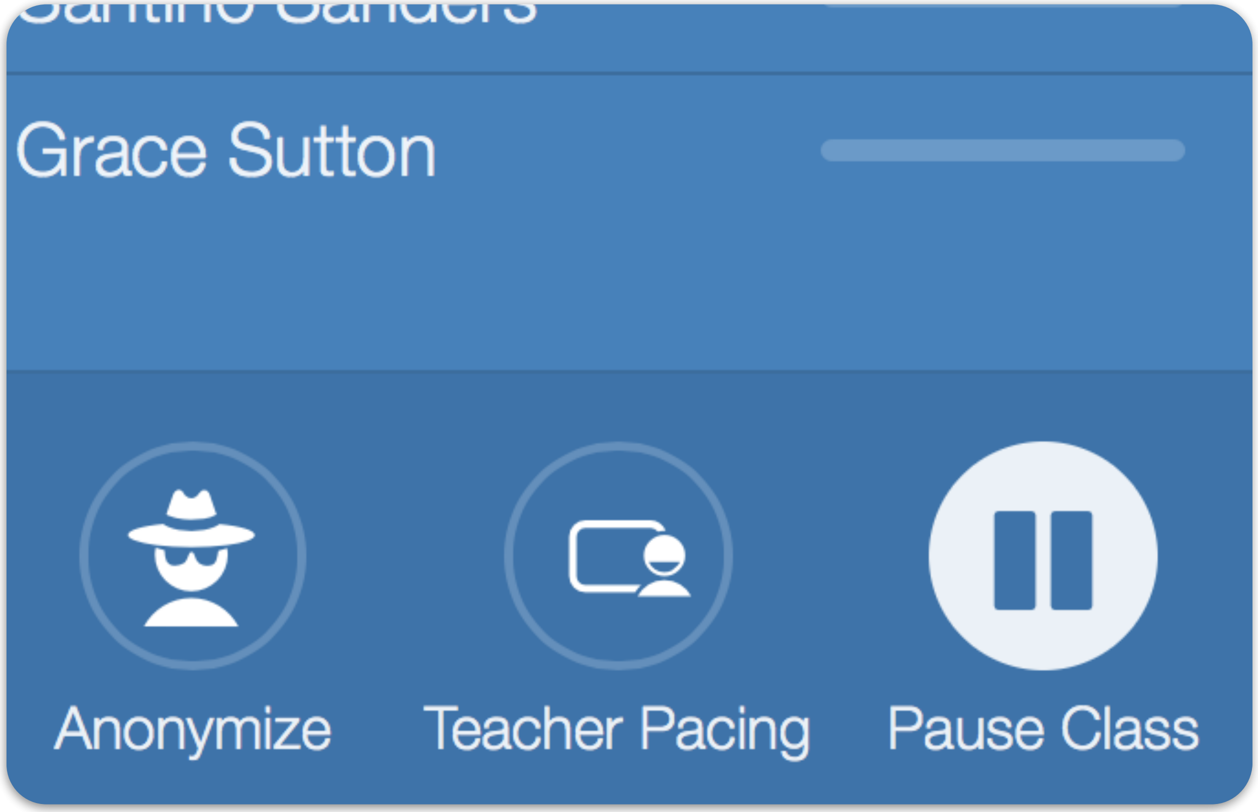
Anonymize



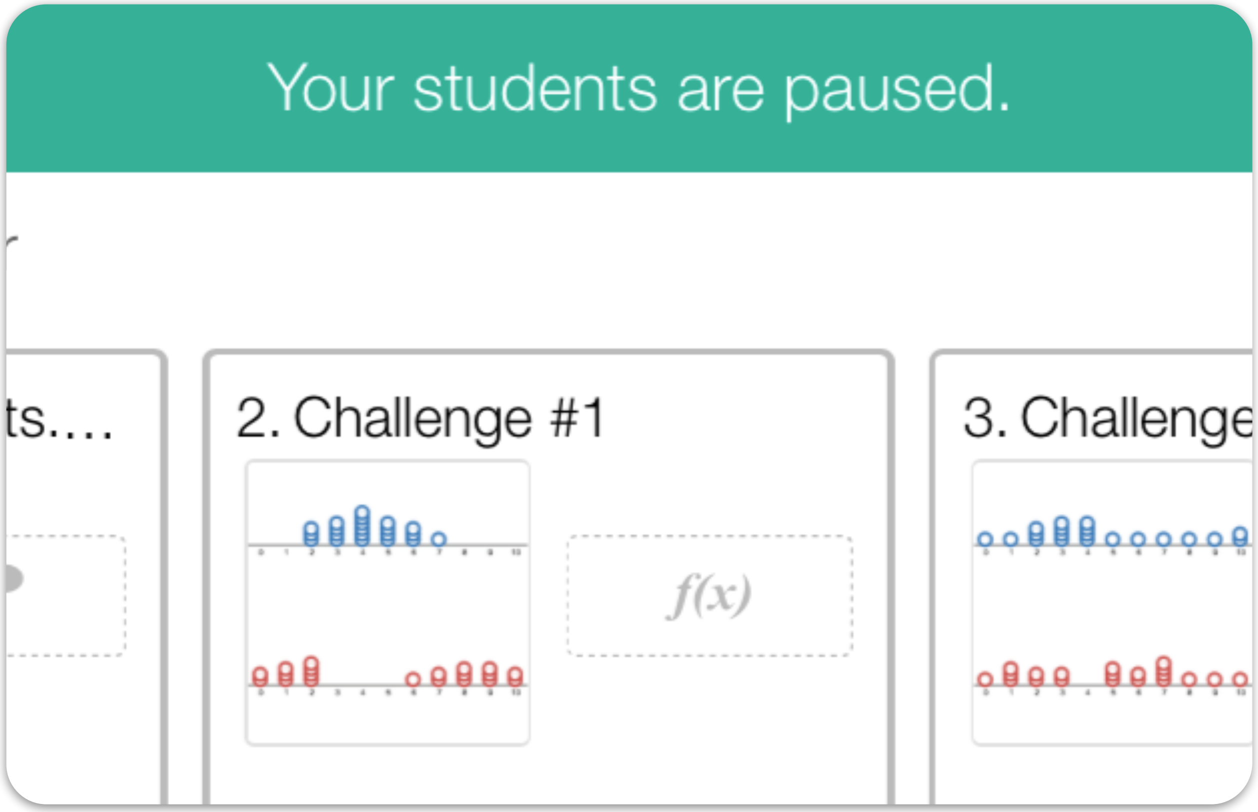
STUDENT INFORMATION

12 Students	Account information	Hide from class
Hypatia *Hidden from class*	Alma Mccoy — *no account linked*	☑
Jean Springer	Julia Wolfe — *no account linked*	☐
Ruth Gonzales	Santino Sanders — *no account linked*	☐
Jacq	Grace Sutton — *no account linked*	☐
	Luca Carroll — *no account linked*	☐
	Nica Fleming — *no account linked*	☐
	Grace Jackson — *no account linked*	☐
He	Ethan Parker — *no account linked*	☐
Godfrey Har	Italia Newton — *no account linked*	☐

desmos

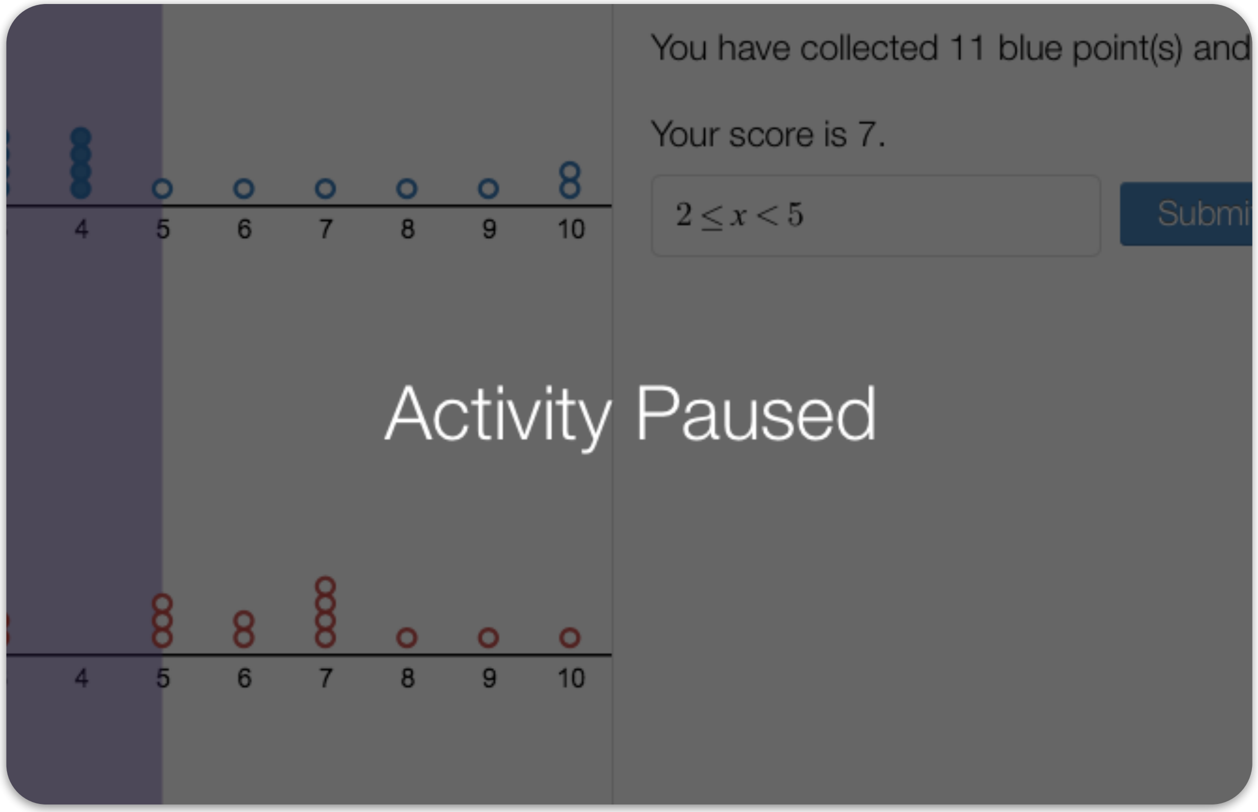


Grace Sutton



Your students are paused.

Pause

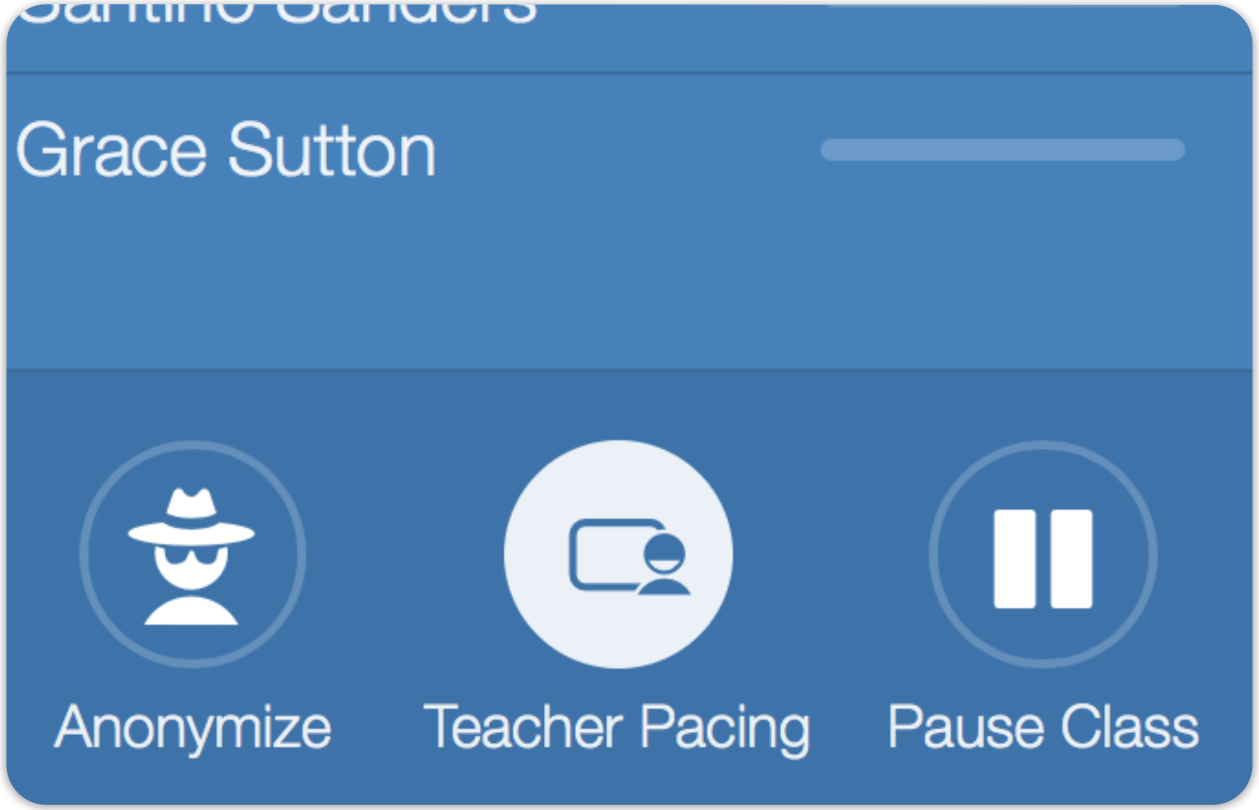


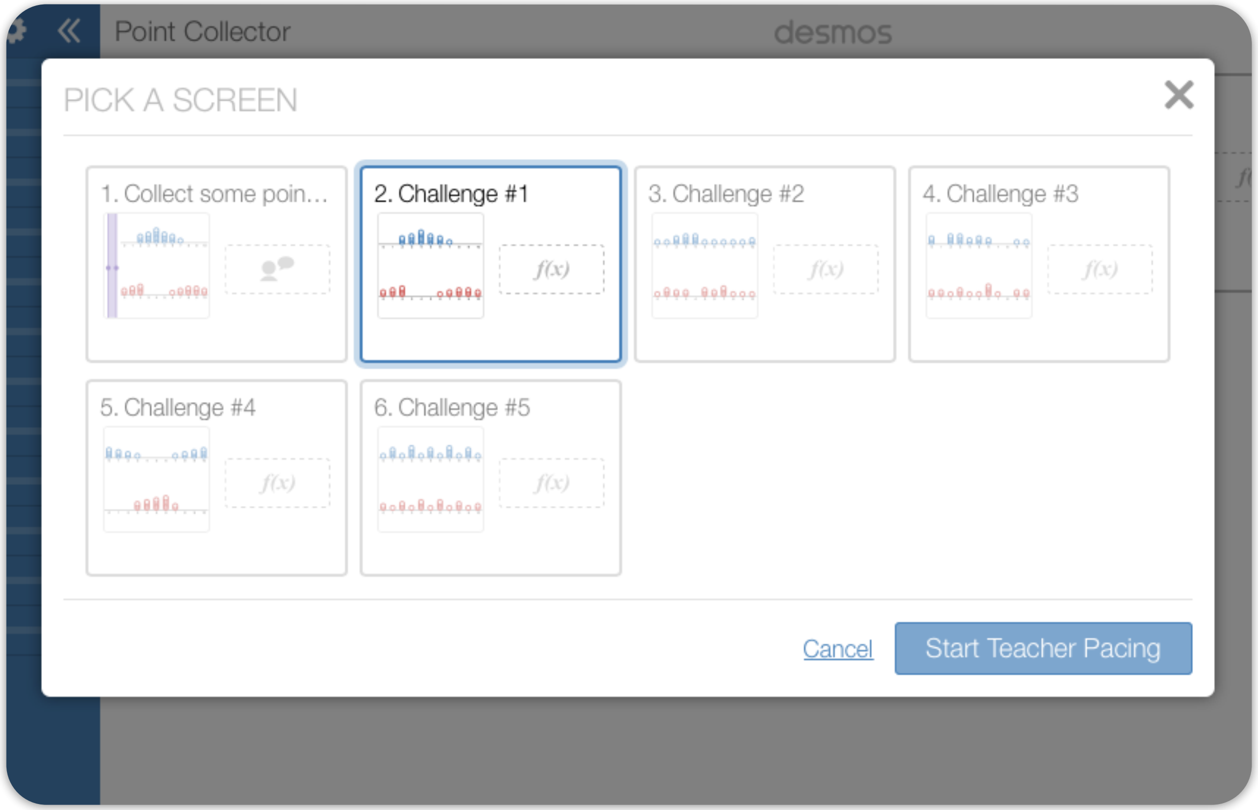
You have collected 11 blue point(s) and

Your score is 7.

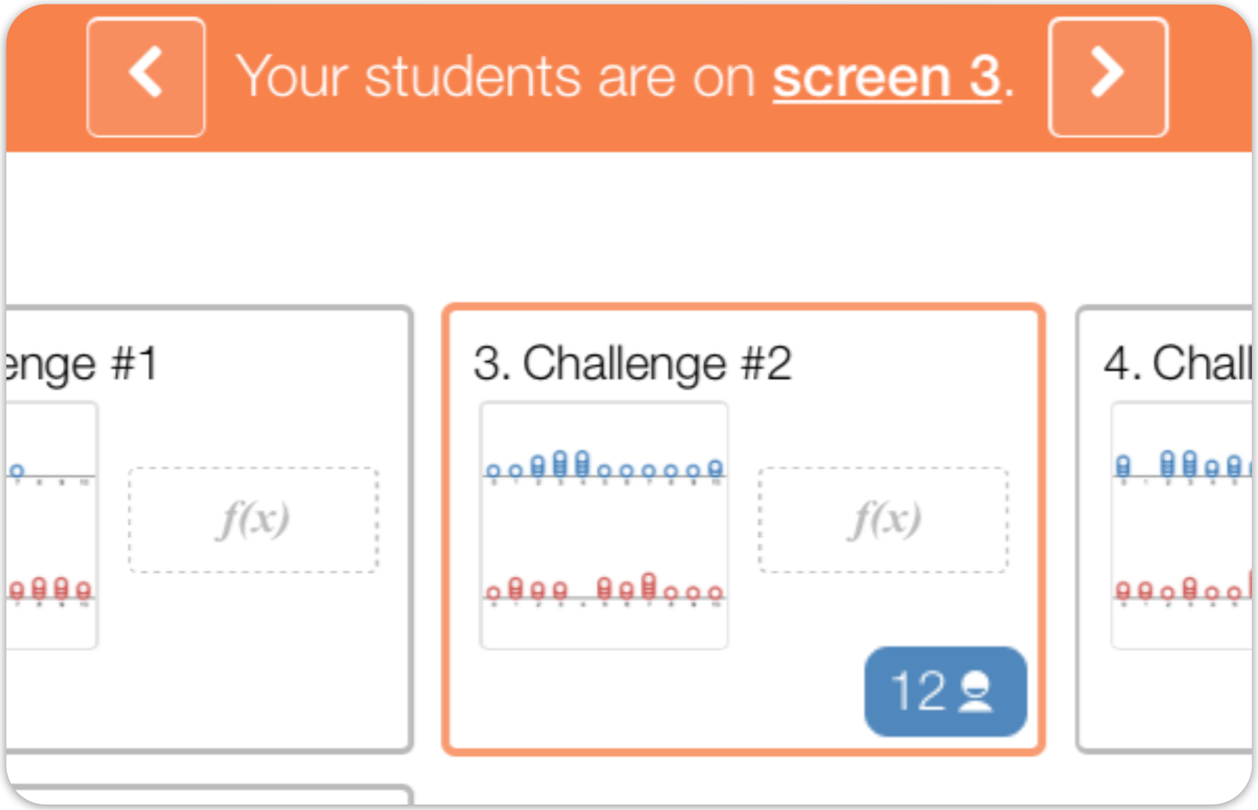
$2 \leq x < 5$

Activity Paused



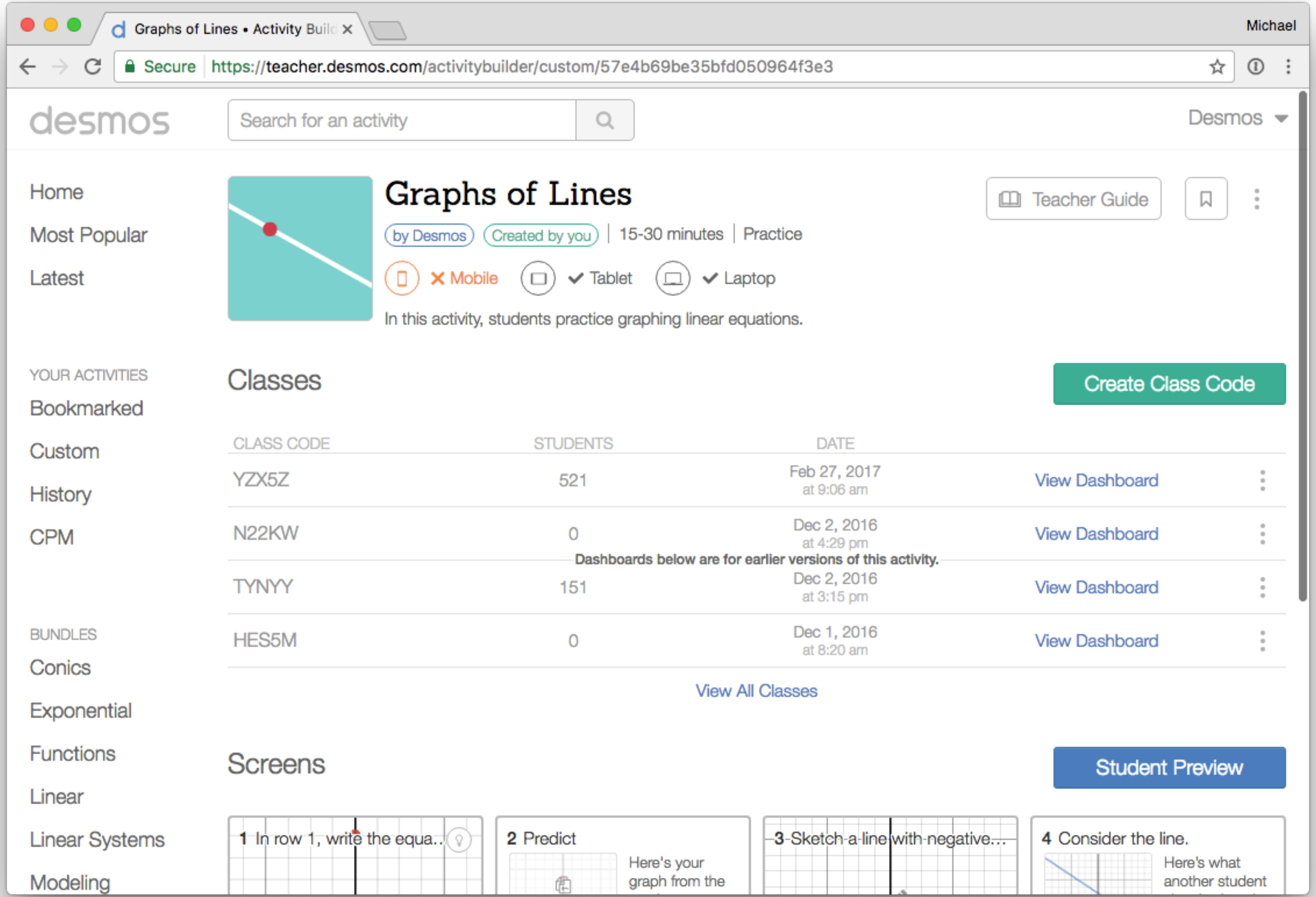


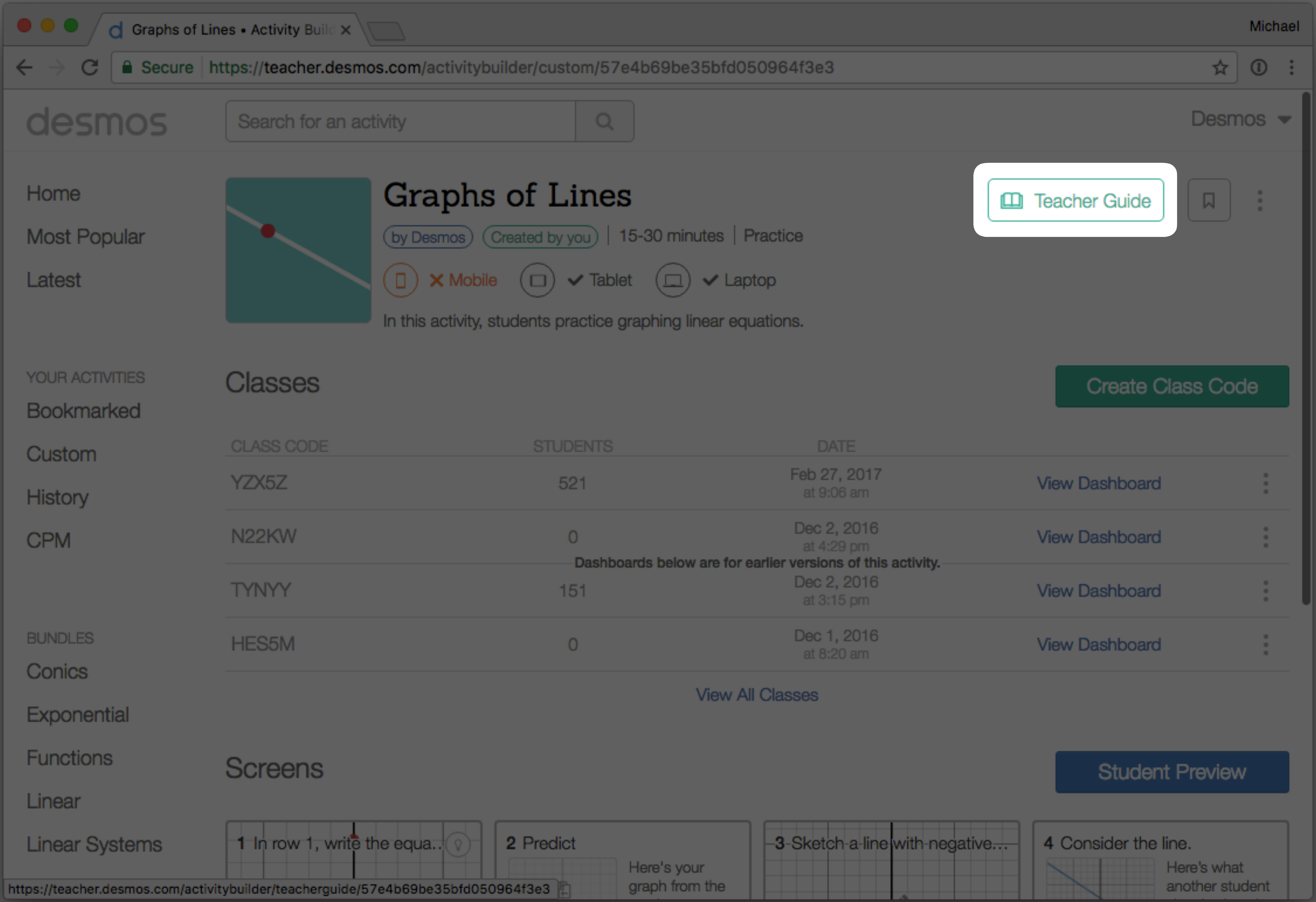
Teacher Pacing


Your students are on screen 3.

desmos

Something New…





Graphs of Lines

by Desmos | Created by you | 15-30 minutes | Practice

✗ Mobile ✓ Tablet ✓ Laptop

In this activity, students practice graphing linear equations.

Classes

CLASS CODE	STUDENTS	DATE		
YZX5Z	521	Feb 27, 2017 at 9:06 am	View Dashboard	⋮
N22KW	0	Dec 2, 2016 at 4:29 pm	View Dashboard	⋮
Dashboards below are for earlier versions of this activity.				
TYNYY	151	Dec 2, 2016 at 3:15 pm	View Dashboard	⋮
HES5M	0	Dec 1, 2016 at 8:20 am	View Dashboard	⋮

Screens

1 In row 1, write the equa...

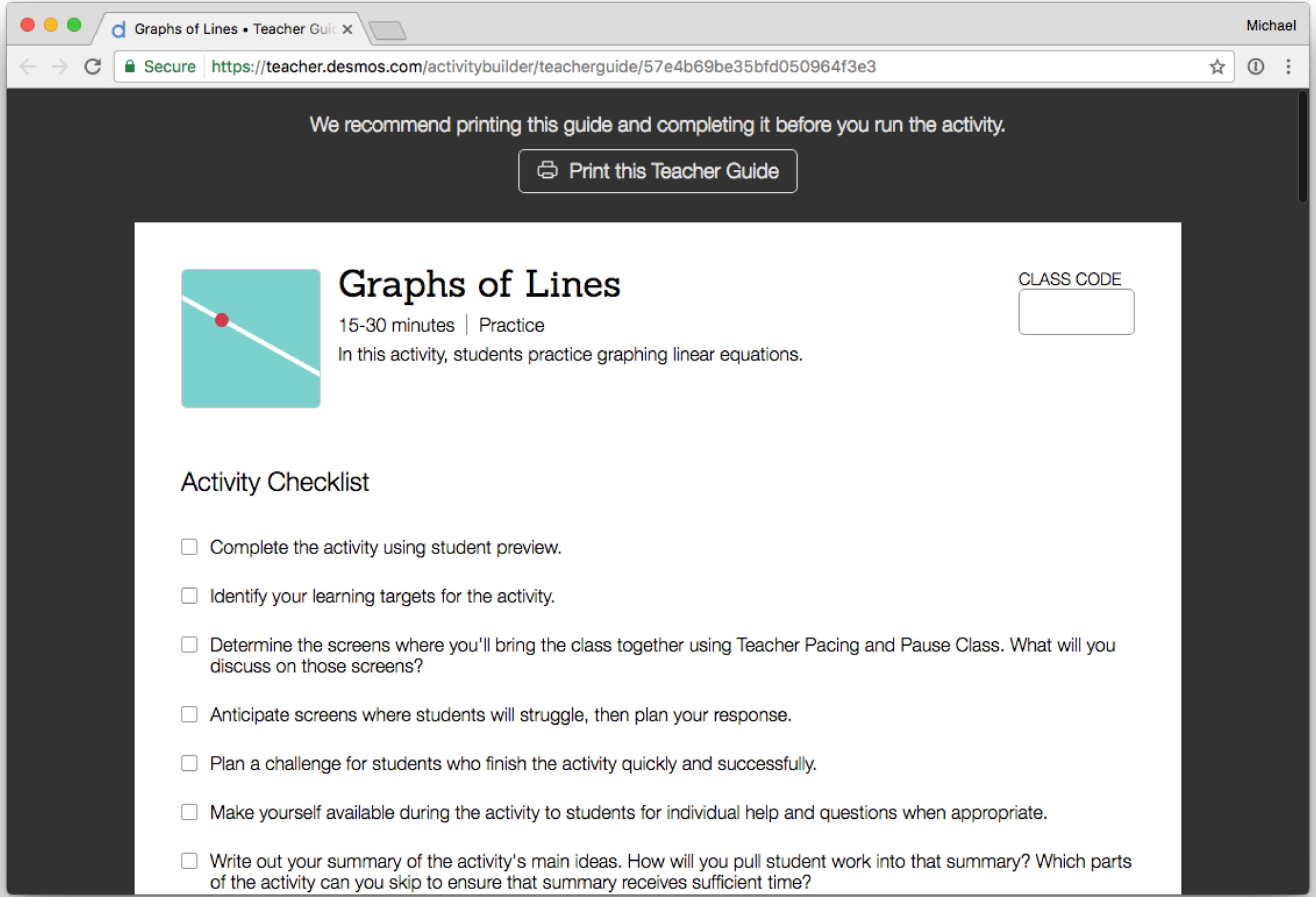
2 Predict

Here's your graph from the

3 Sketch a line with negative...

4 Consider the line.

Here's what another student


Graphs of Lines • Teacher Gui
Michael
Secure
https://teacher.desmos.com/activitybuilder/teacherguide/57e4b69be35bfd050964f3e3
Print this Teacher Guide
CLASS CODE

We recommend printing this guide and completing it before you run the activity.

Graphs of Lines

15-30 minutes | Practice

In this activity, students practice graphing linear equations.

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?

Graphs of Lines

15-30 minutes | Practice

In this activity, students practice graphing linear equations.

CLASS CODE

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.

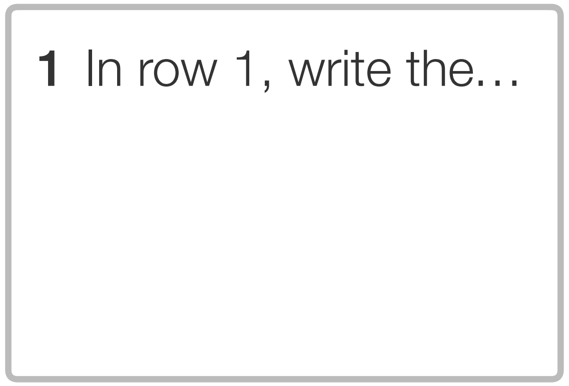
☐ Write out your summary of the activity's main ideas. How will you pull student work into that summary? Which parts of the activity can you skip to ensure that summary receives sufficient time?

Activity Screens: Teacher Pacing and Pause Class

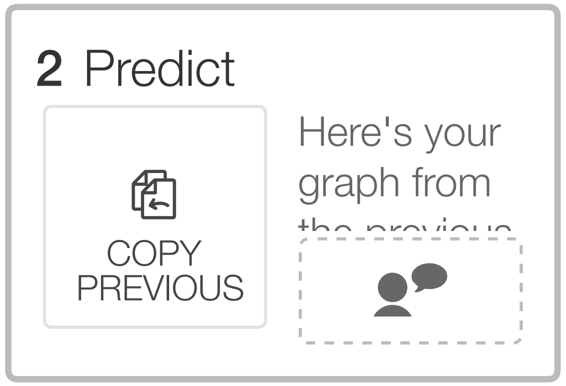
Use this page to plan your use of Teacher Pacing and Pause Class. Teacher Pacing lets you restrict students to a single screen or a range of screens. Pause Class keeps students from interacting with whatever screens they are currently viewing. Use these two tools to create conversations in your classroom.

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?

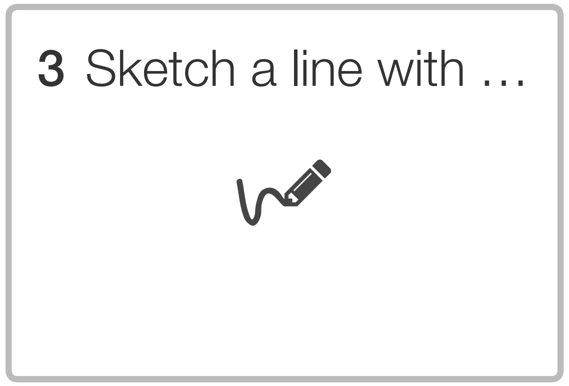


1 In row 1, write the…

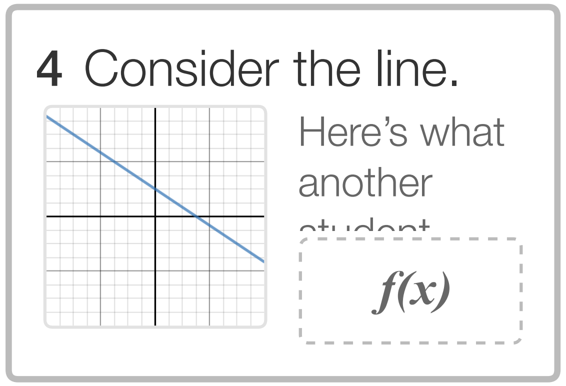


2 Predict

Here's your graph from

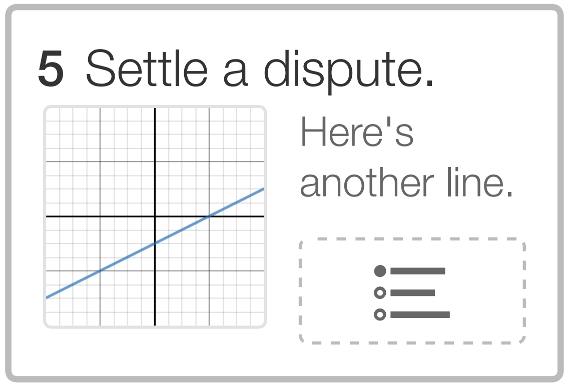


3 Sketch a line with …



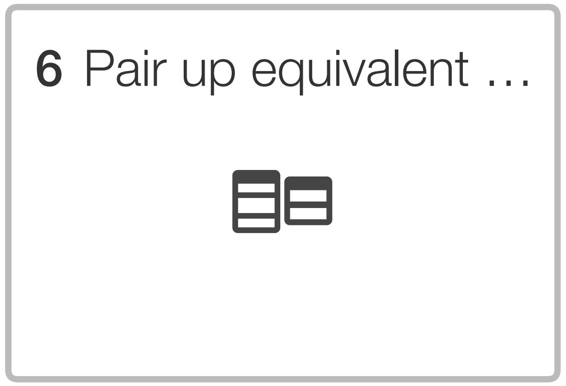
4 Consider the line.

Here’s what another

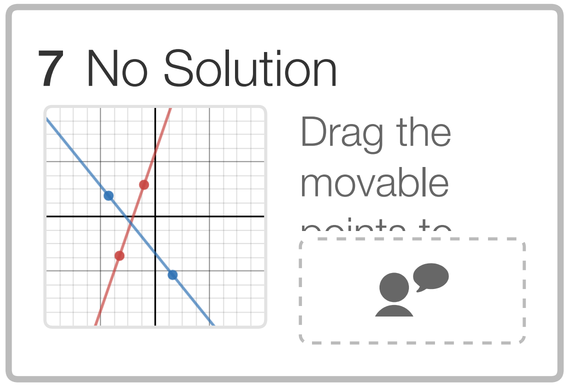


5 Settle a dispute.

Here's another line.

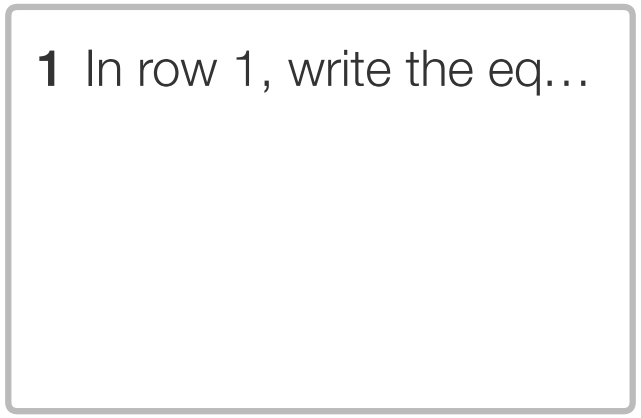


6 Pair up equivalent …



7 No Solution

Drag the movable



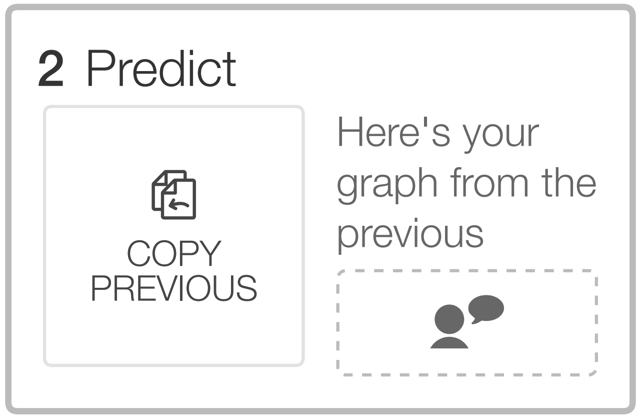
1 In row 1, write the eq…

Teacher Tip:

Using Screen 1 in combination with Screen 2:

Pause. Show overlay. Ask students to change their answers to show the starburst.

My Notes:



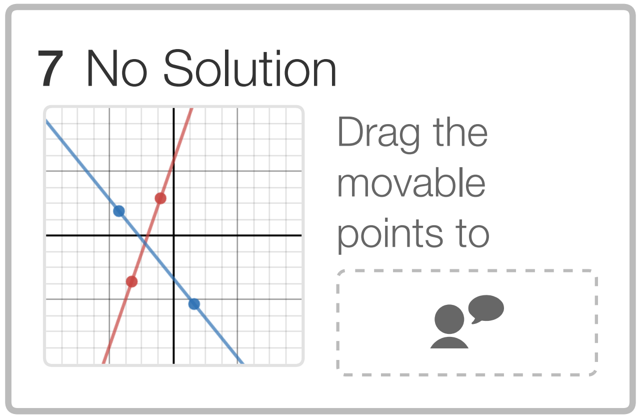
2 Predict

Here's your graph from the previous

Here's your graph from the previous screen.

What would it look like if all of your classmates' lines were shown on the same coordinate plane?

My Notes:



7 No Solution

Drag the movable points to

Drag the movable points to create a system of linear equations with no solution.

What do you notice about the slopes of the lines?

My Notes:

Summary Notes:

Principles for

Building

Facilitating

@mjfenton

Principles for Building Effective Digital Tasks

1. Connect representations.

2. Create an intellectual need for new mathematical skills.

3. Integrate strategy and practice.

4. Create activities that are easy to start, difficult to finish.

Read the rest here: bit.ly/desmos-building-code

Round 1

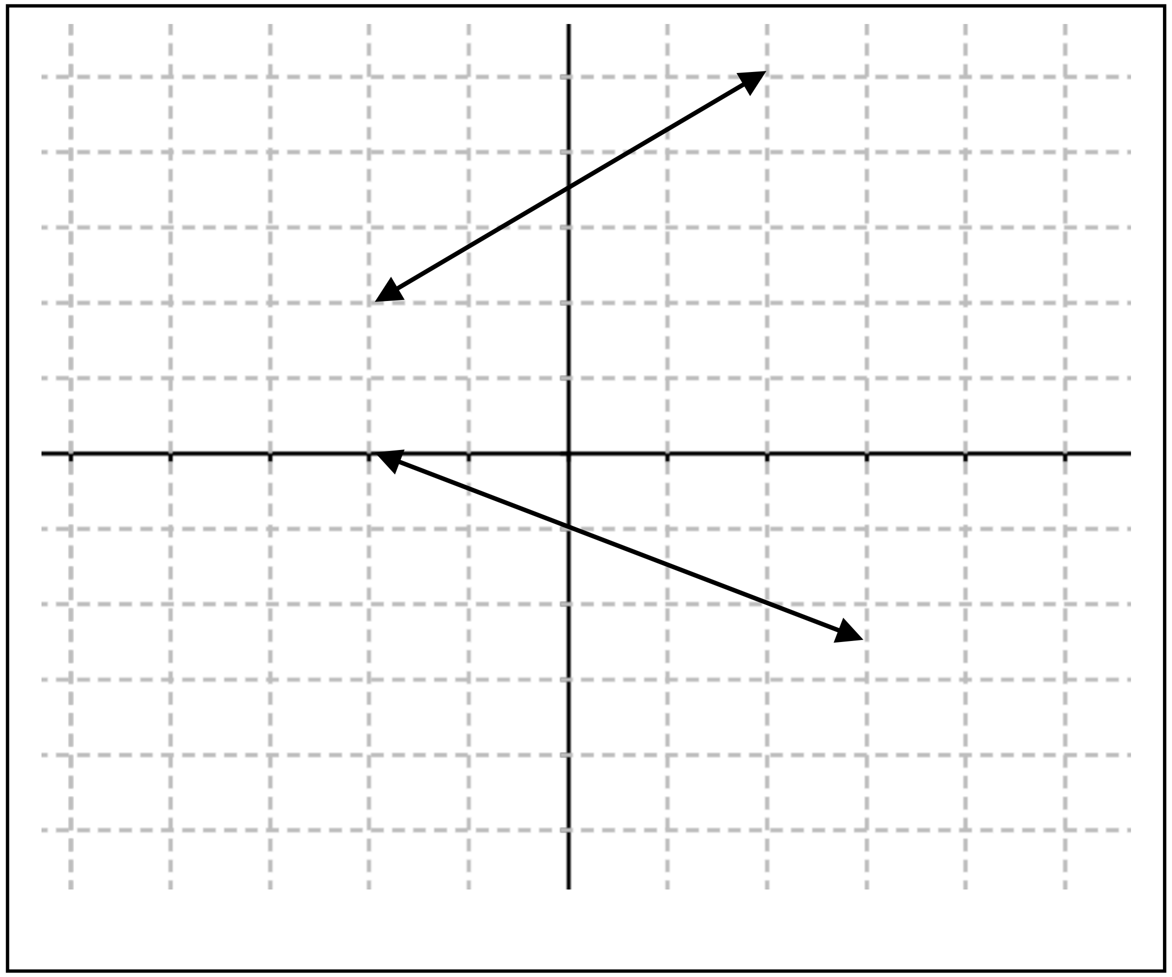
Algebra 1 – Module 5: Systems of Equations
S – 2.1: Introduction to Systems of Equations

Name ___________________________________
Per _____ Date ____________________________

1a) Determine the equations of the lines graphed in the coordinate plane to the right.

The points (-2, 2) and (2, 5) lie on the line above.

The points (-2, 0), (0, -1), and (2, -2) lie on the line below.



1b) Where will the two lines cross?

2) What are the slopes of the following lines? Show how you arrived at your answer.

a) $2x + y = 9$

b) $-4x - 7y = 8$

c) $x - 3y = -24$

3a) Find the equation of a line that passes through (0, 5) that **does not** intersect $y = 2x - 3$. Show or

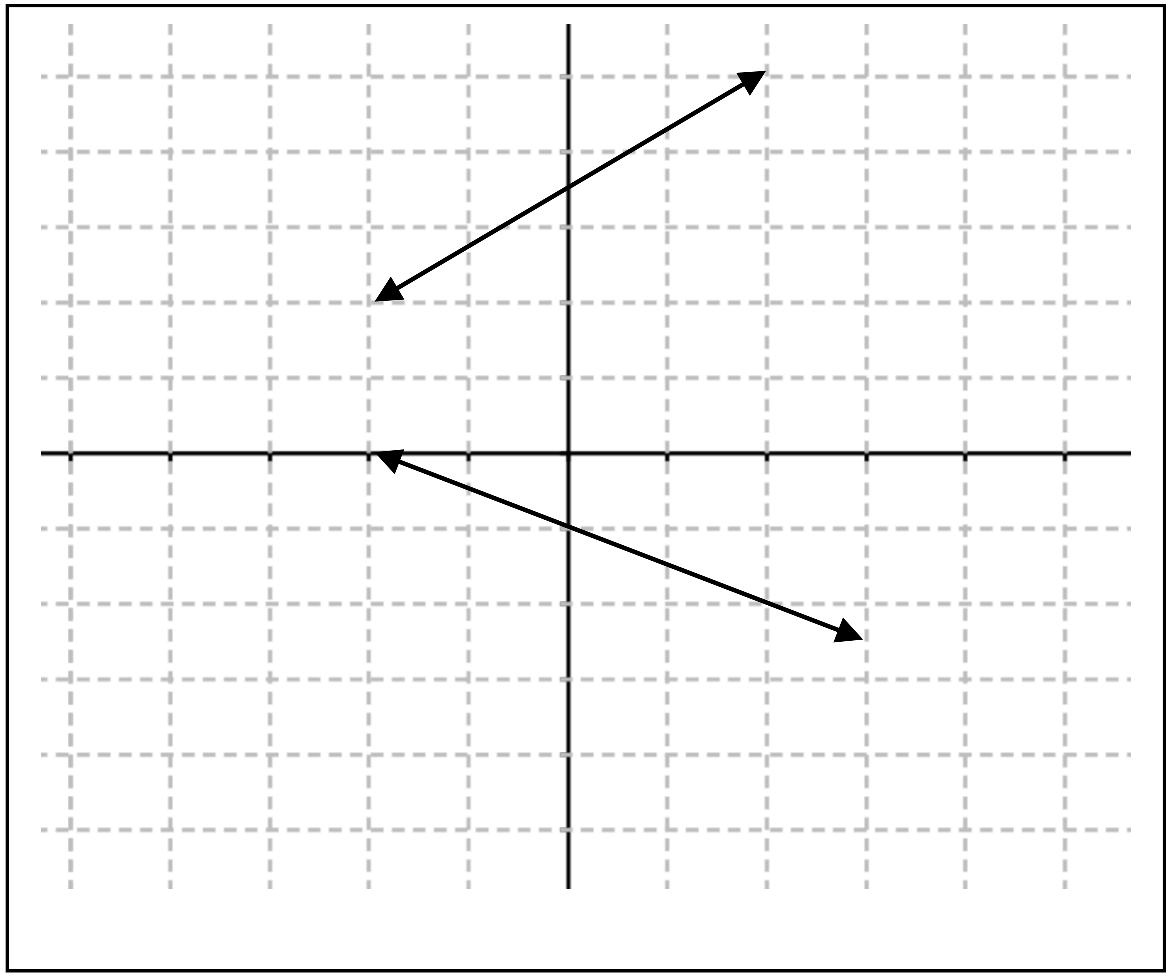
Algebra 1 – Module 5: Systems of Equations
S – 2.1: Introduction to Systems of Equations

Name ______________________________
Per _____ Date _______________________

1a) Determine the equations of the lines graphed in the coordinate plane to the right.

The points (-2, 2) and (2, 5) lie on the line above.

The points (-2, 0), (0, -1), and (2, -2) lie on the line below.



1b) Where will the two lines cross?

2) What are the slopes of the following lines? Show how you arrived at your answer.

a) $2x + y = 9$

b) $-4x - 7y = 8$

c) $x - 3y = -24$

3a) Find the equation of a line that passes through (0, 5) that **does not** intersect $y = 2x - 3$. Show or ons Name ______________________________

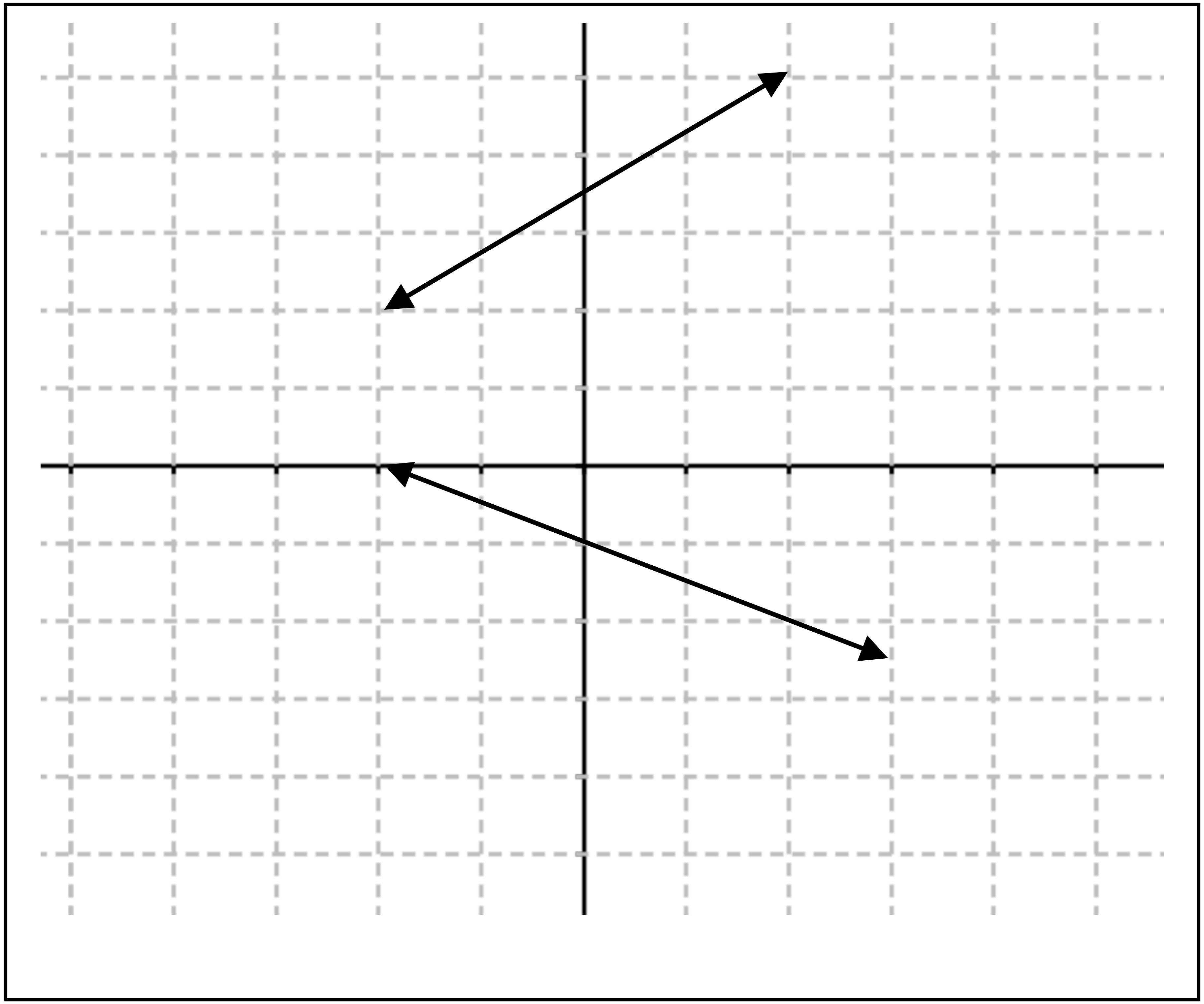
ons Per ______ Date ________________________

es graphed

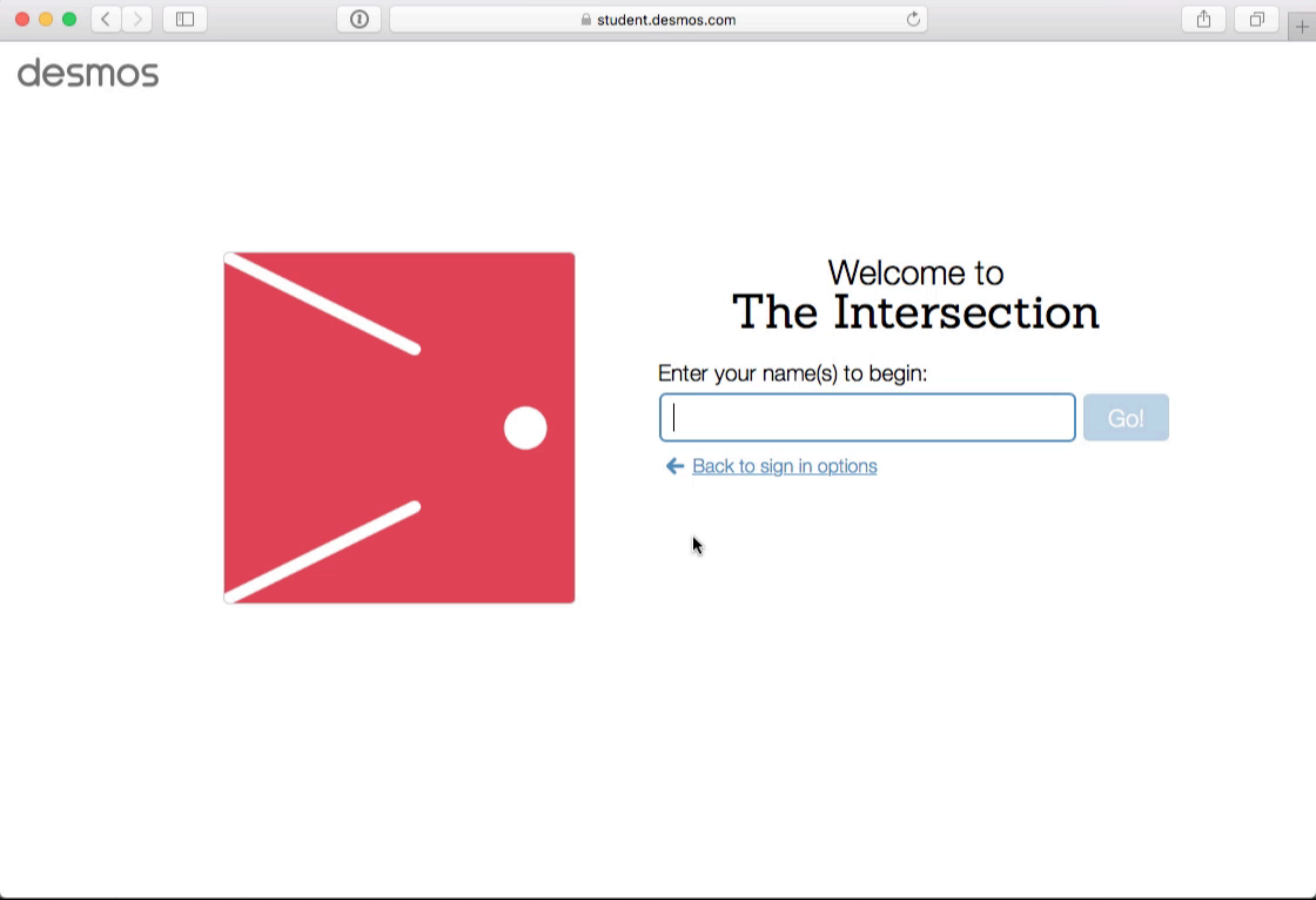
l.

on the

2, -2) lie

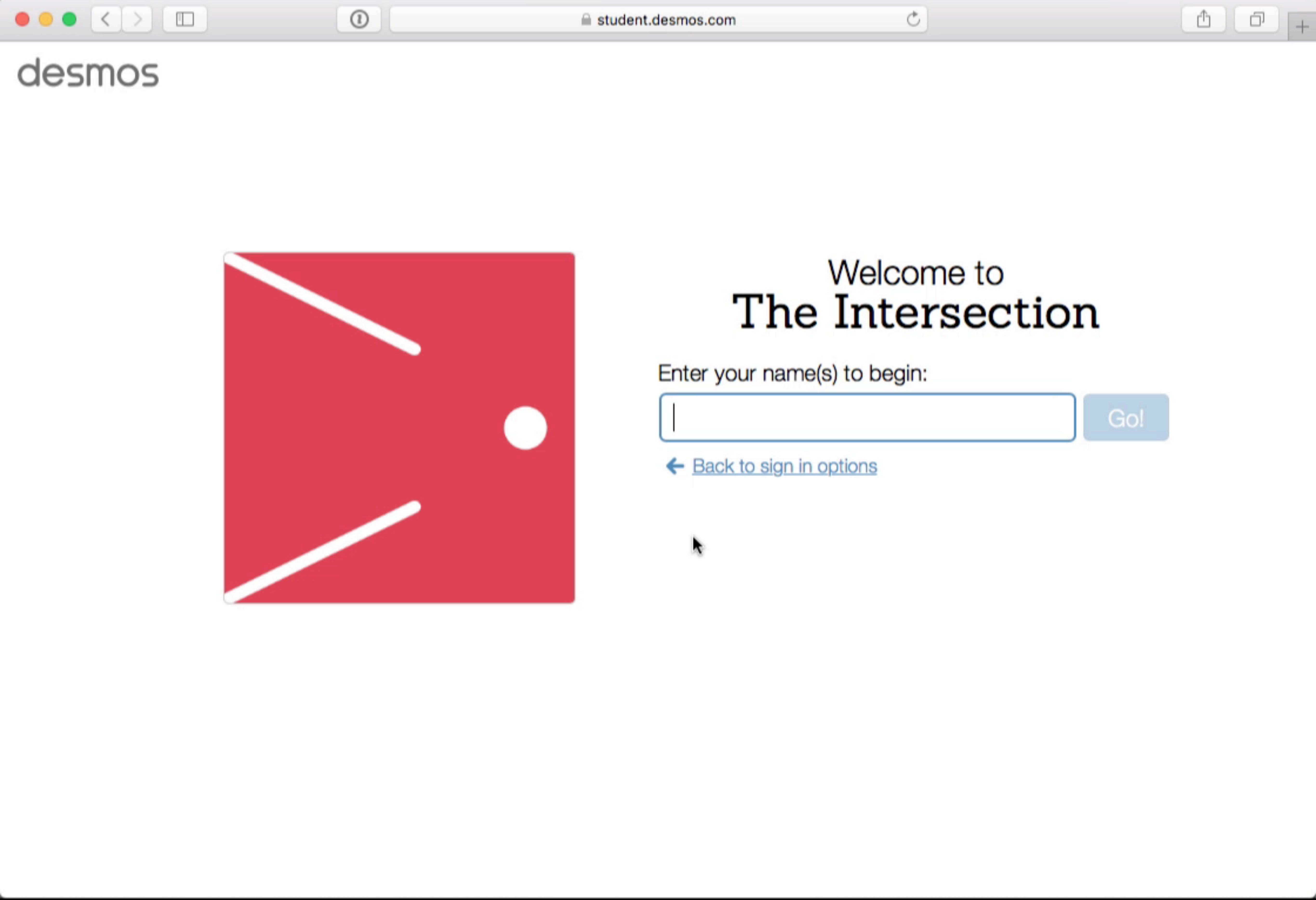


g lines? Show how you arrived at your answer.



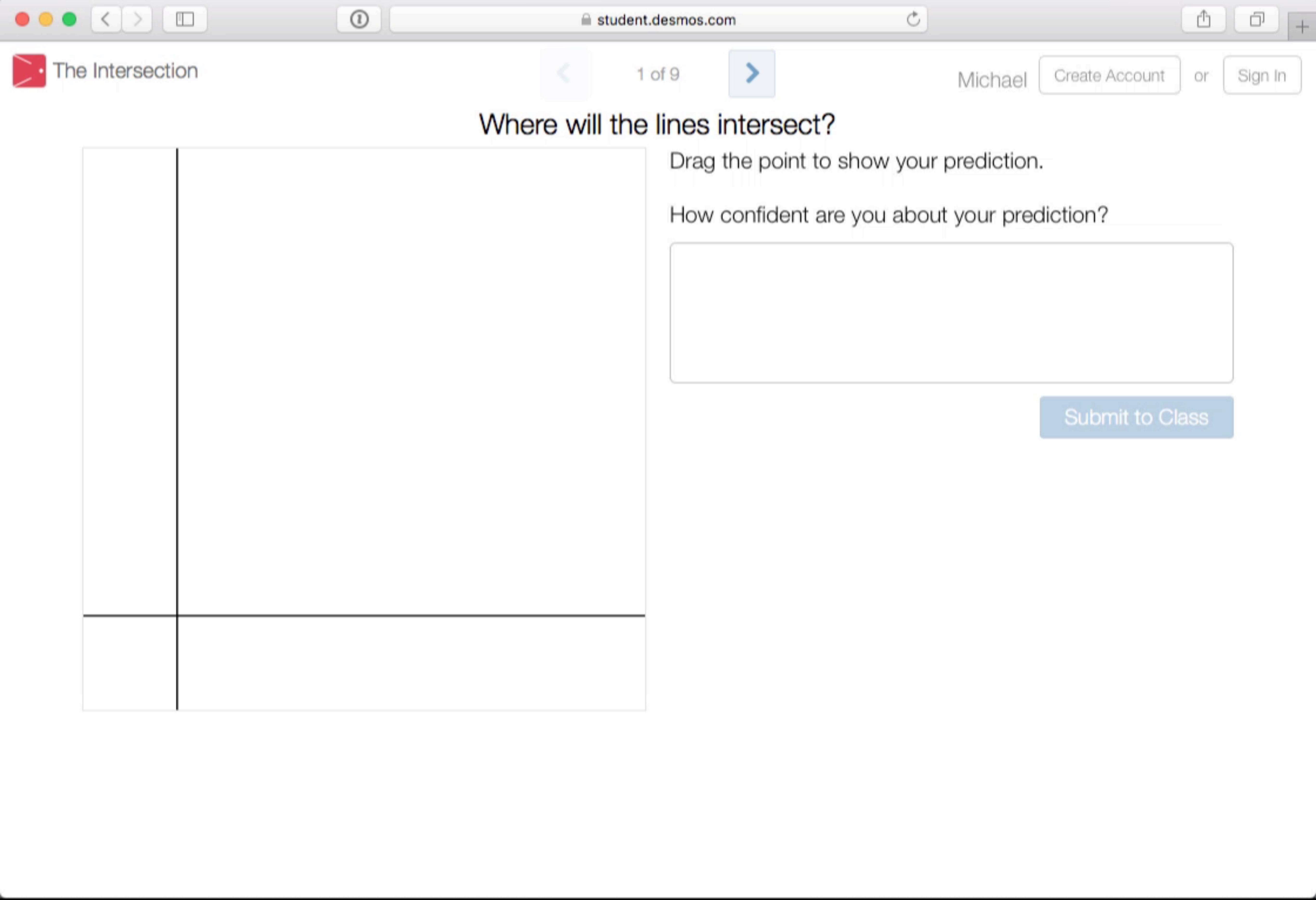
Welcome to
The Intersection

Enter your name(s) to begin:



Welcome to
The Intersection

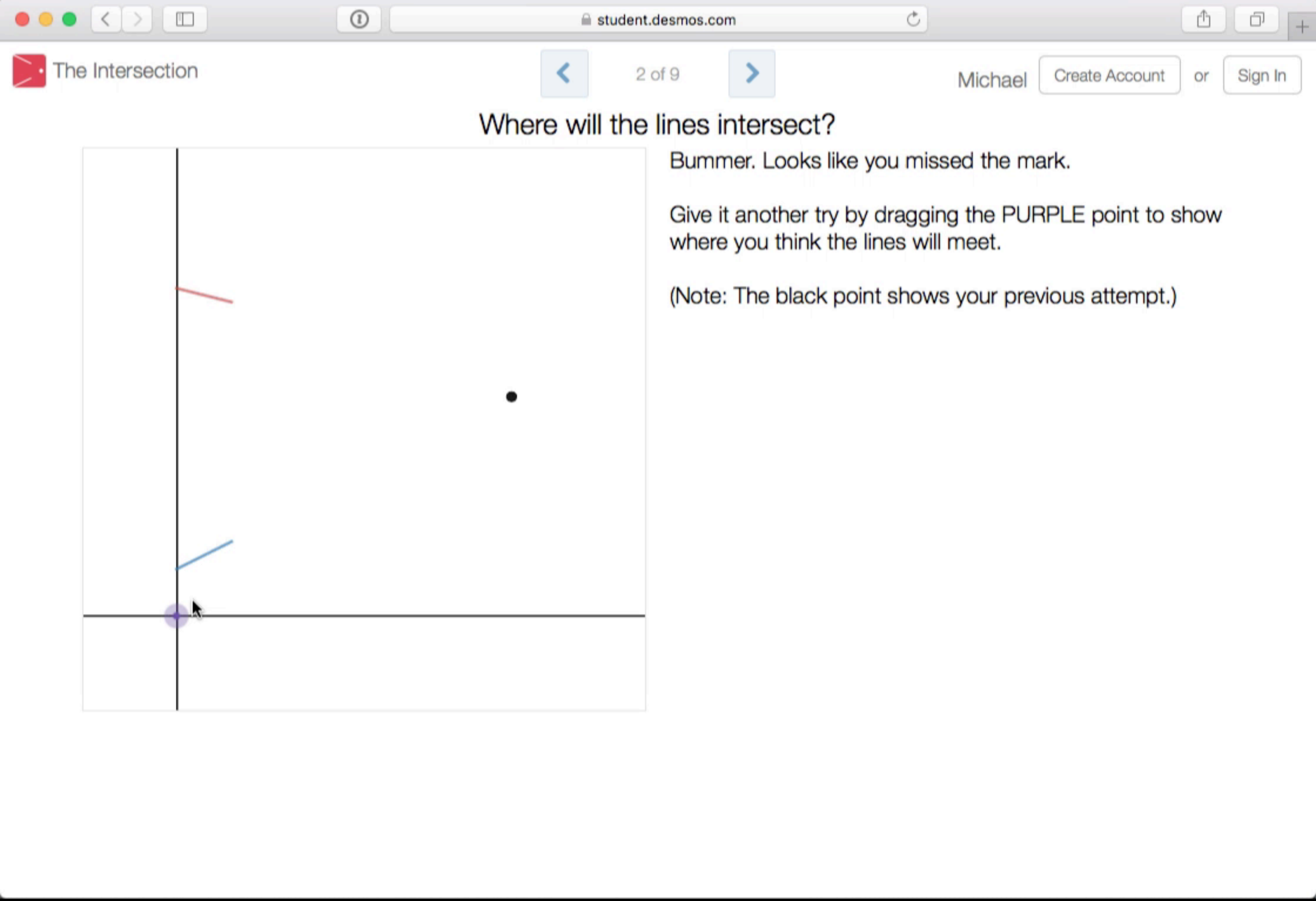
Enter your name(s) to begin:



Where will the lines intersect?

Drag the point to show your prediction.

How confident are you about your prediction?

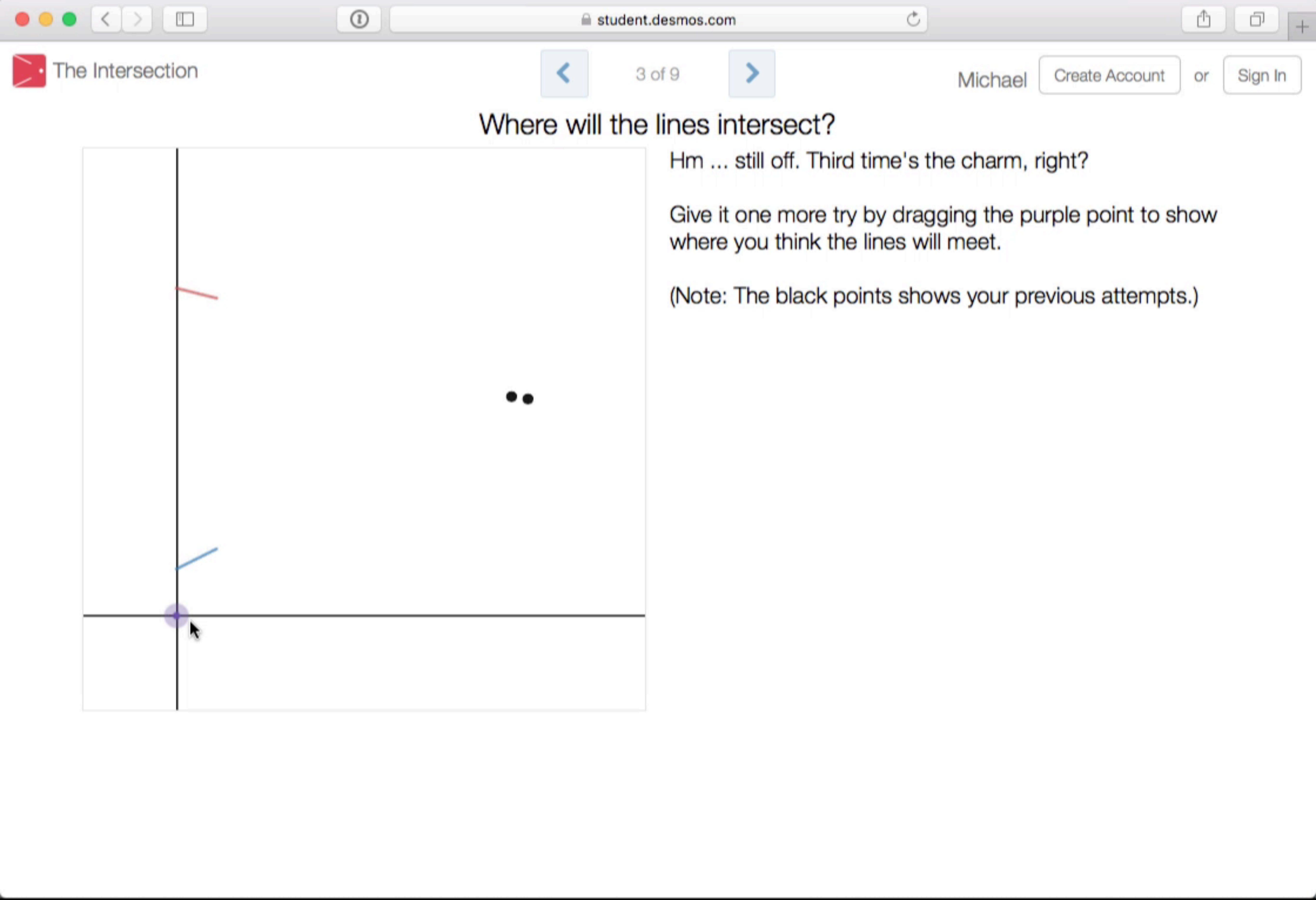


Where will the lines intersect?

Bummer. Looks like you missed the mark.

Give it another try by dragging the PURPLE point to show where you think the lines will meet.

(Note: The black point shows your previous attempt.)

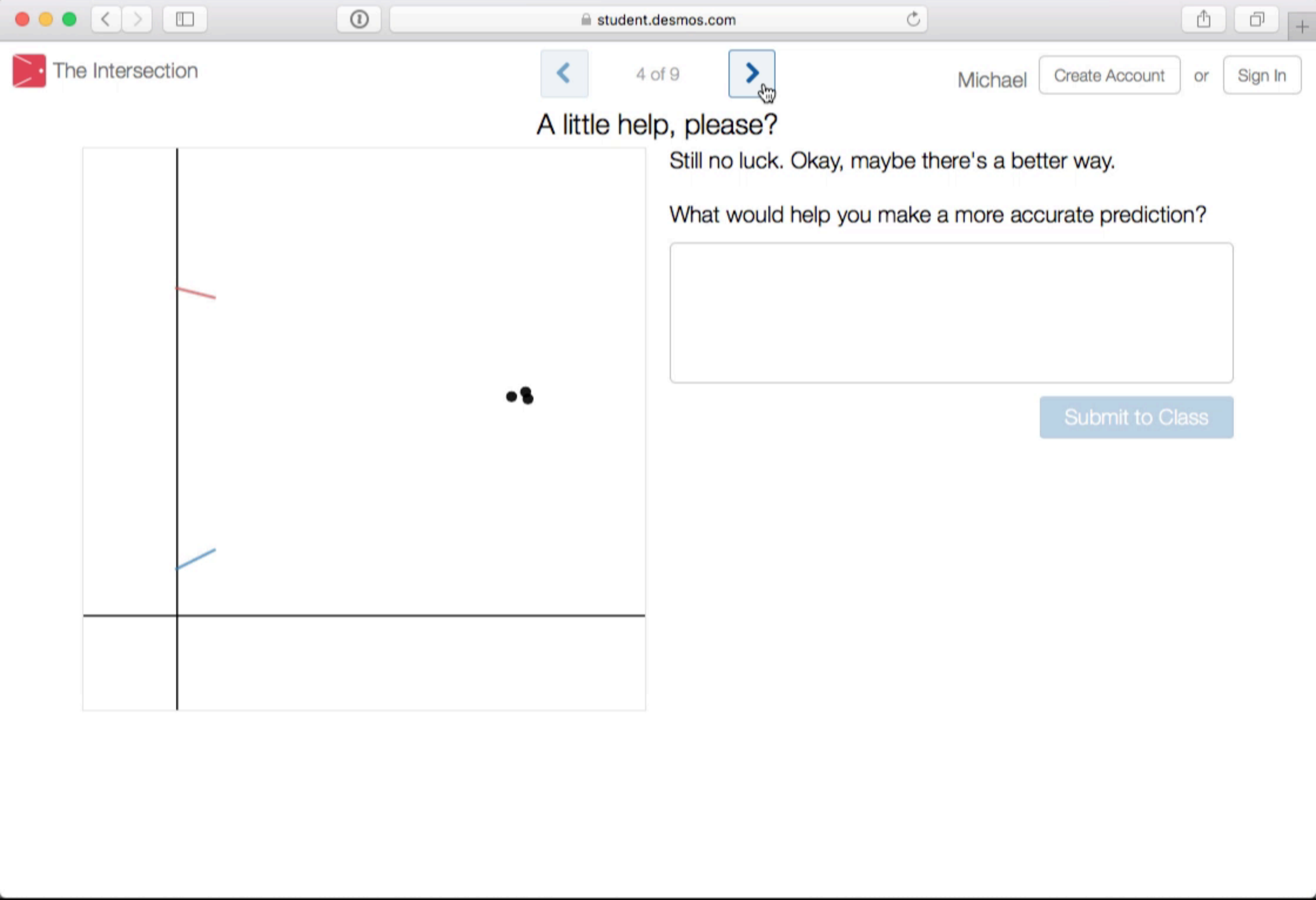


Where will the lines intersect?

Hm ... still off. Third time's the charm, right?

Give it one more try by dragging the purple point to show where you think the lines will meet.

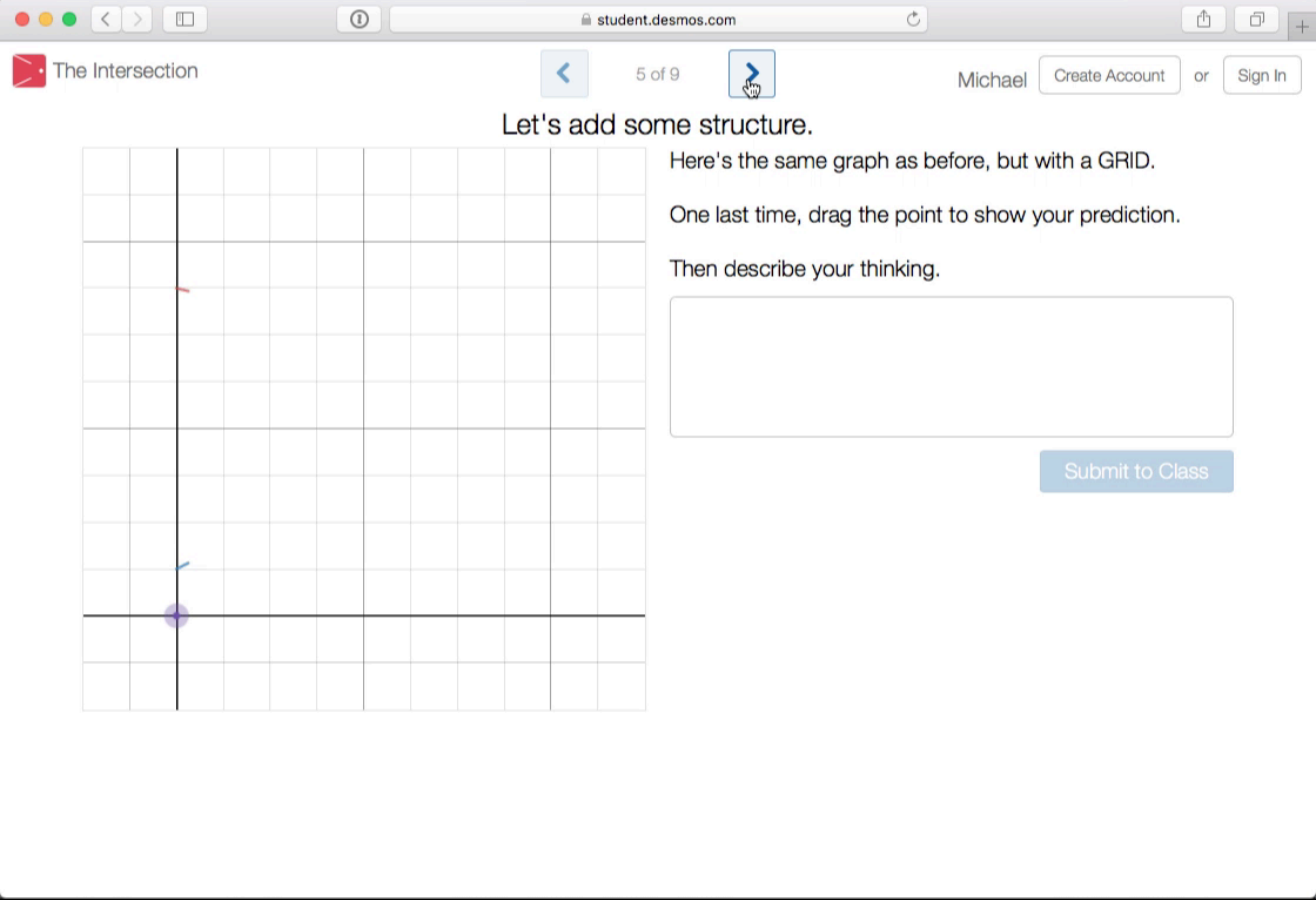
(Note: The black points shows your previous attempts.)



A little help, please?

Still no luck. Okay, maybe there's a better way.

What would help you make a more accurate prediction?

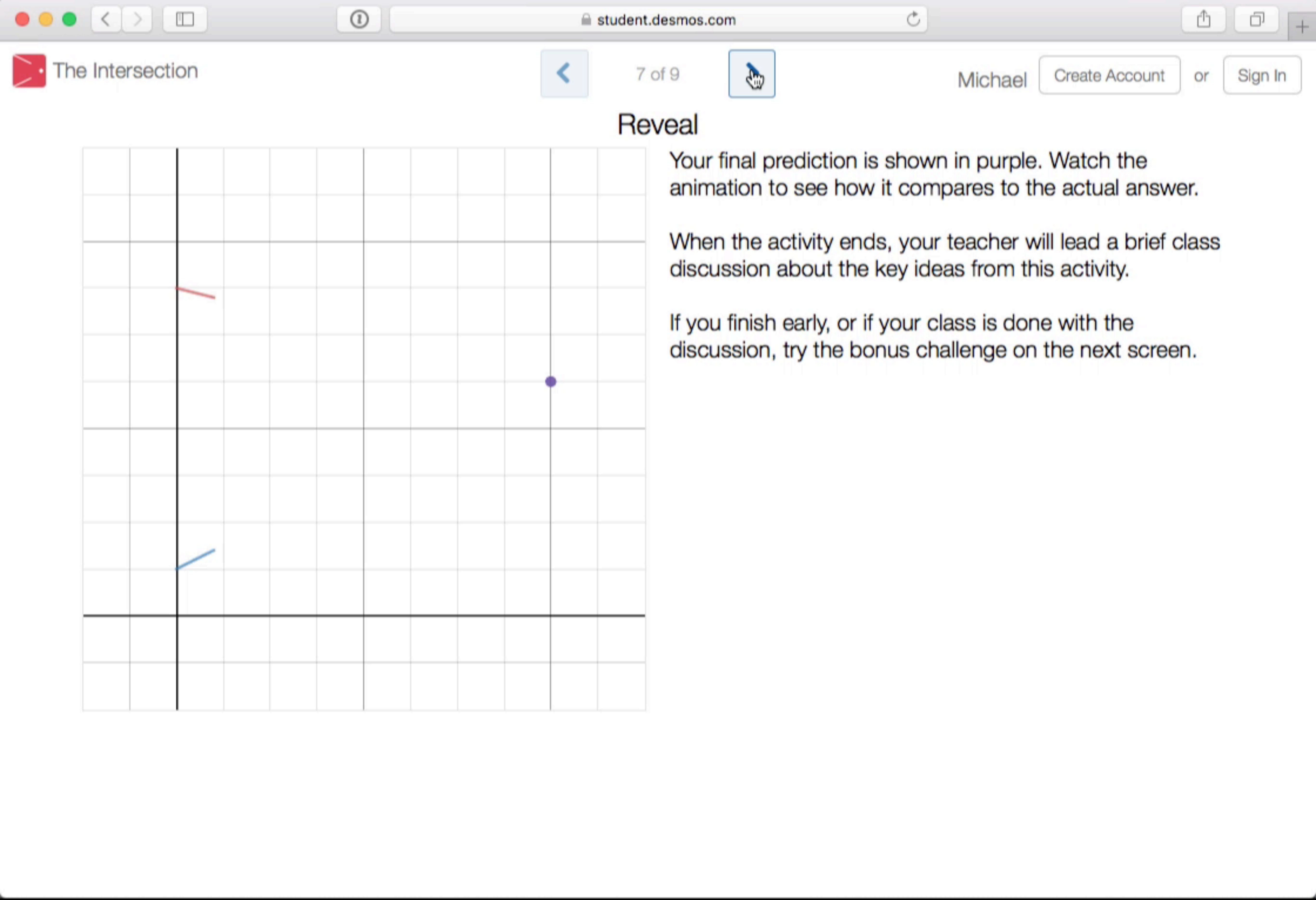


Let's add some structure.

Here's the same graph as before, but with a GRID.

One last time, drag the point to show your prediction.

Then describe your thinking.

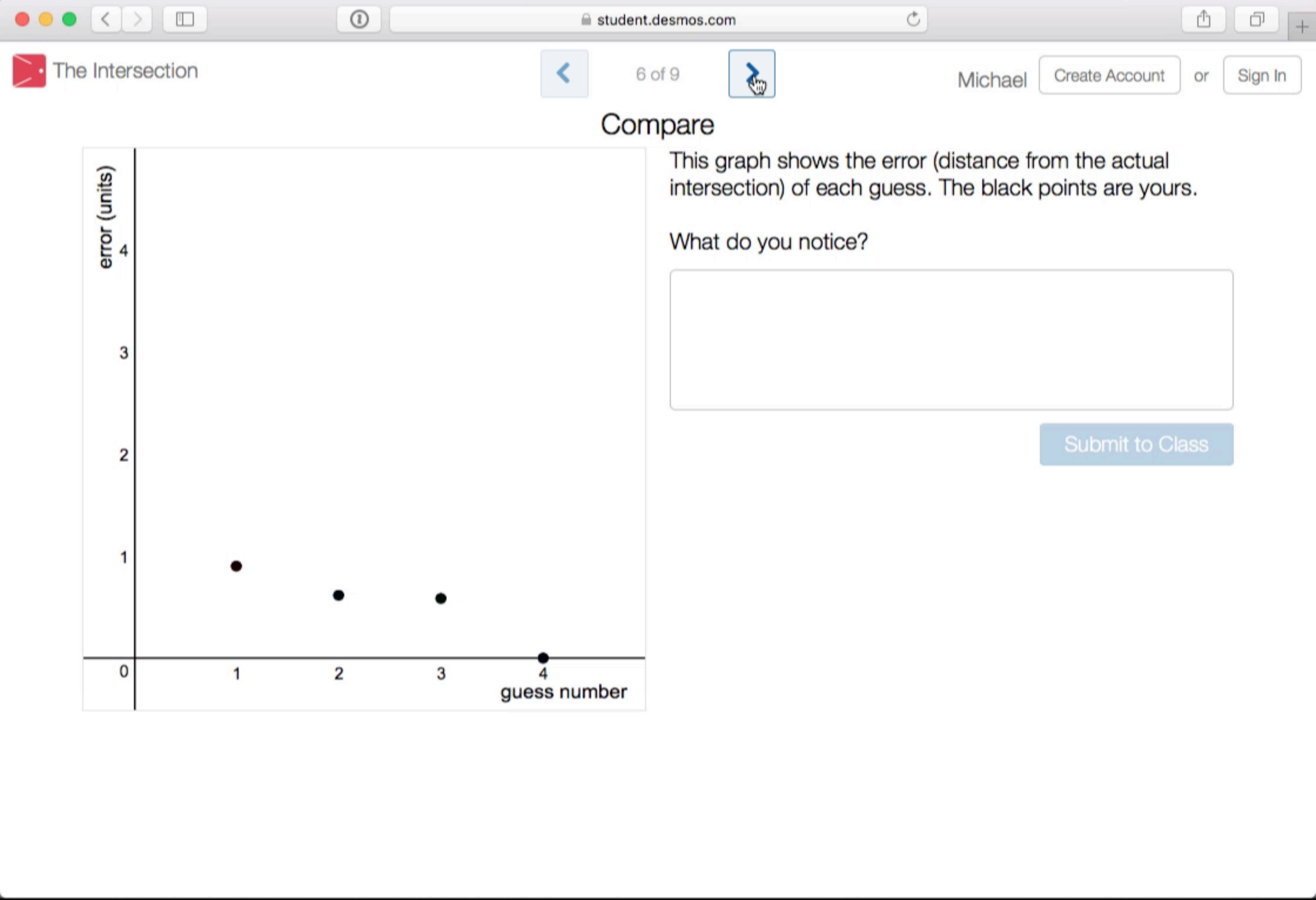


Reveal

Your final prediction is shown in purple. Watch the animation to see how it compares to the actual answer.

When the activity ends, your teacher will lead a brief class discussion about the key ideas from this activity.

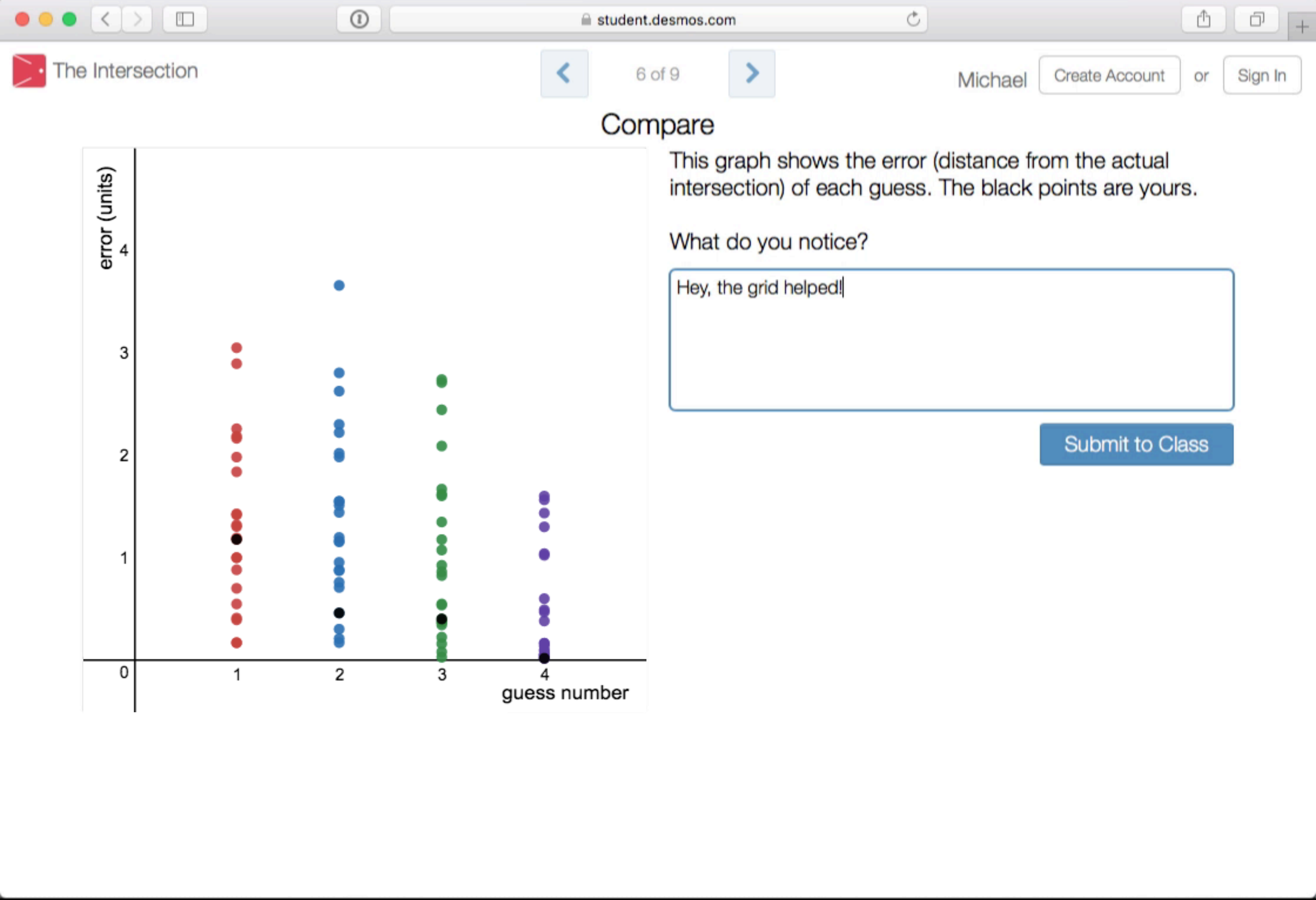
If you finish early, or if your class is done with the discussion, try the bonus challenge on the next screen.



Compare

This graph shows the error (distance from the actual intersection) of each guess. The black points are yours.

What do you notice?



Compare

This graph shows the error (distance from the actual intersection) of each guess. The black points are yours.

What do you notice?

Hey, the grid helped!

Connect representations.

Create an intellectual need
for new mathematical skills.

Integrate strategy and practice.

Create activities that are
easy to start, difficult to finish.

Connect representations.

Create an intellectual need for new mathematical skills.

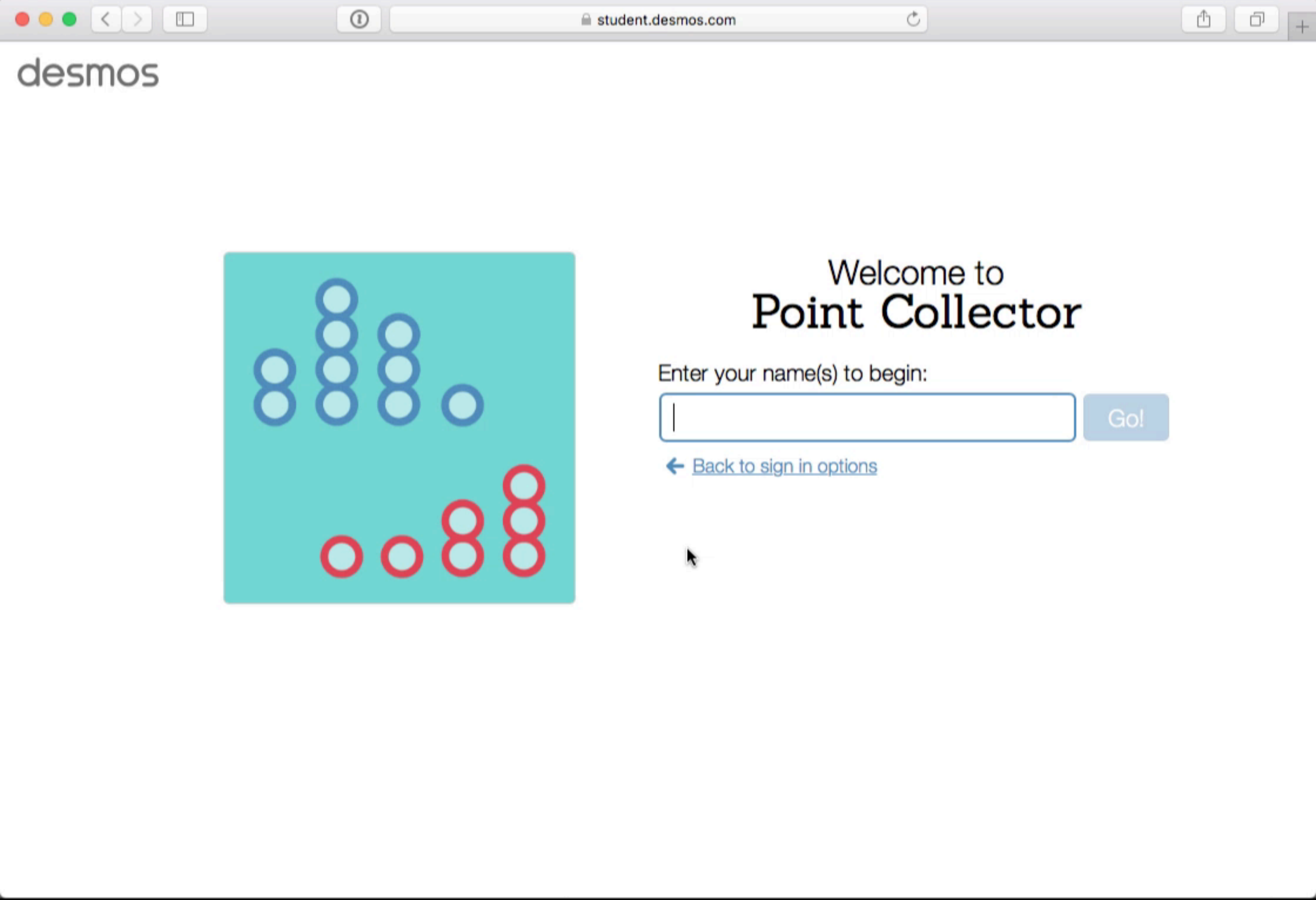
Integrate strategy and practice.

Create activities that are easy to start, difficult to finish.

“If Math Is The **Aspirin**,
Then How Do You
Create The **Headache**?”

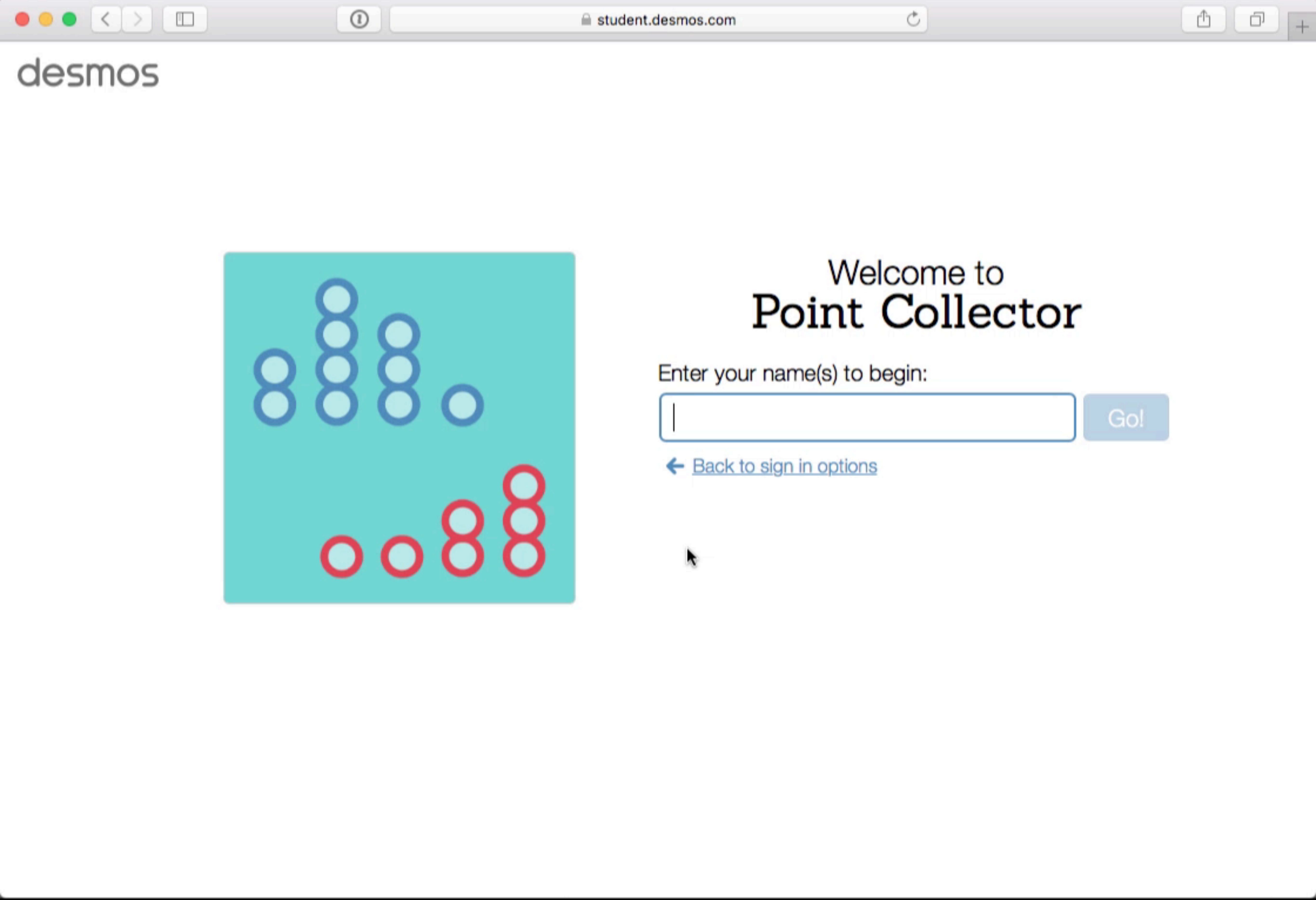
– Dan Meyer

Round 2



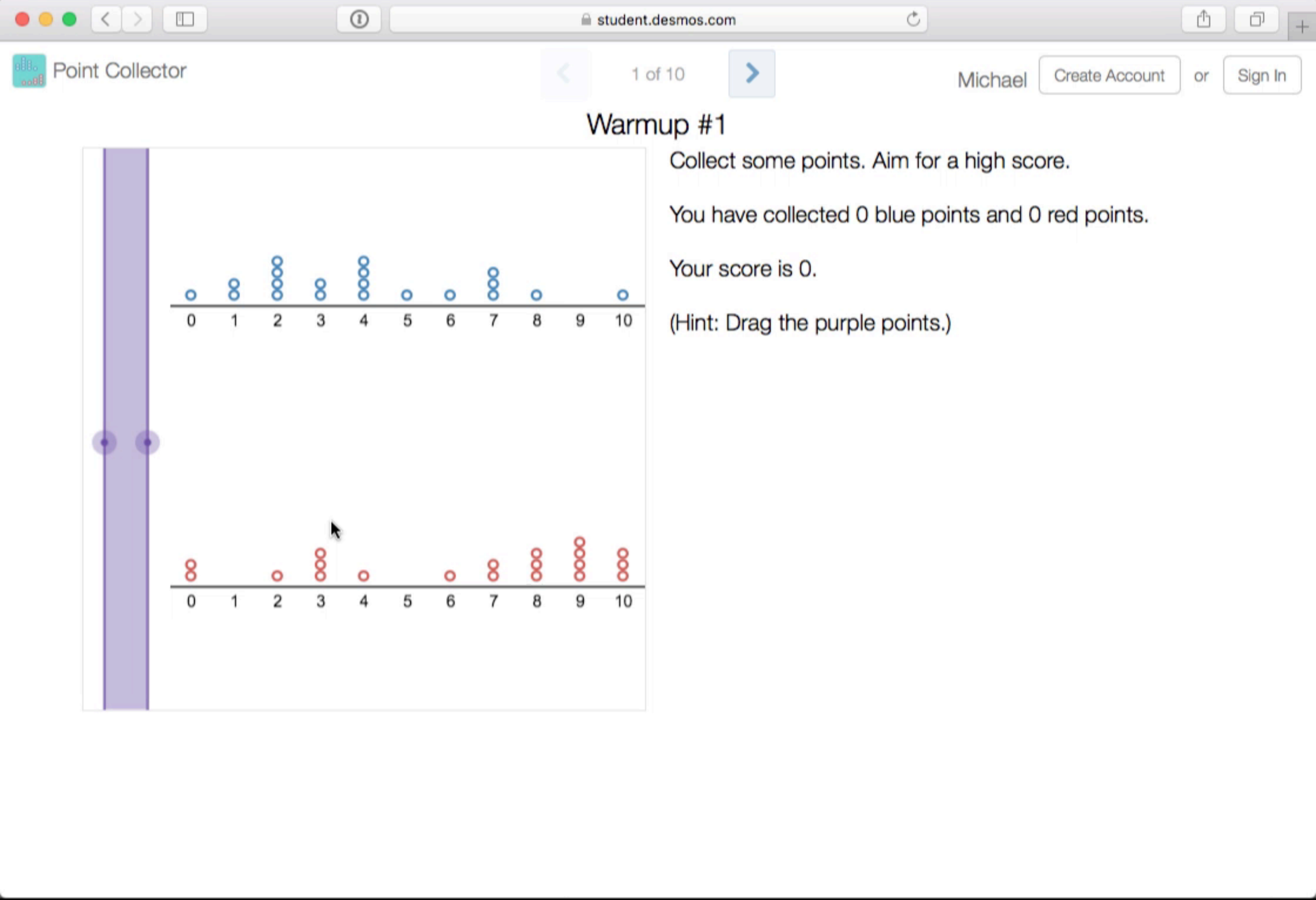
Welcome to
Point Collector

Enter your name(s) to begin:



Welcome to
Point Collector

Enter your name(s) to begin:



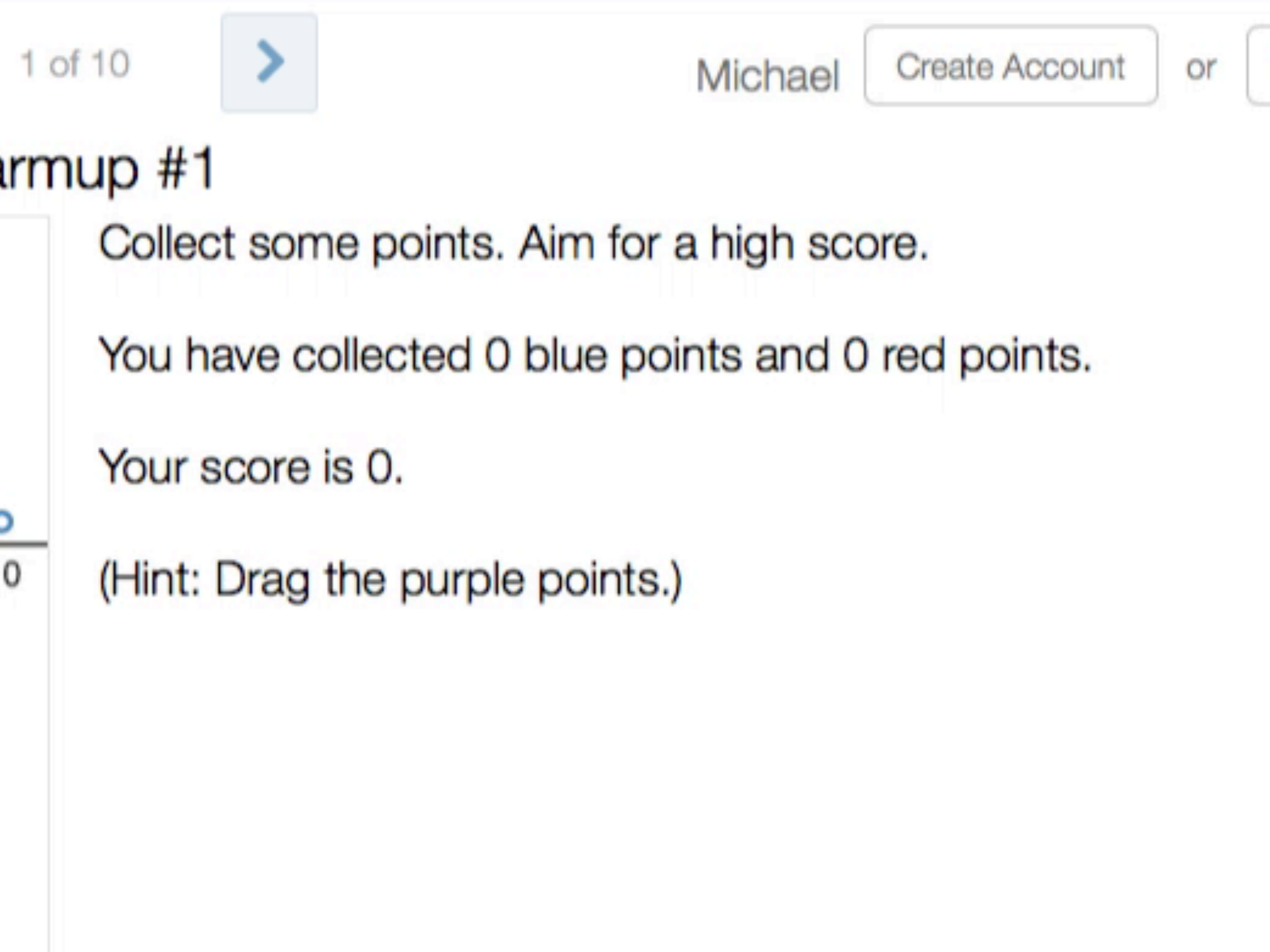
Warmup #1

Collect some points. Aim for a high score.

You have collected 0 blue points and 0 red points.

Your score is 0.

(Hint: Drag the purple points.)



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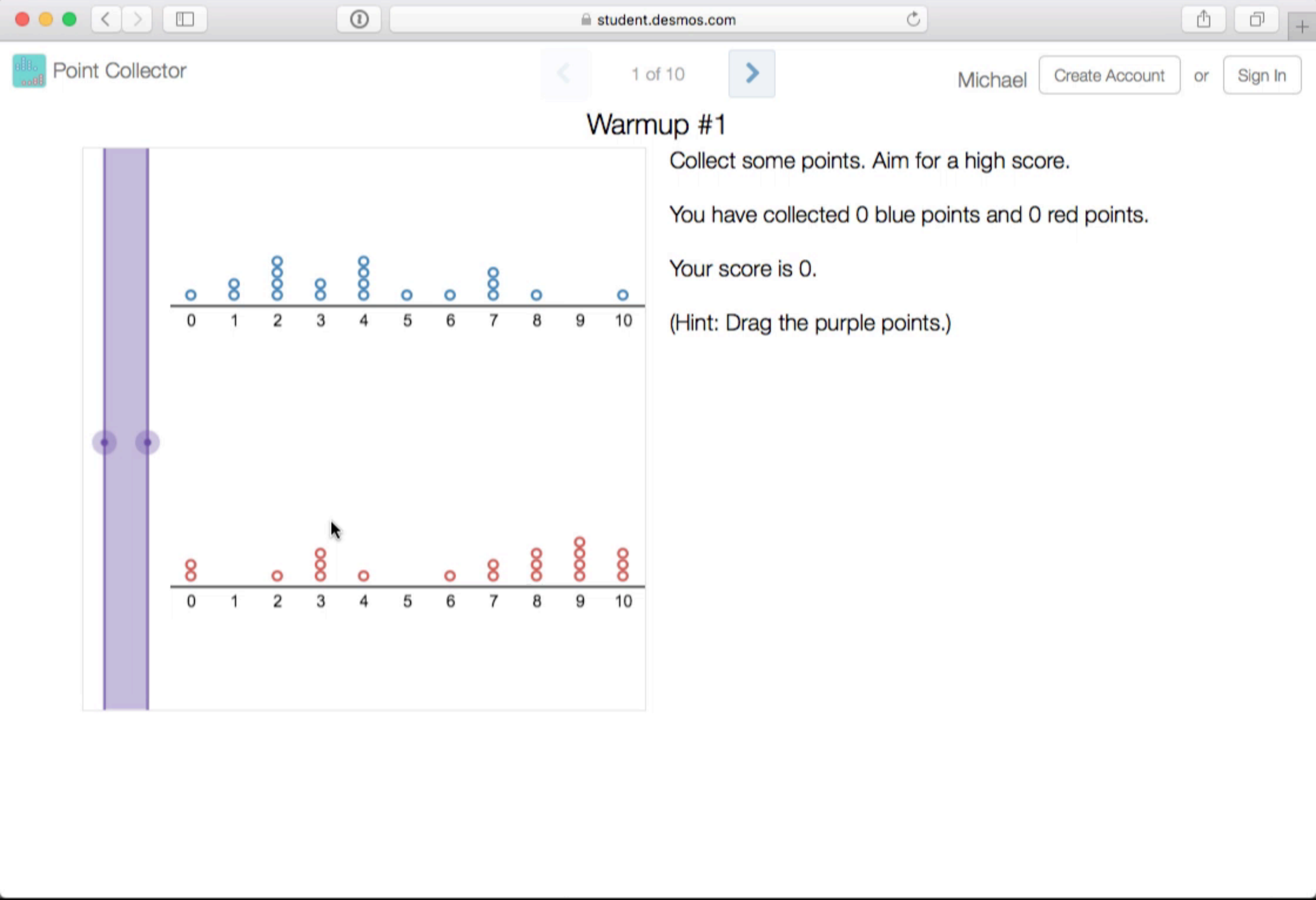

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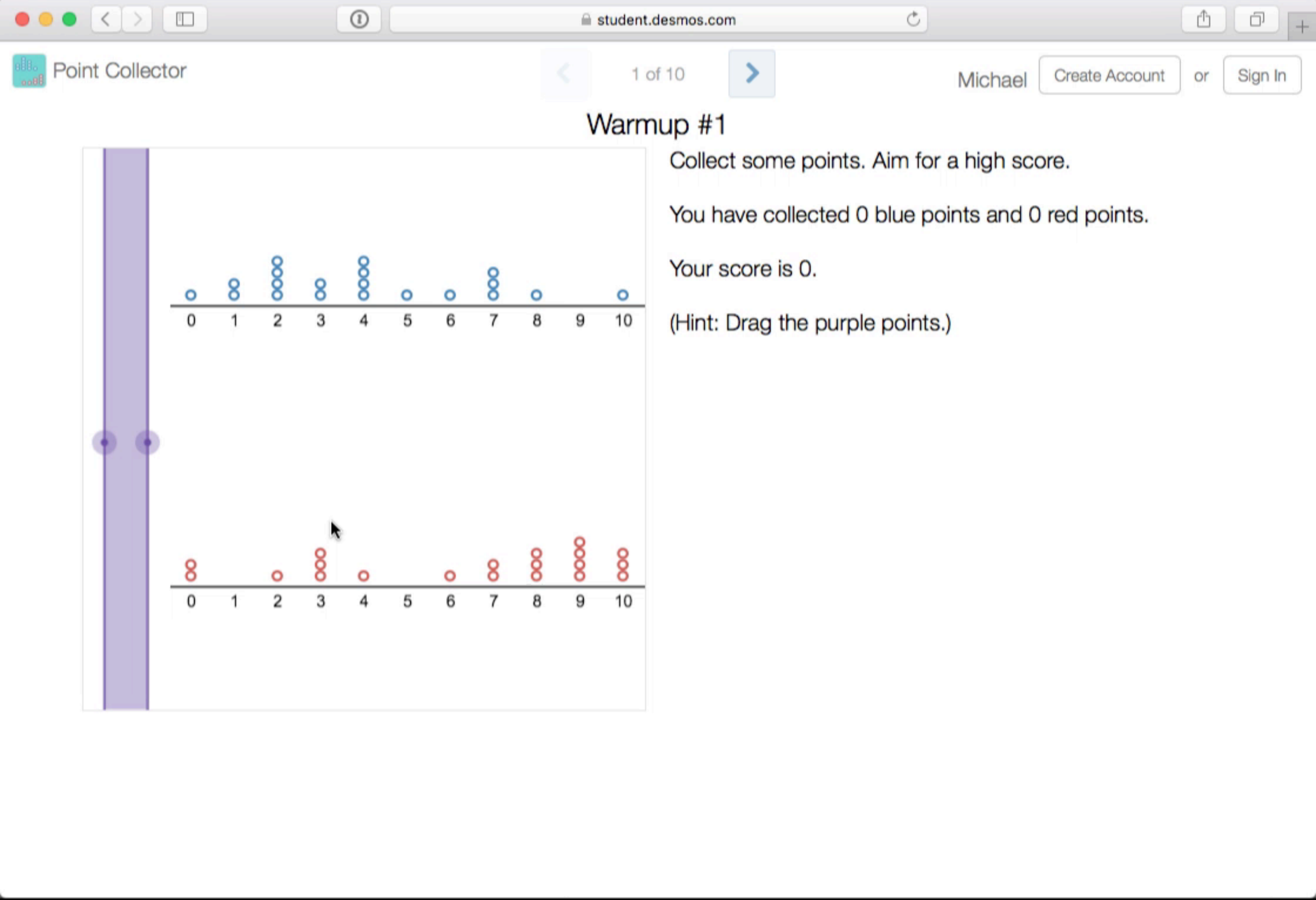


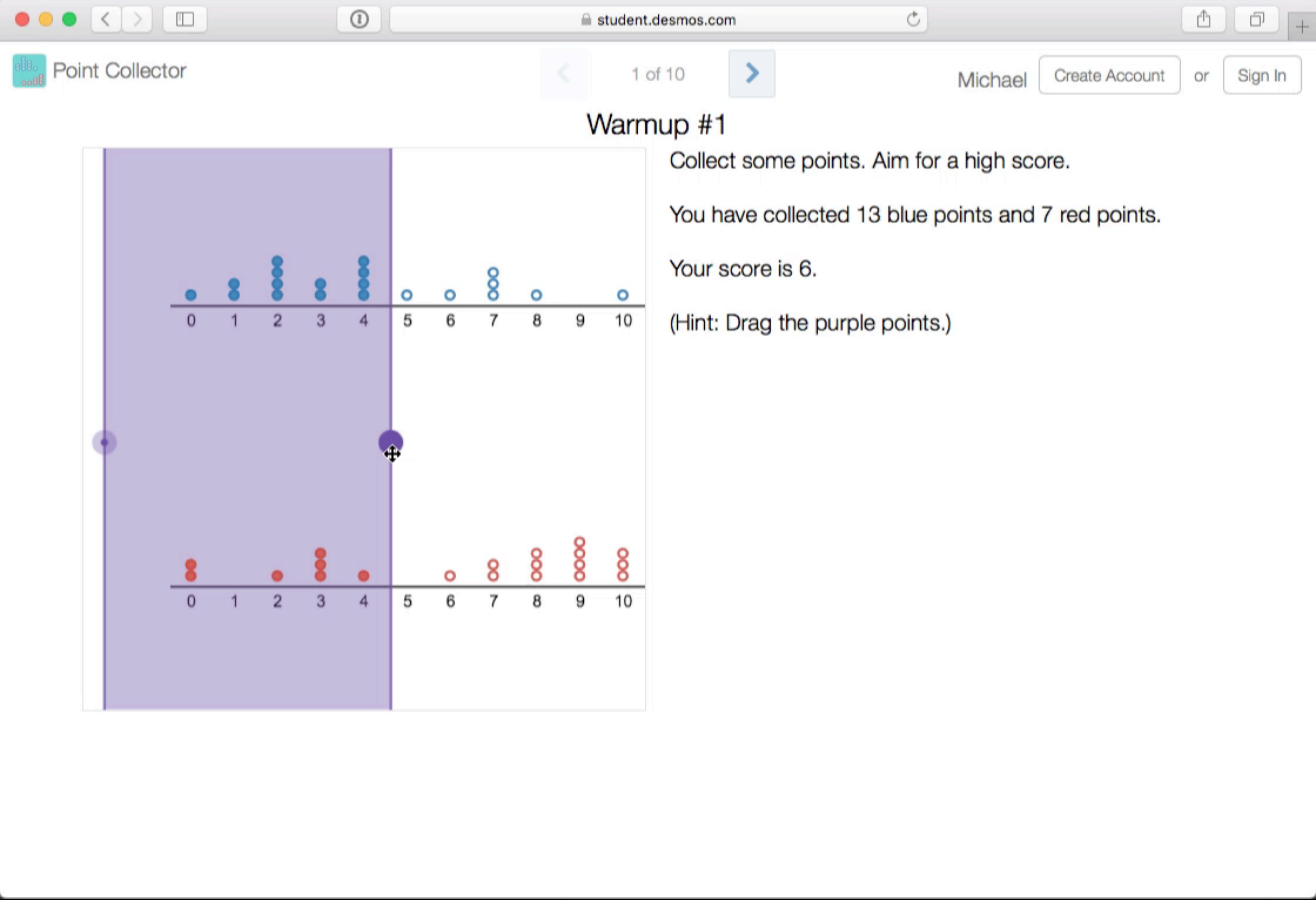
Warmup #1

Collect some points. Aim for a high score.

You have collected 0 blue points and 0 red points.

Your score is 0.

(Hint: Drag the purple points.)



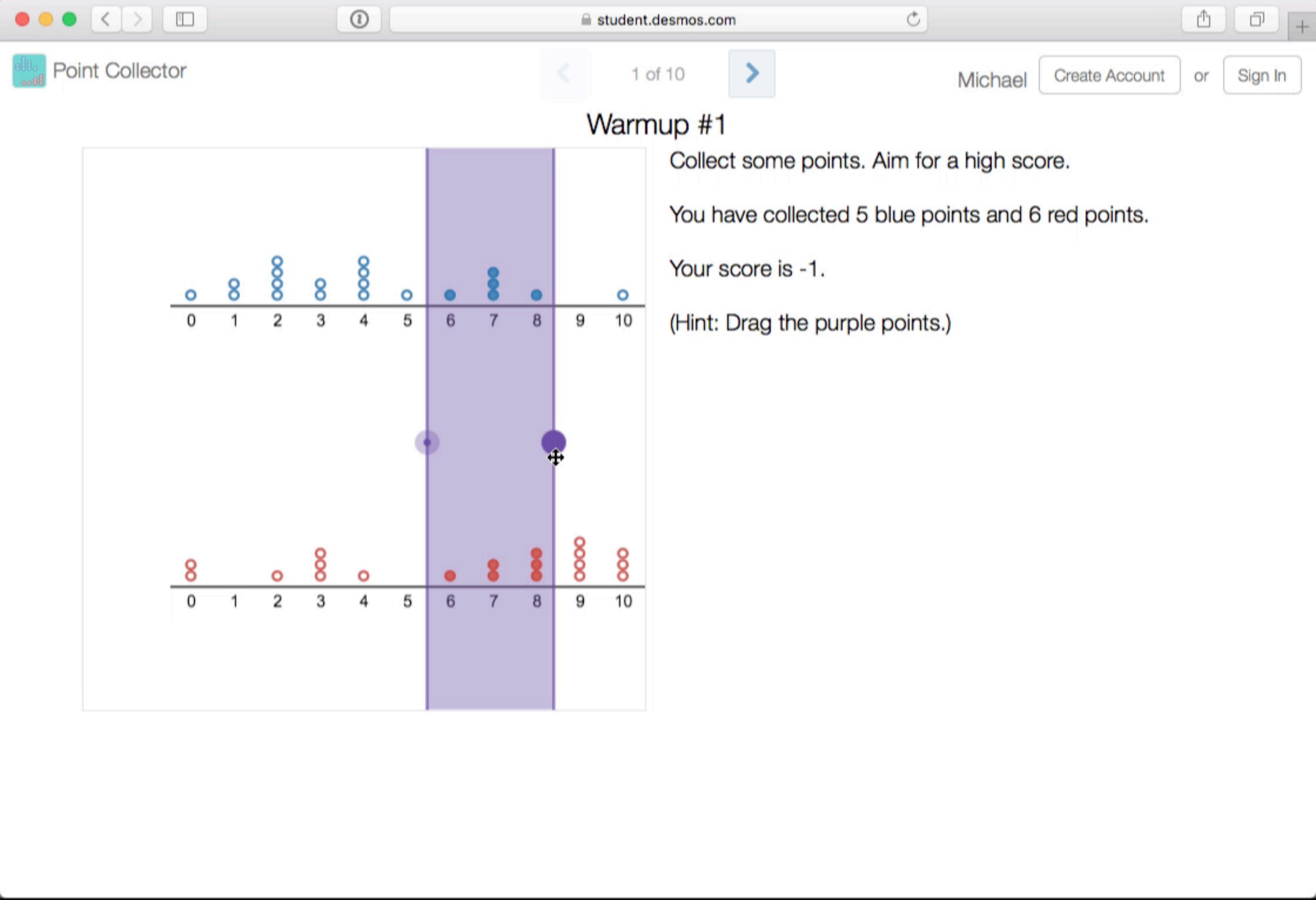
Warmup #1

Collect some points. Aim for a high score.

You have collected 13 blue points and 7 red points.

Your score is 6.

(Hint: Drag the purple points.)



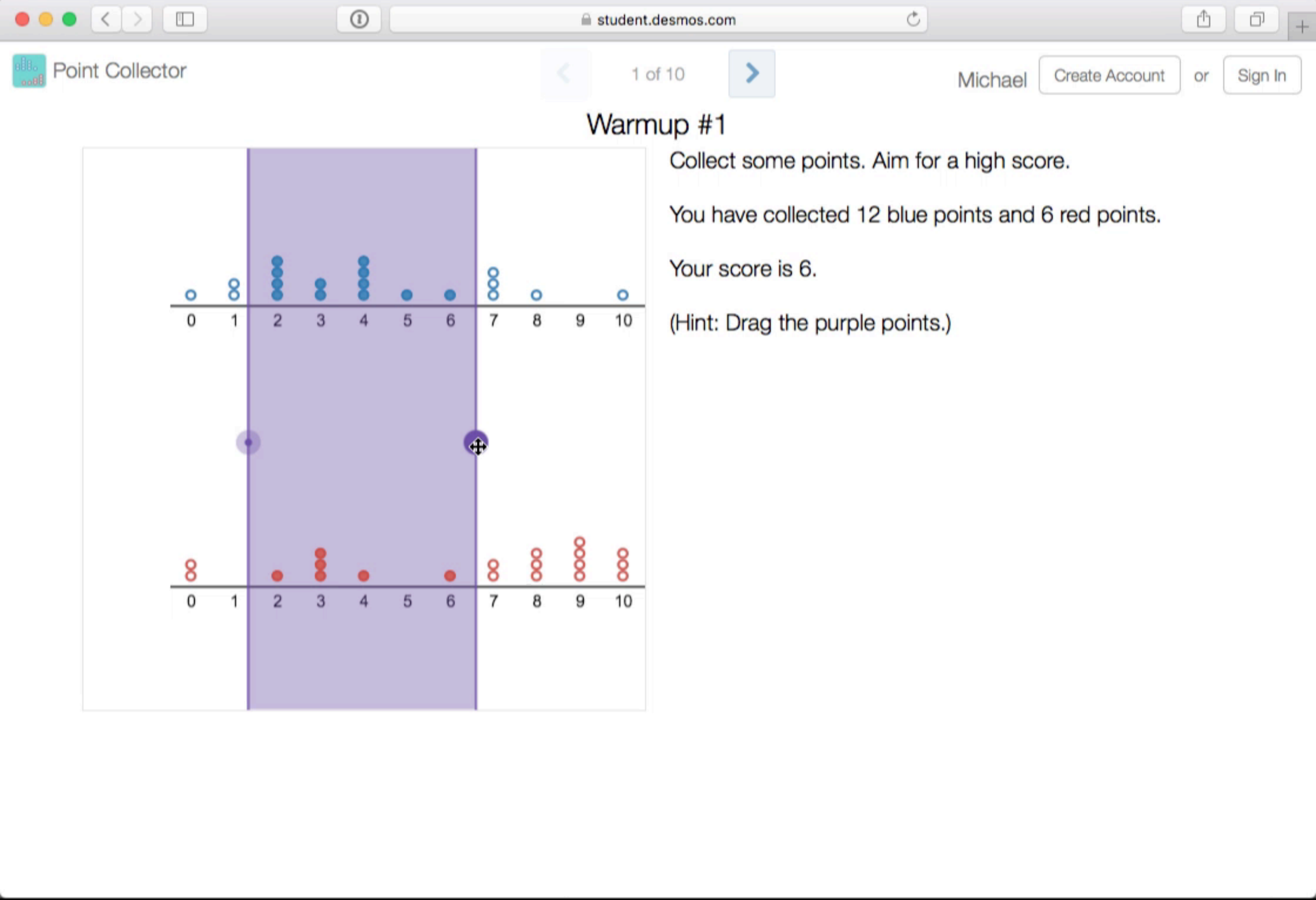
Warmup #1

Collect some points. Aim for a high score.

You have collected 5 blue points and 6 red points.

Your score is -1.

(Hint: Drag the purple points.)



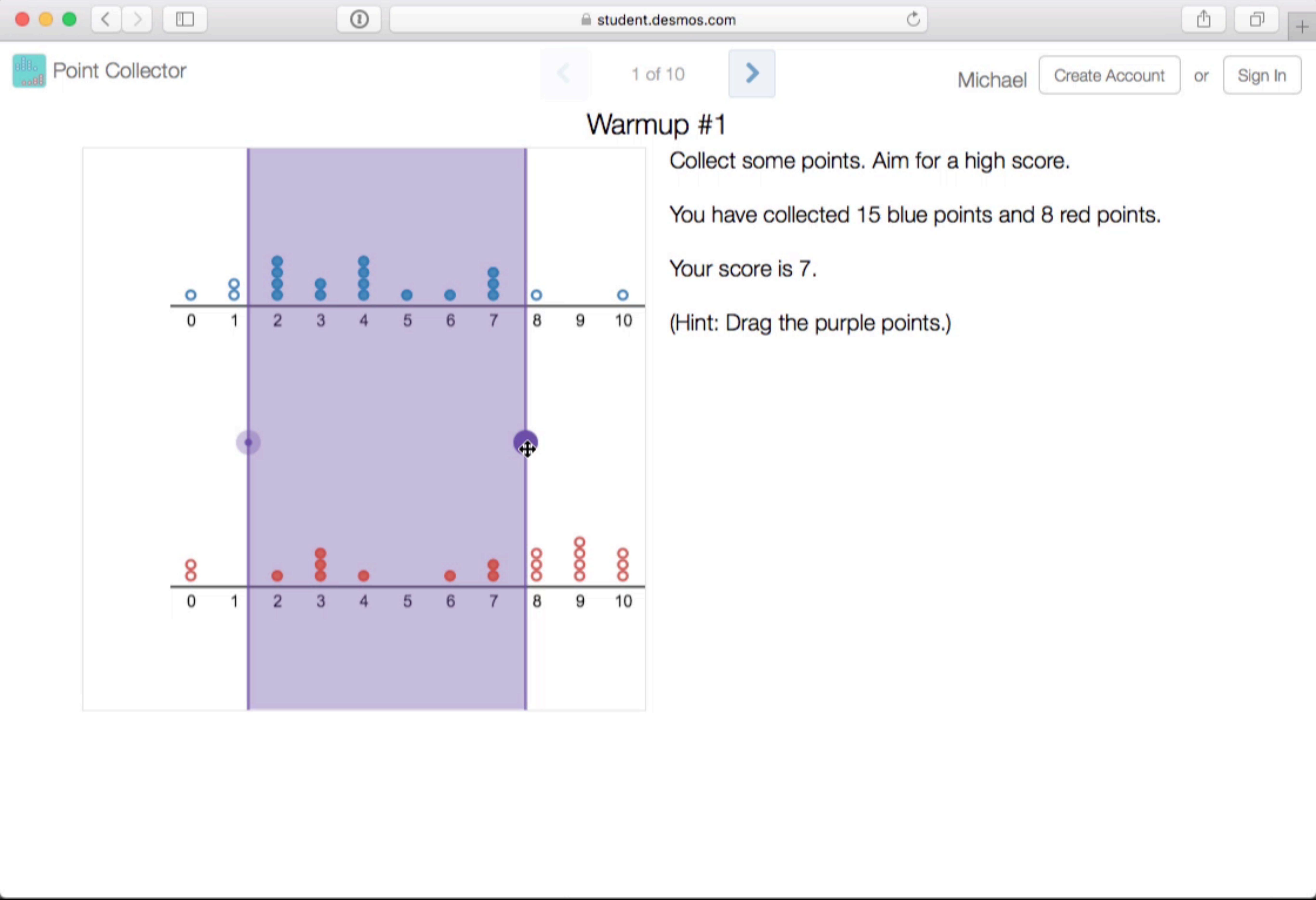
Warmup #1

Collect some points. Aim for a high score.

You have collected 12 blue points and 6 red points.

Your score is 6.

(Hint: Drag the purple points.)



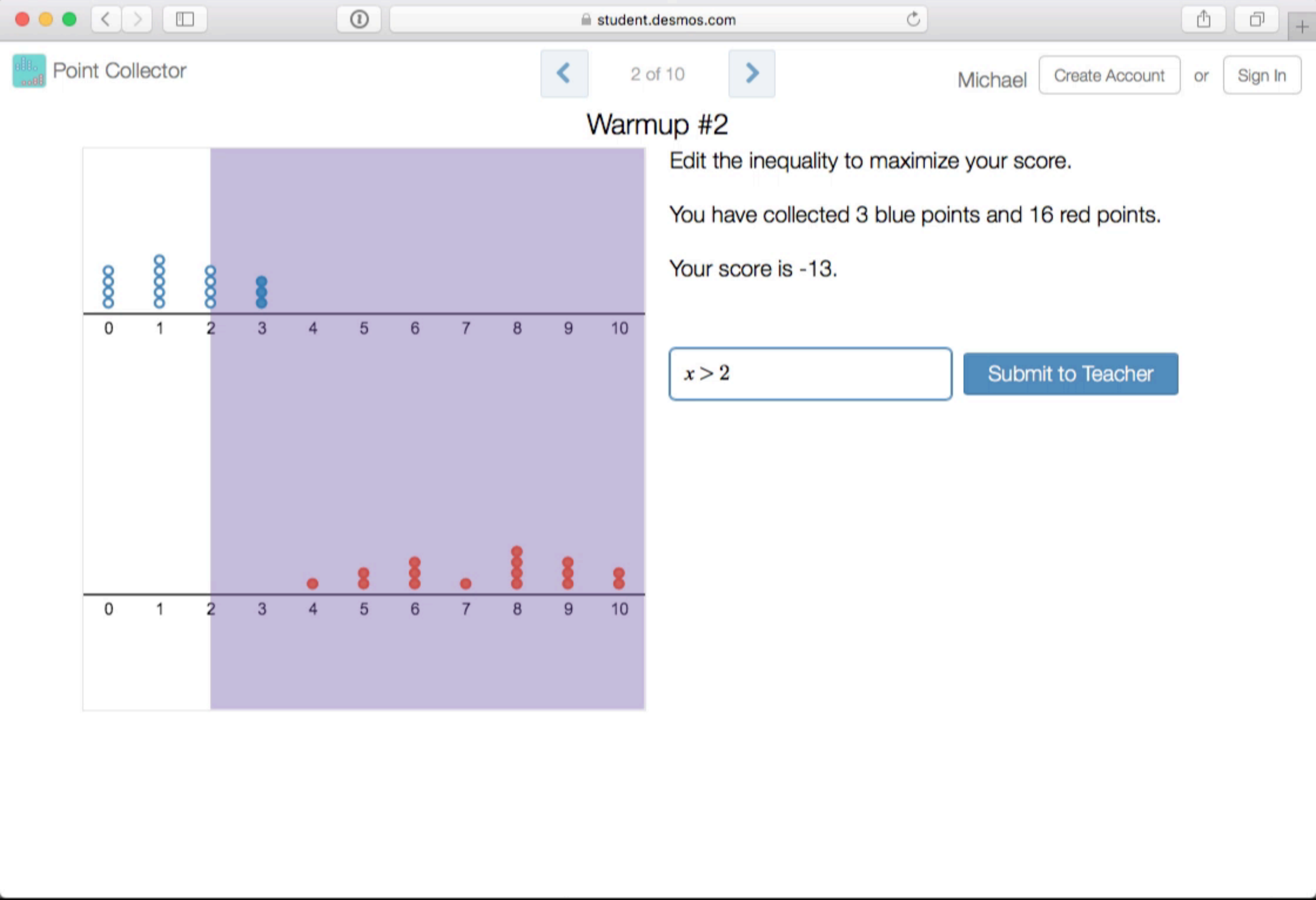
Warmup #1

Collect some points. Aim for a high score.

You have collected 15 blue points and 8 red points.

Your score is 7.

(Hint: Drag the purple points.)



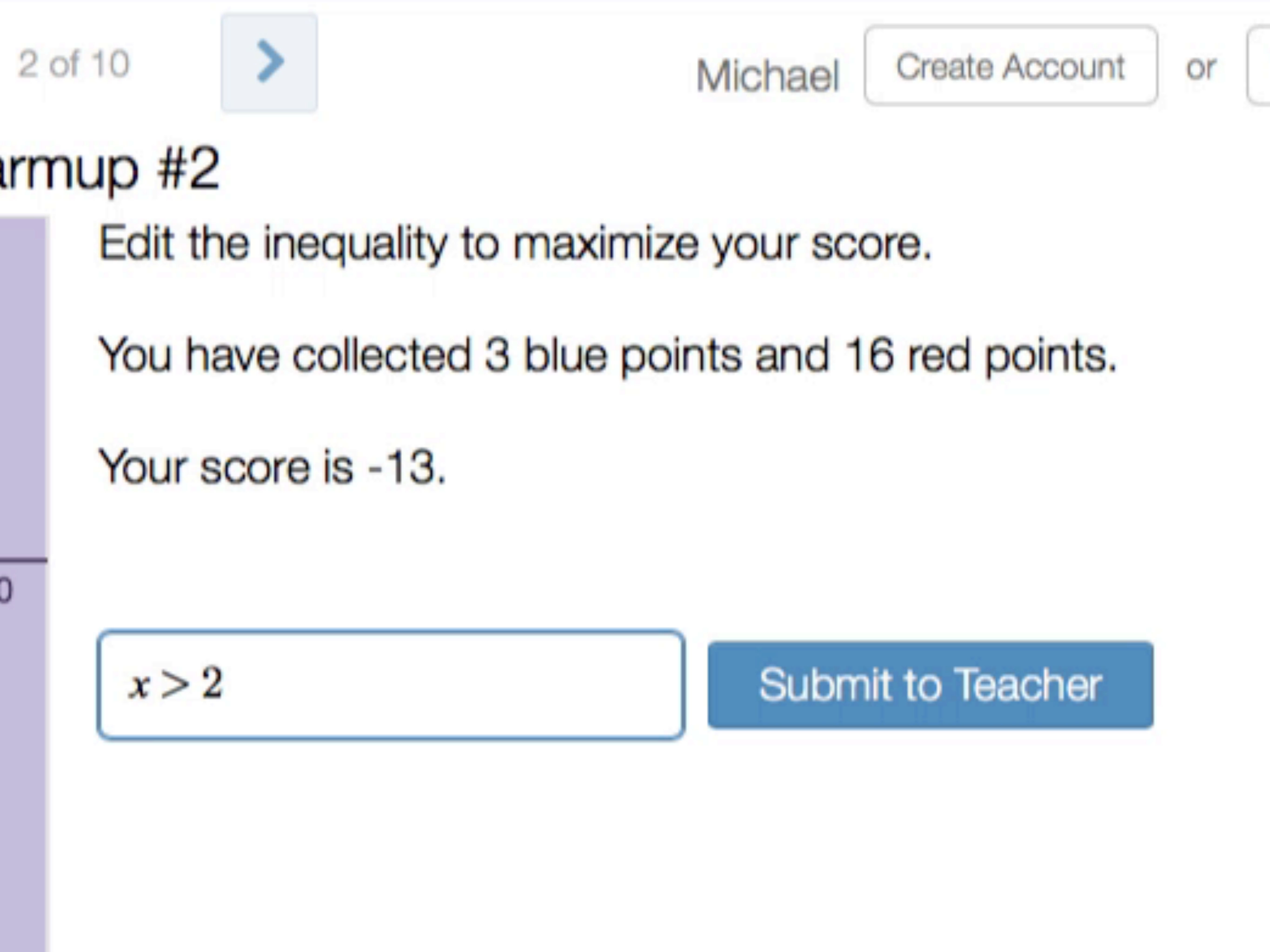
Warmup #2

Edit the inequality to maximize your score.

You have collected 3 blue points and 16 red points.

Your score is -13.

$x > 2$



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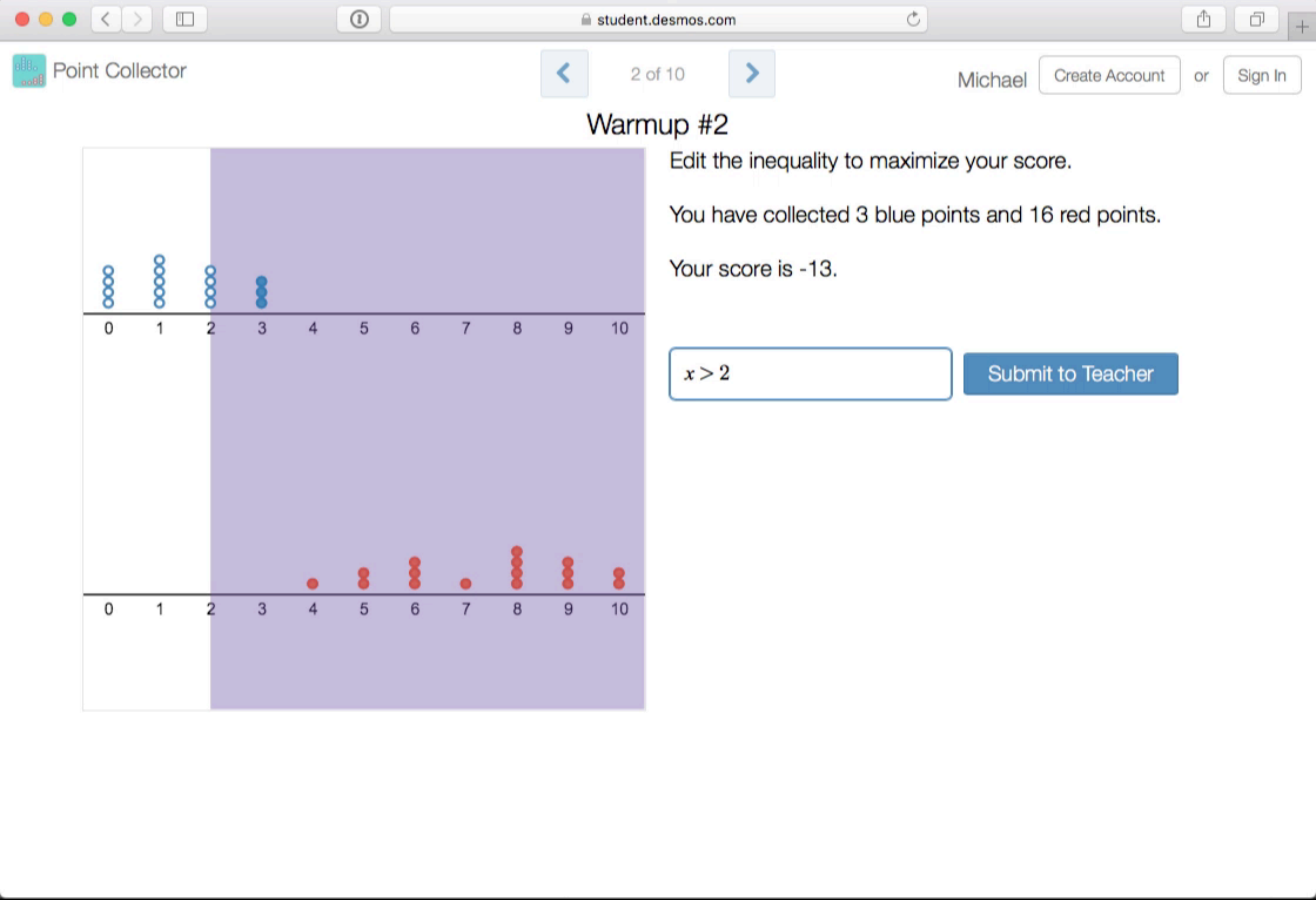

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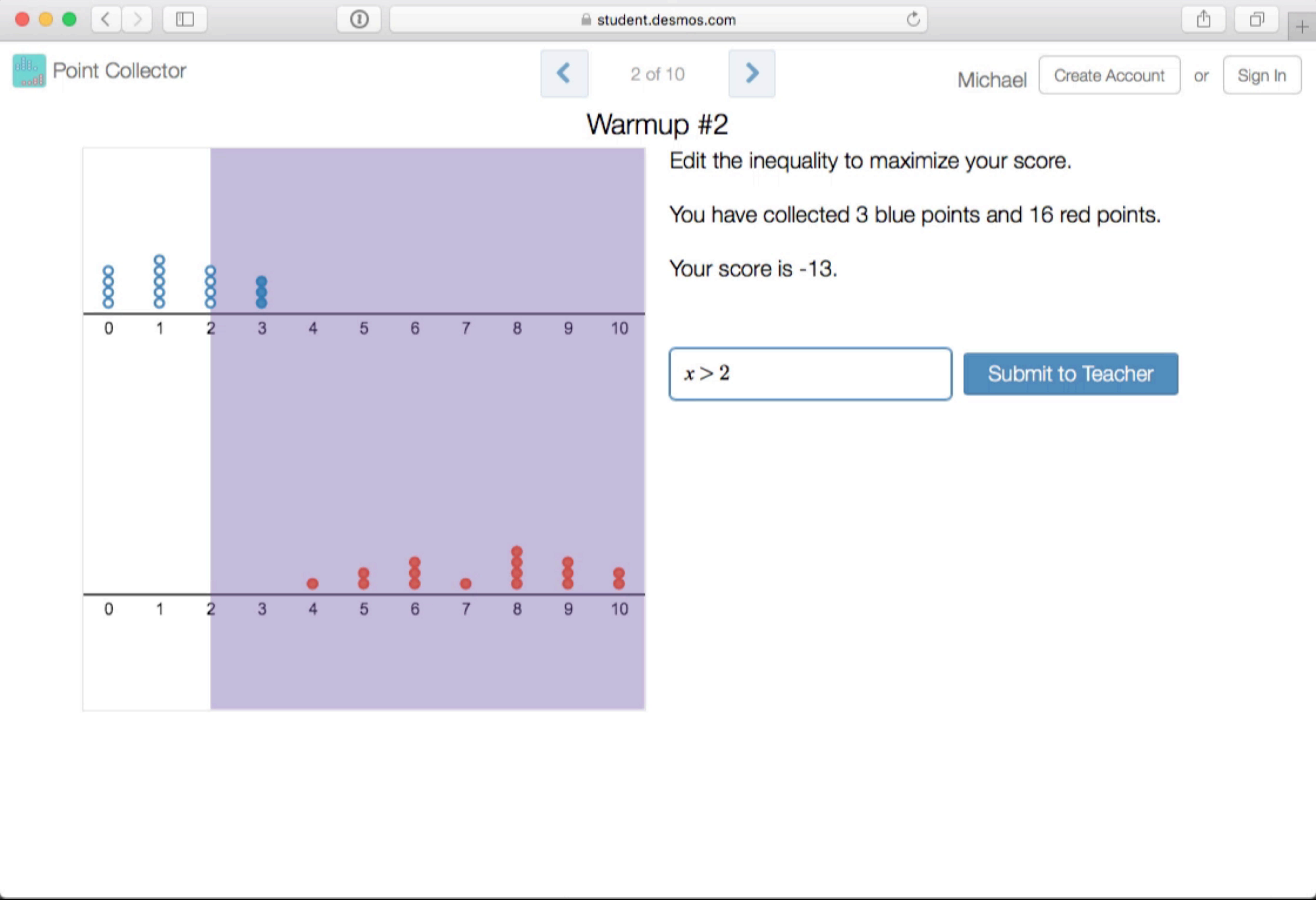

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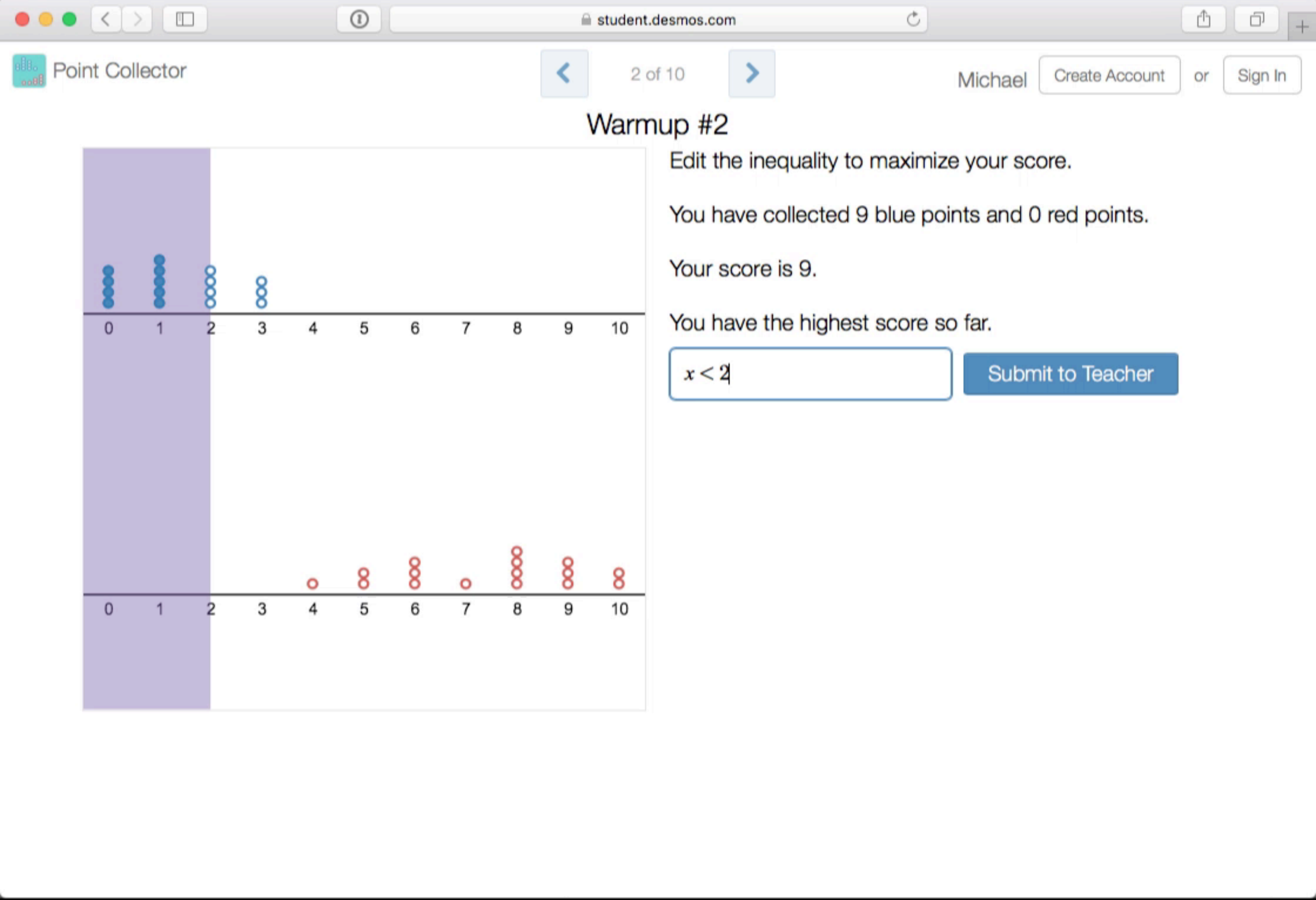


Warmup #2

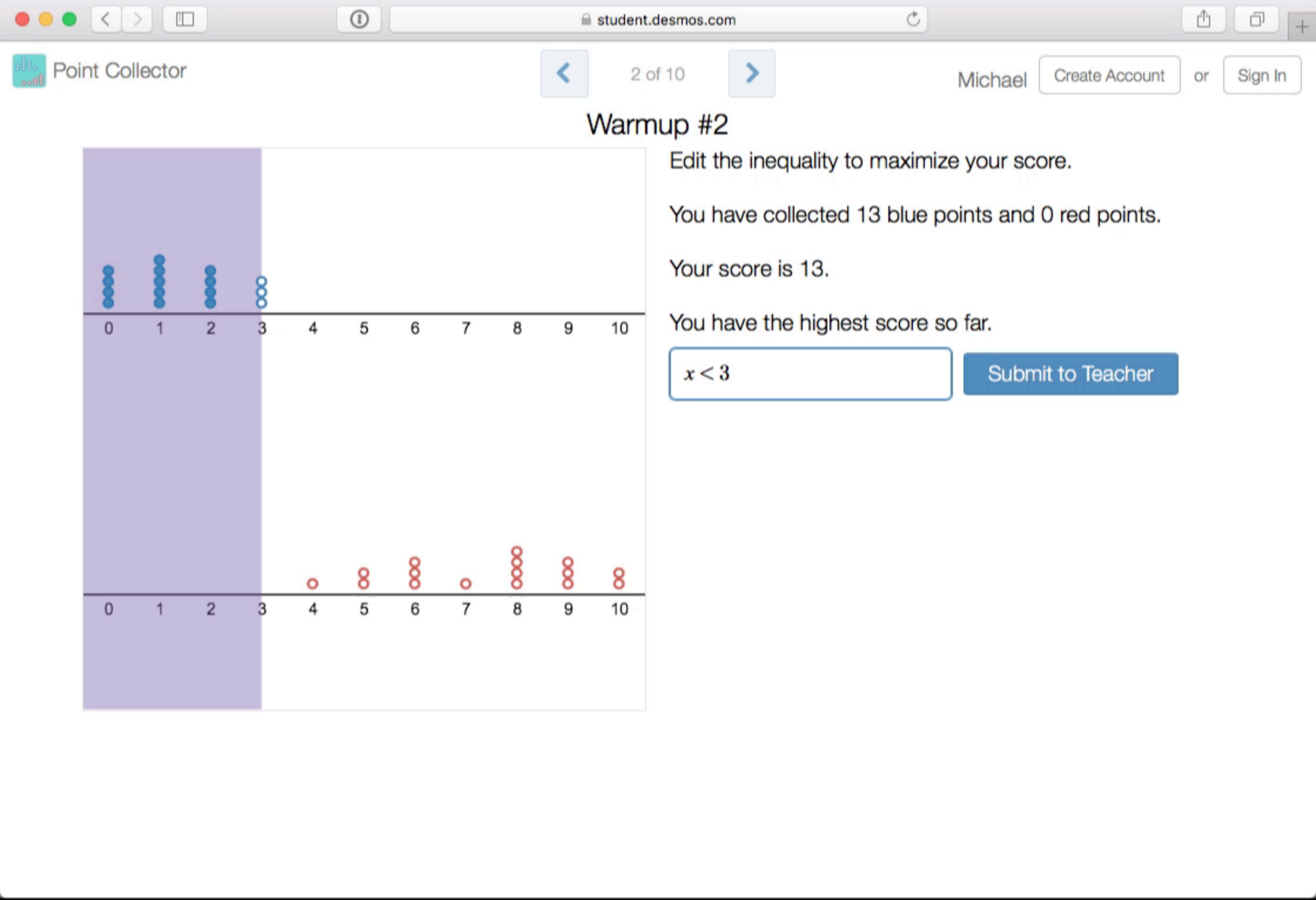
Edit the inequality to maximize your score.

You have collected 9 blue points and 0 red points.

Your score is 9.

You have the highest score so far.

$x < 2$



Warmup #2

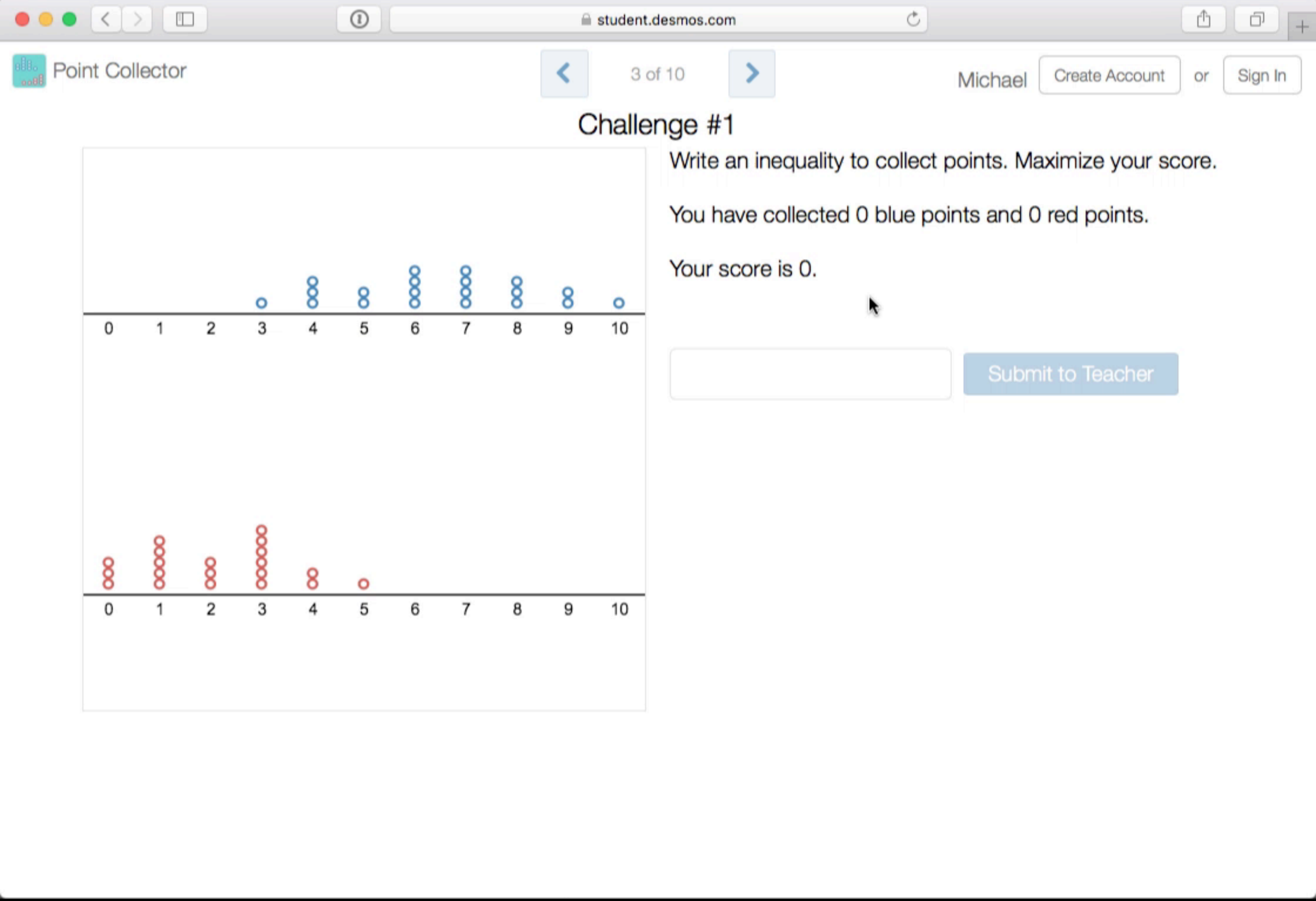
Edit the inequality to maximize your score.

You have collected 13 blue points and 0 red points.

Your score is 13.

You have the highest score so far.

$x < 3$

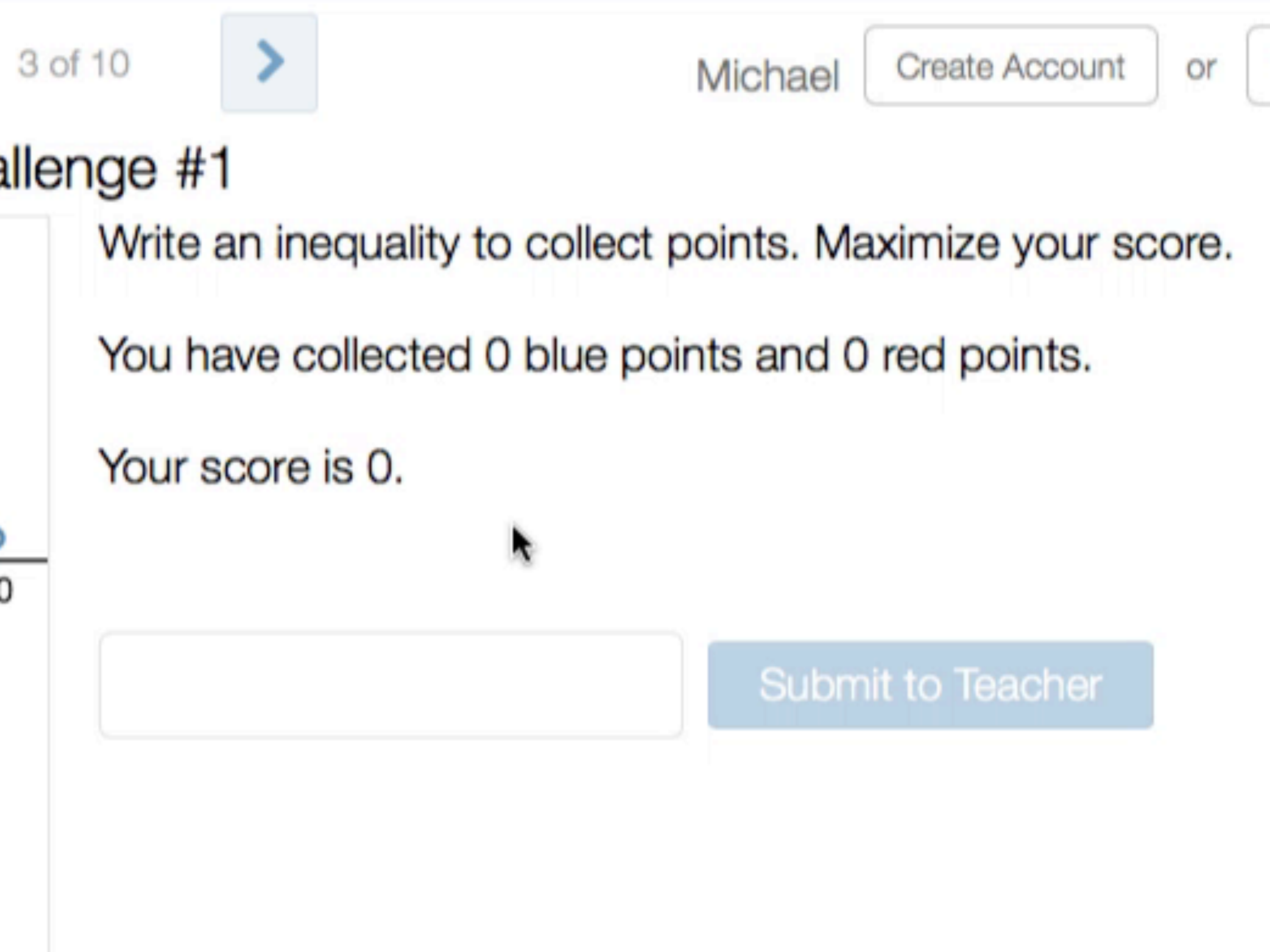


Challenge #1

Write an inequality to collect points. Maximize your score.

You have collected 0 blue points and 0 red points.

Your score is 0.

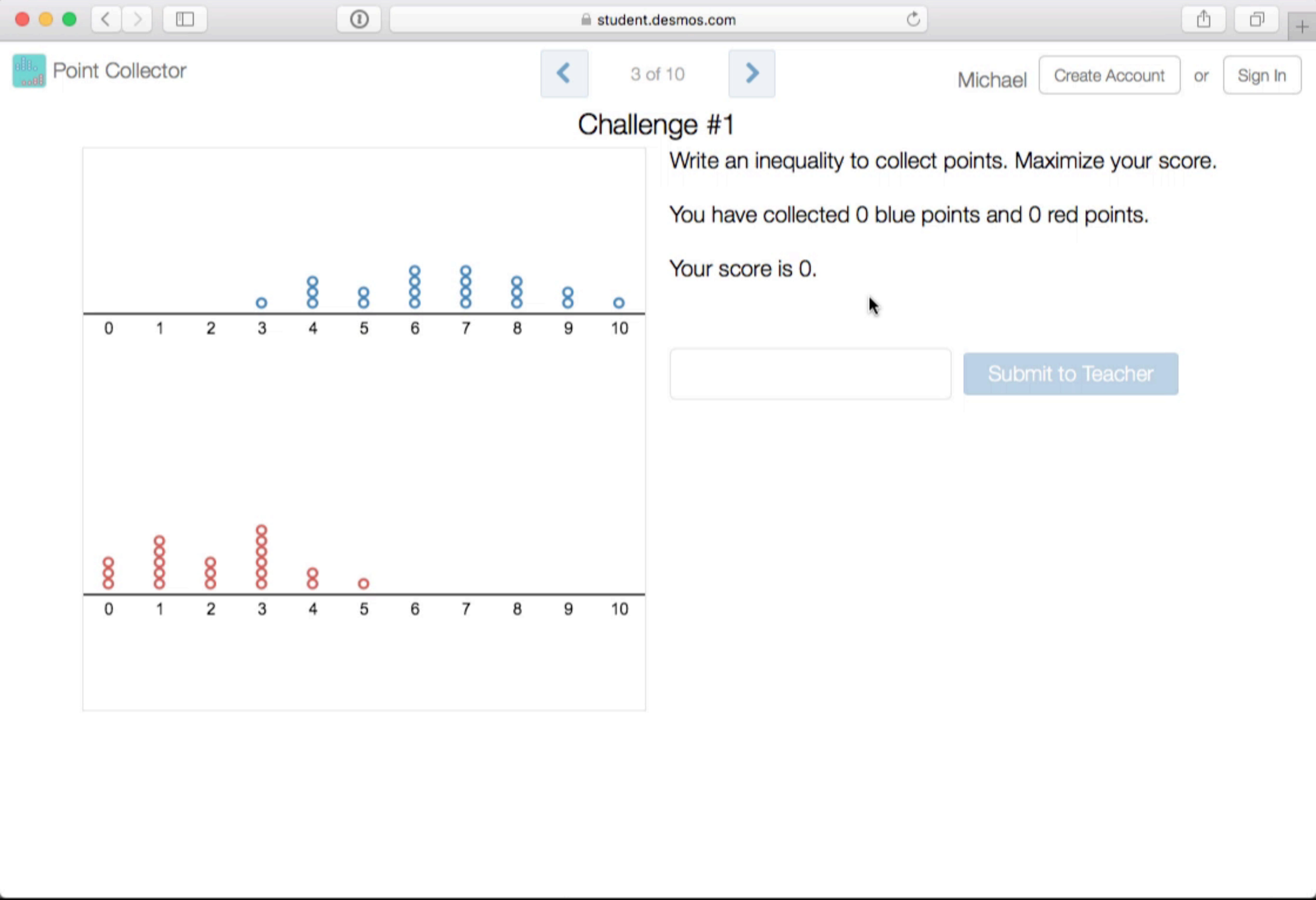


allenge #1

Write an inequality to collect points. Maximize your score.

You have collected 0 blue points and 0 red points.

Your score is 0.

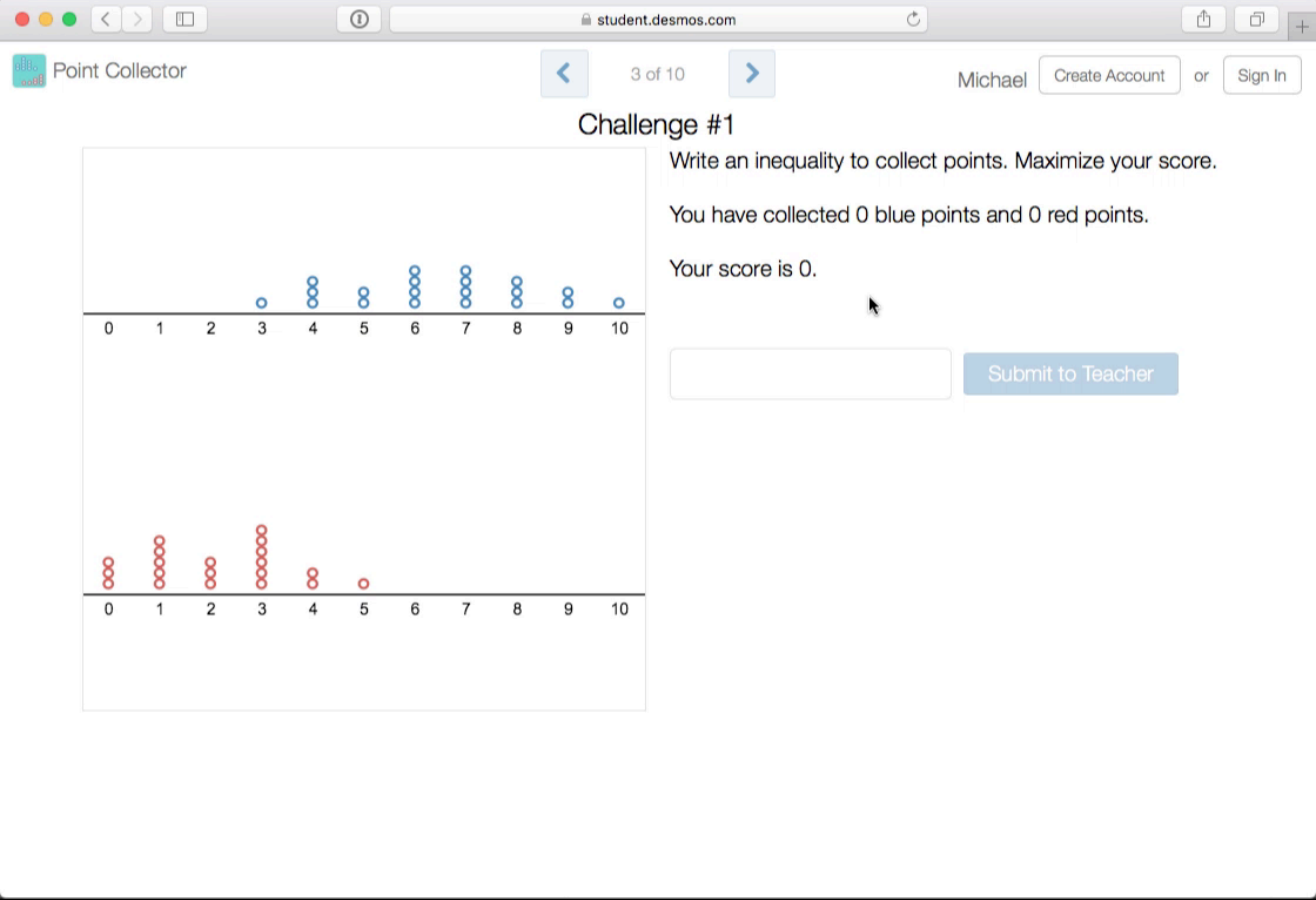


Challenge #1

Write an inequality to collect points. Maximize your score.

You have collected 0 blue points and 0 red points.

Your score is 0.

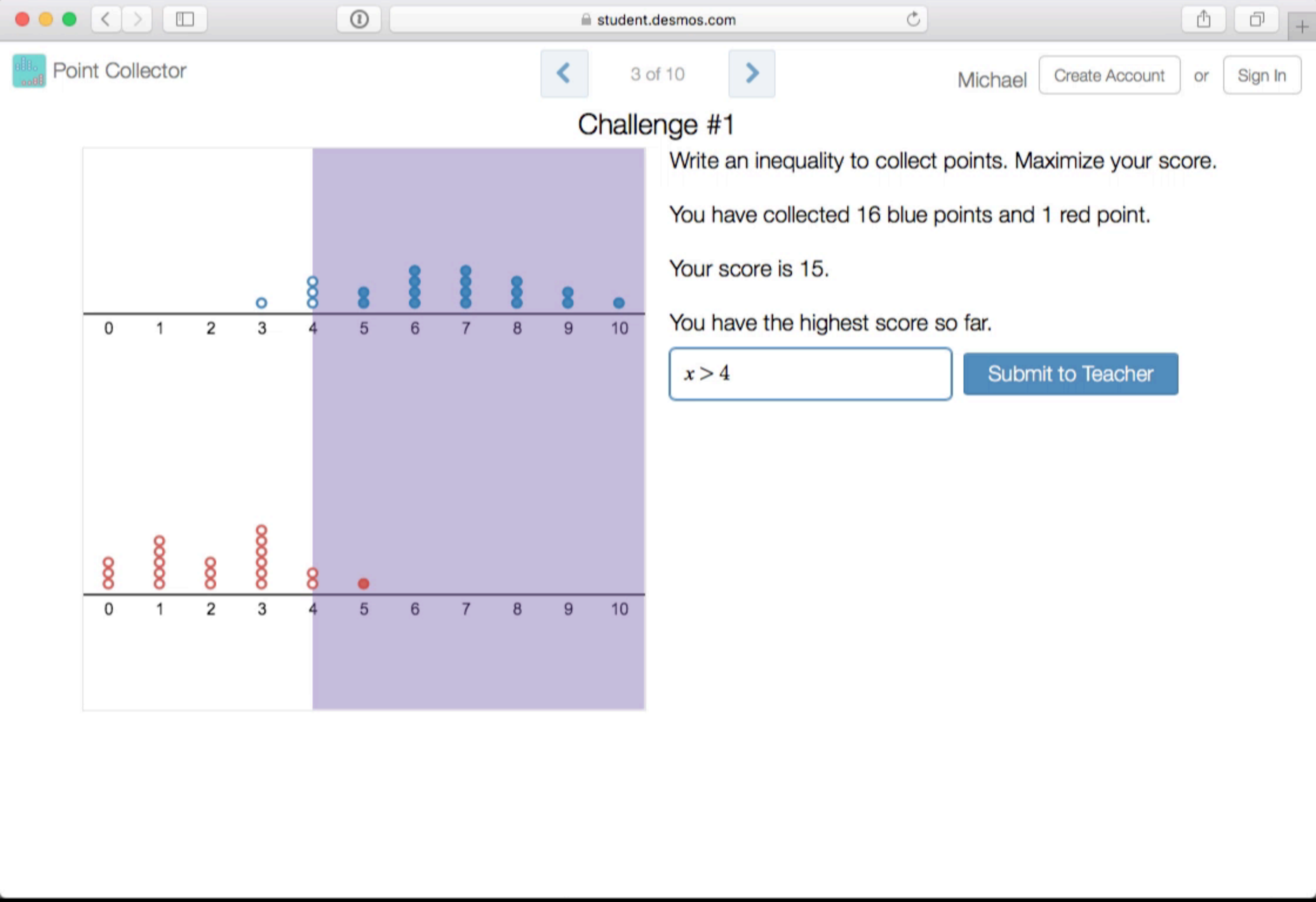


Challenge #1

Write an inequality to collect points. Maximize your score.

You have collected 0 blue points and 0 red points.

Your score is 0.



Challenge #1

Write an inequality to collect points. Maximize your score.

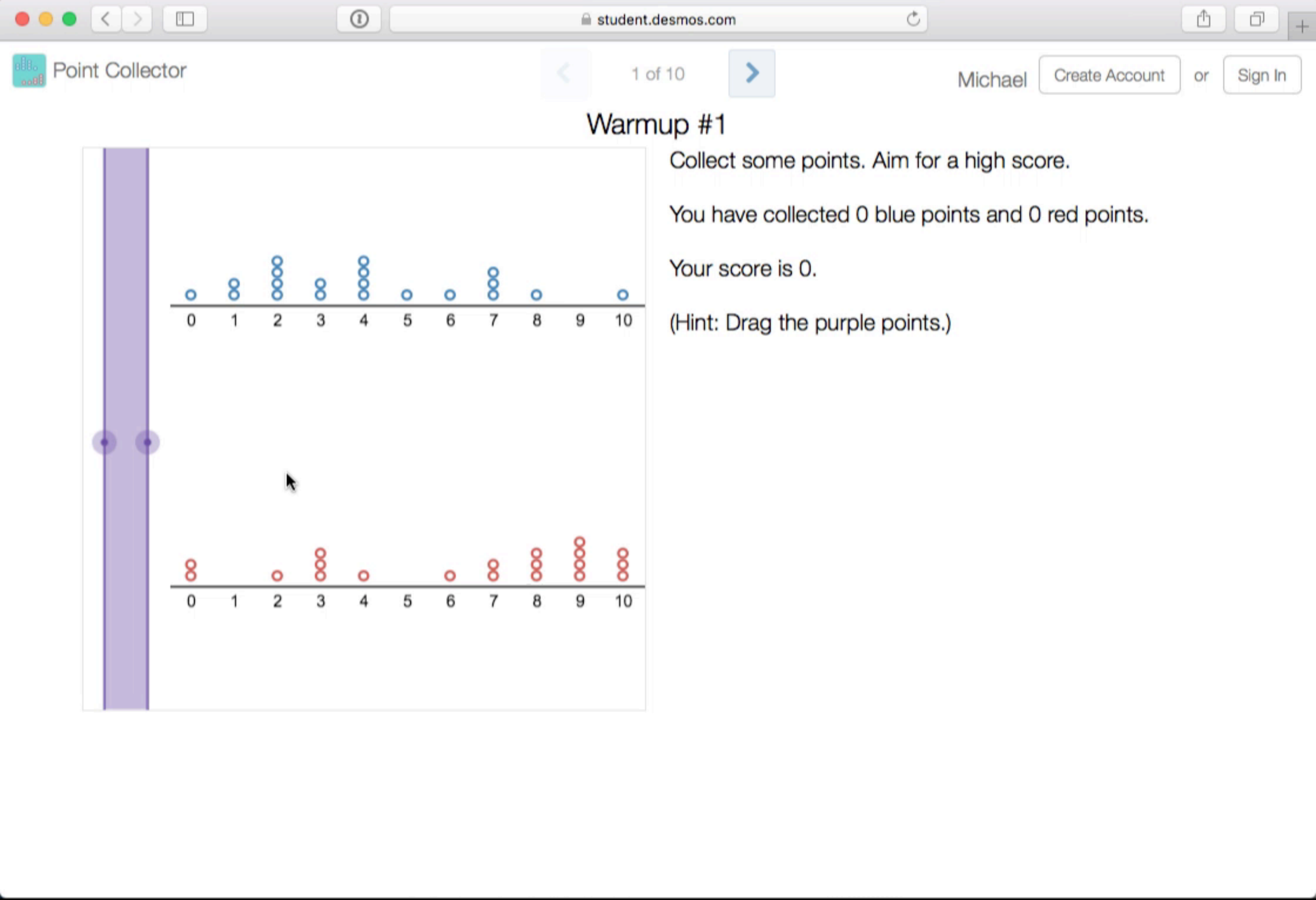
You have collected 16 blue points and 1 red point.

Your score is 15.

You have the highest score so far.

$x > 4$

Imagine…



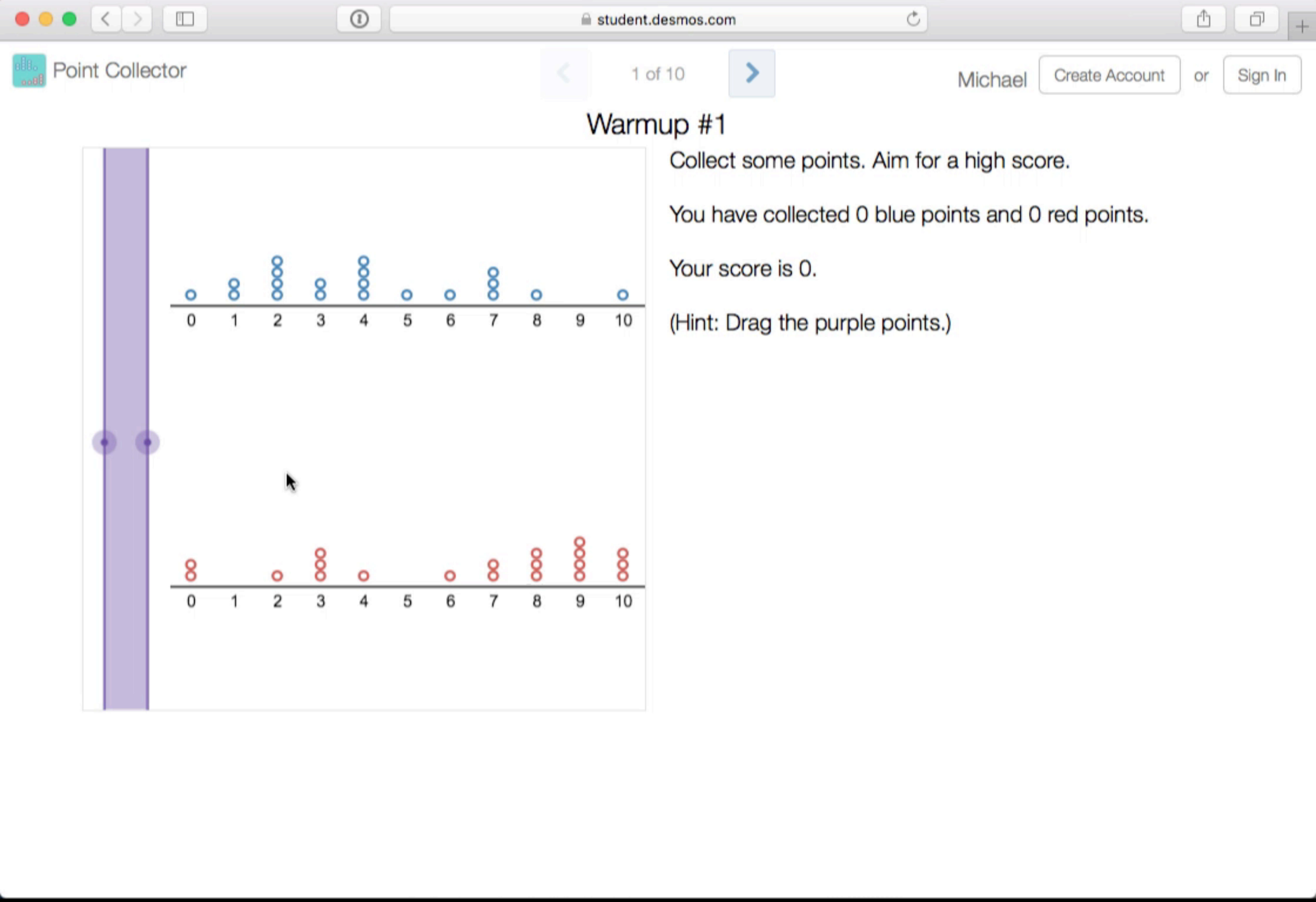
Warmup #1

Collect some points. Aim for a high score.

You have collected 0 blue points and 0 red points.

Your score is 0.

(Hint: Drag the purple points.)



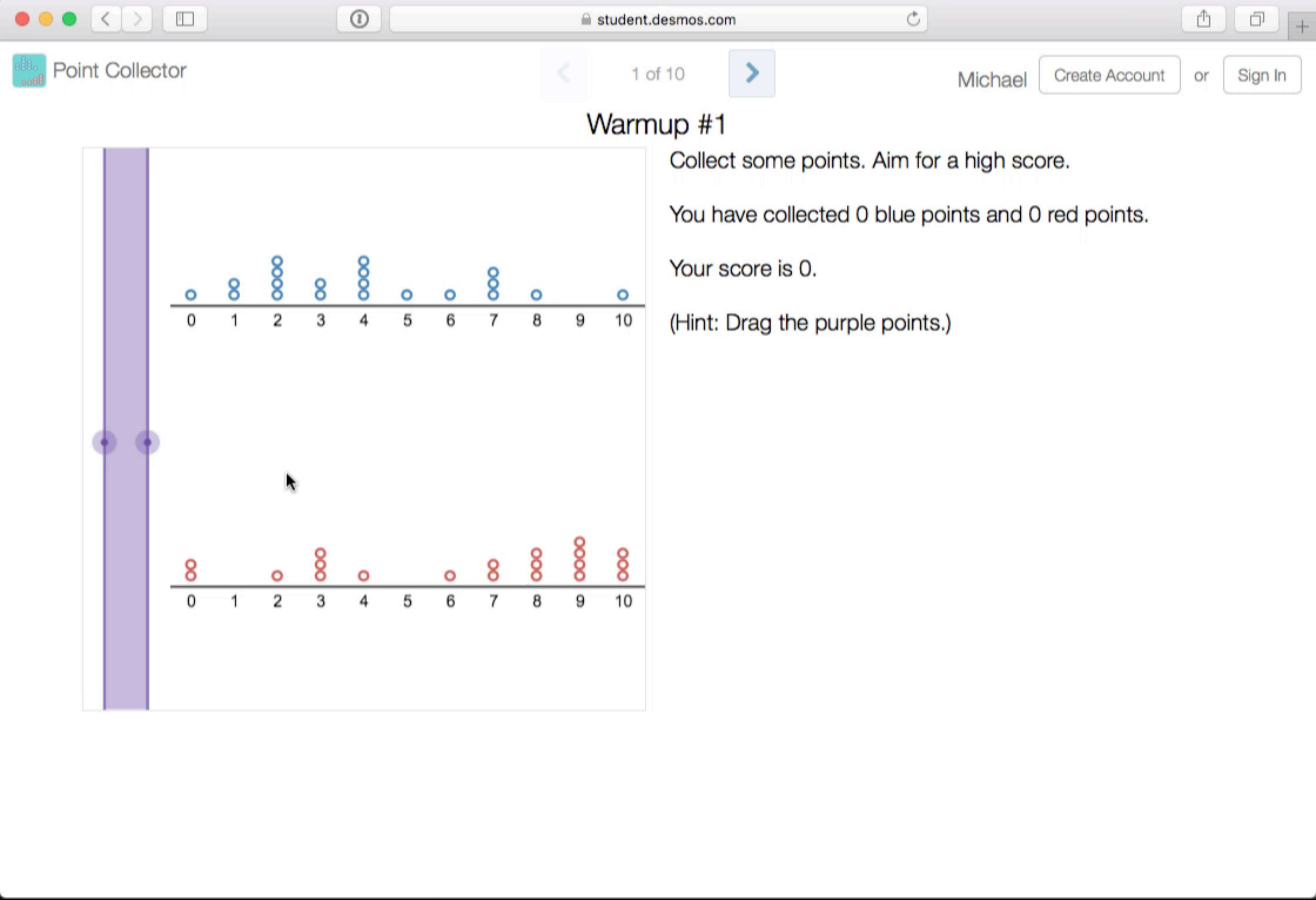
Warmup #1

Collect some points. Aim for a high score.

You have collected 0 blue points and 0 red points.

Your score is 0.

(Hint: Drag the purple points.)



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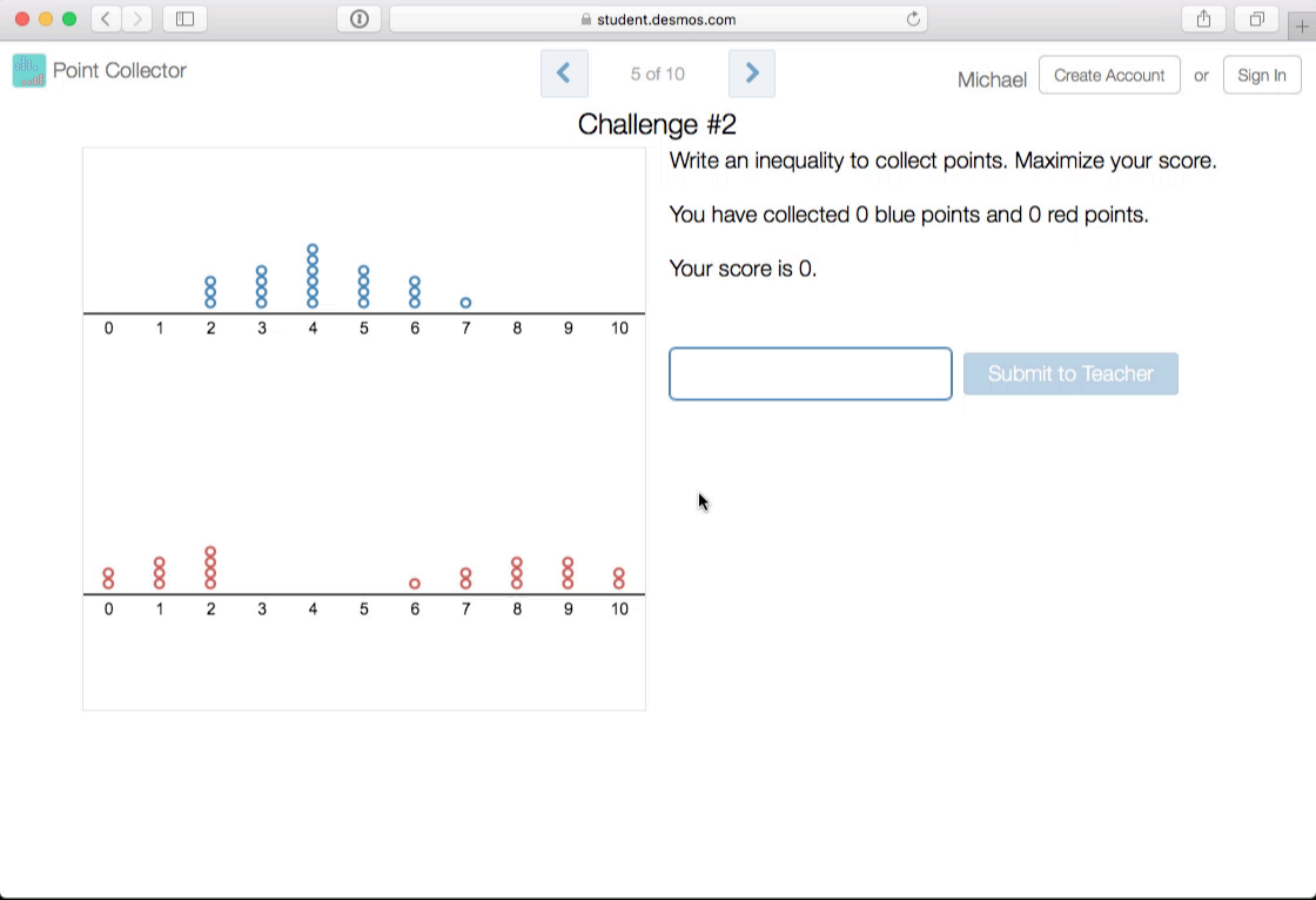
Your score is 0.

(Hint: Drag the purple points.)

Imagine…



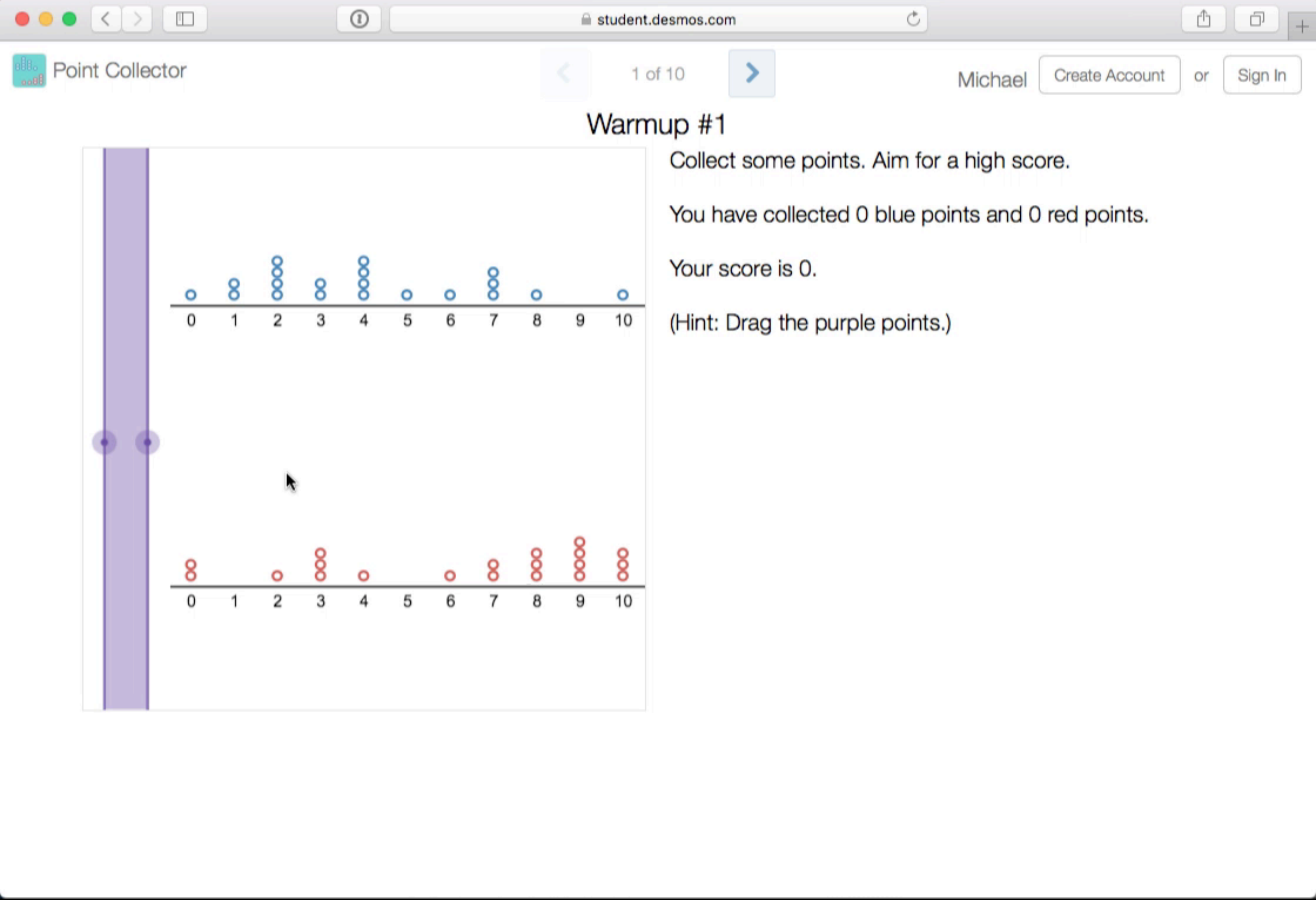
Challenge #2

Write an inequality to collect points. Maximize your score.

You have collected 0 blue points and 0 red points.

Your score is 0.

Instead…



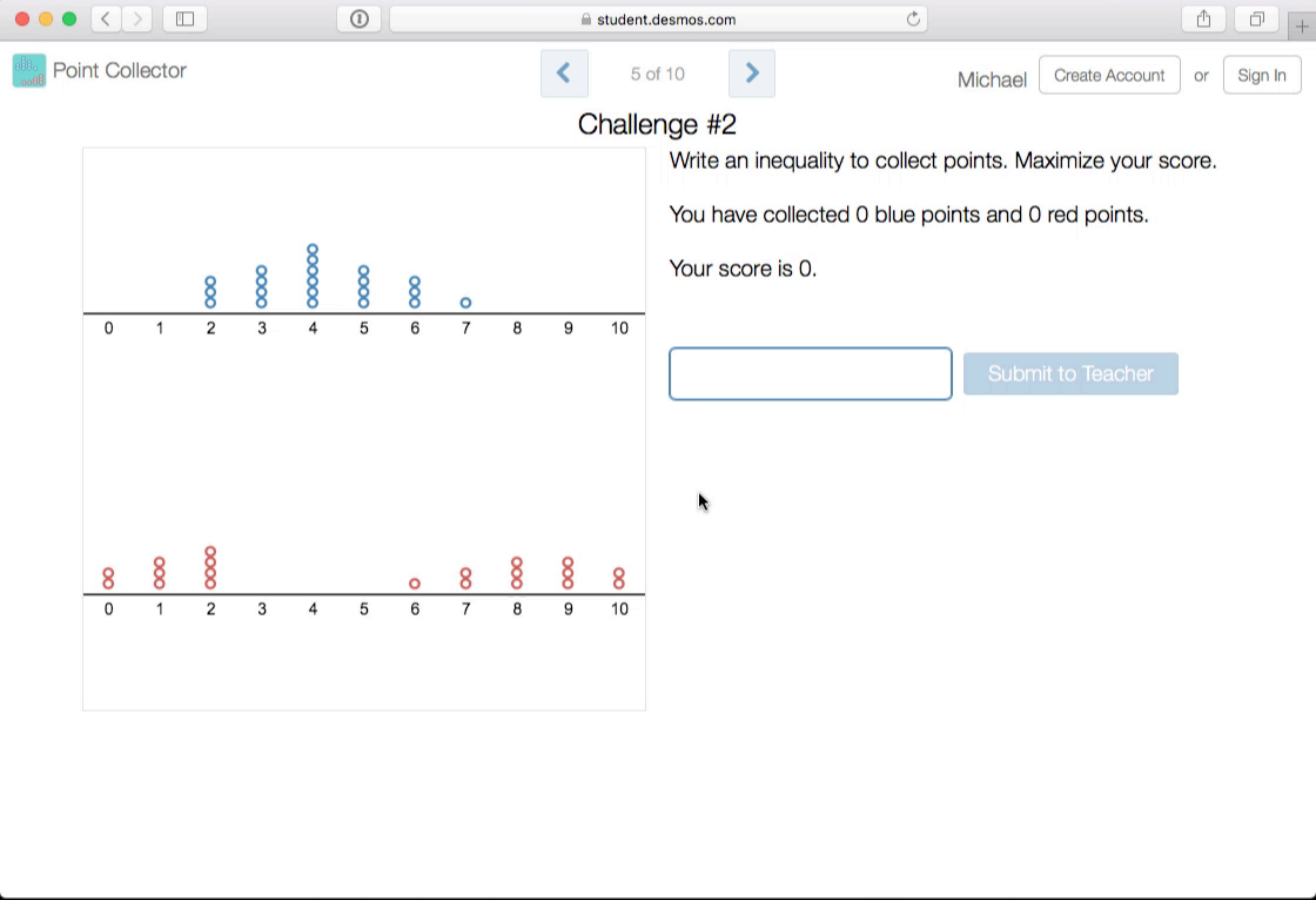
Warmup #1

Collect some points. Aim for a high score.

You have collected 0 blue points and 0 red points.

Your score is 0.

(Hint: Drag the purple points.)

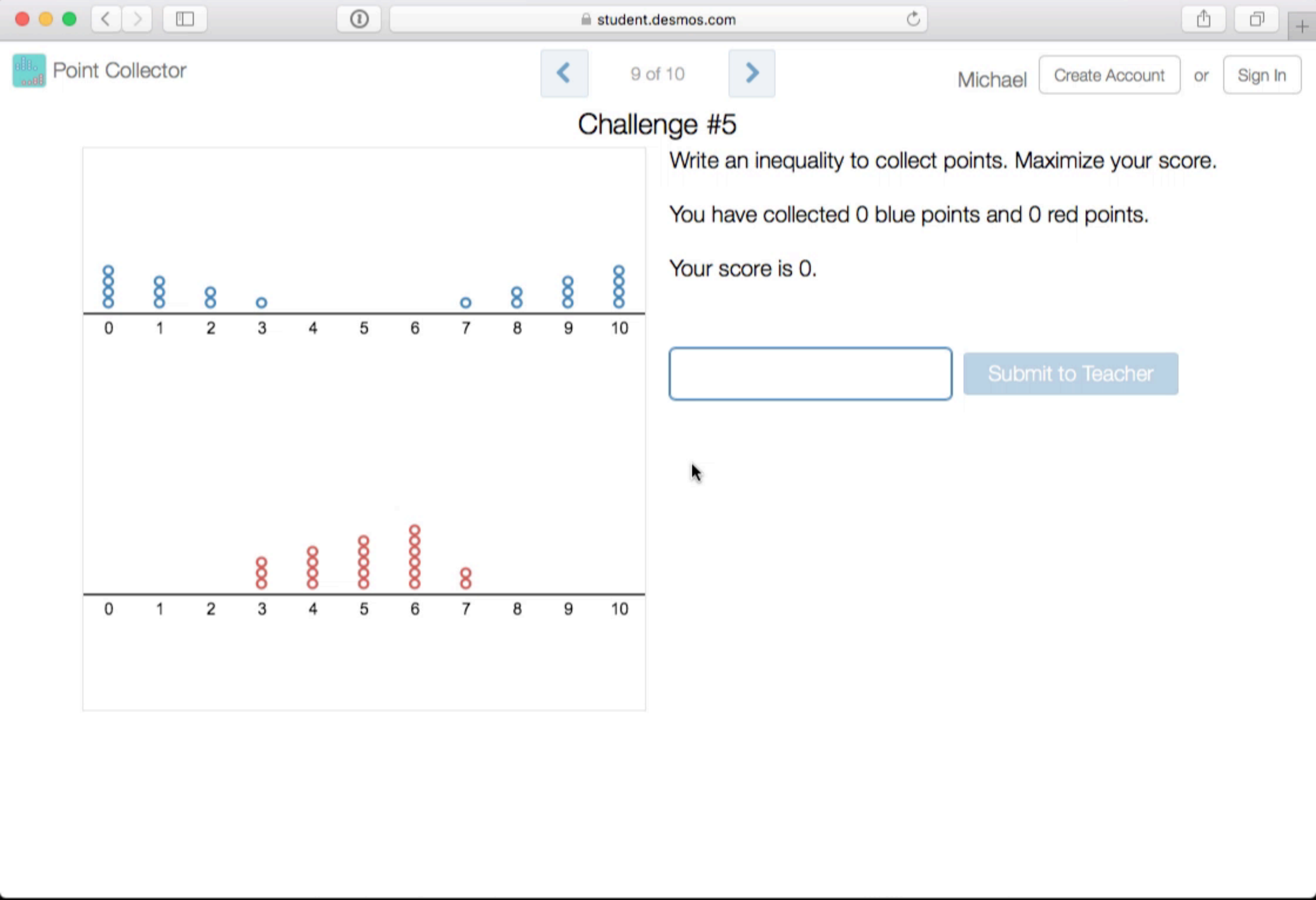


Challenge #2

Write an inequality to collect points. Maximize your score.

You have collected 0 blue points and 0 red points.

Your score is 0.

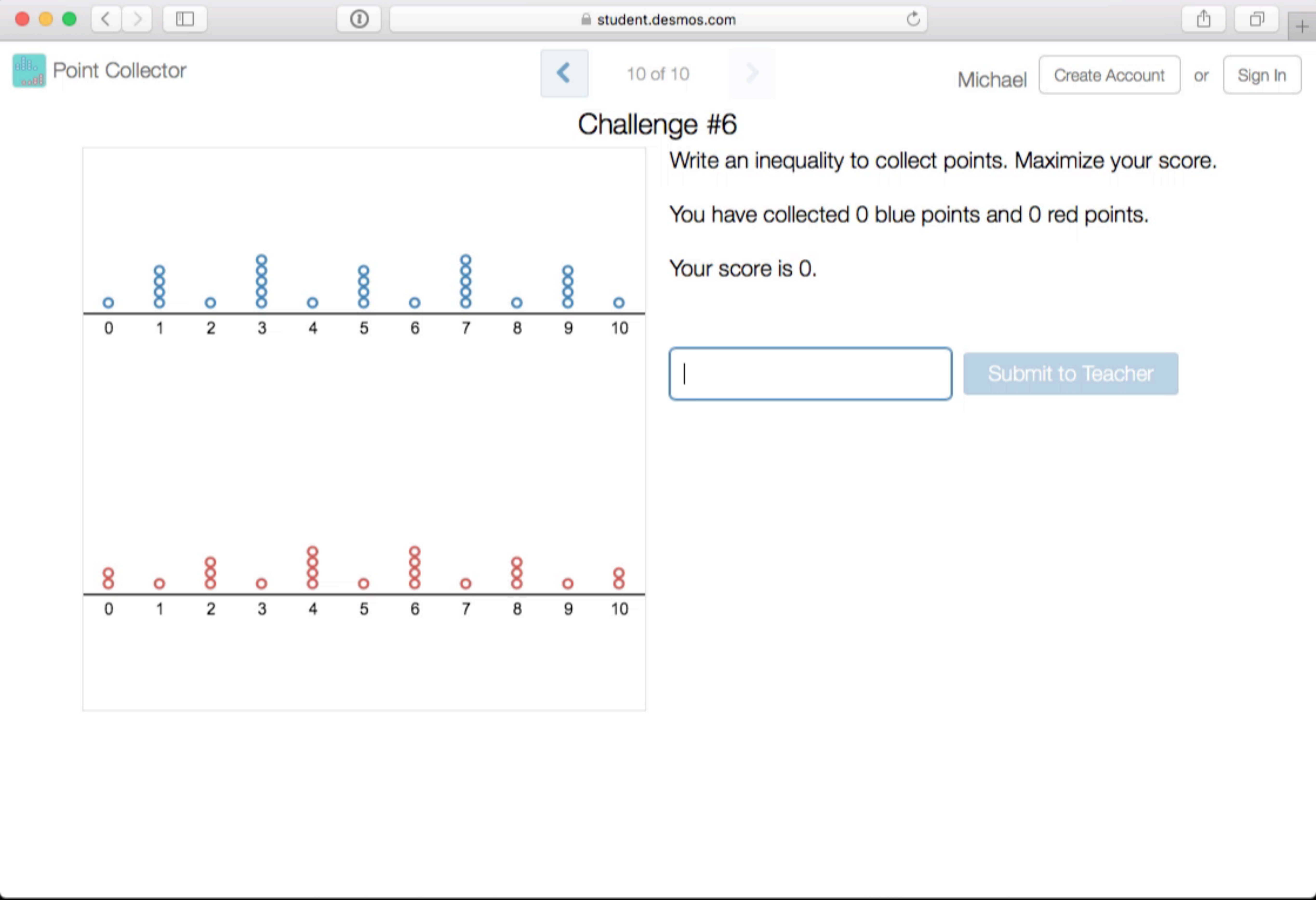


Challenge #5

Write an inequality to collect points. Maximize your score.

You have collected 0 blue points and 0 red points.

Your score is 0.



Challenge #6

Write an inequality to collect points. Maximize your score.

You have collected 0 blue points and 0 red points.

Your score is 0.

Connect representations.

Create an intellectual need
for new mathematical skills.

Integrate strategy and practice.

Create activities that are
easy to start, difficult to finish.

Connect representations.

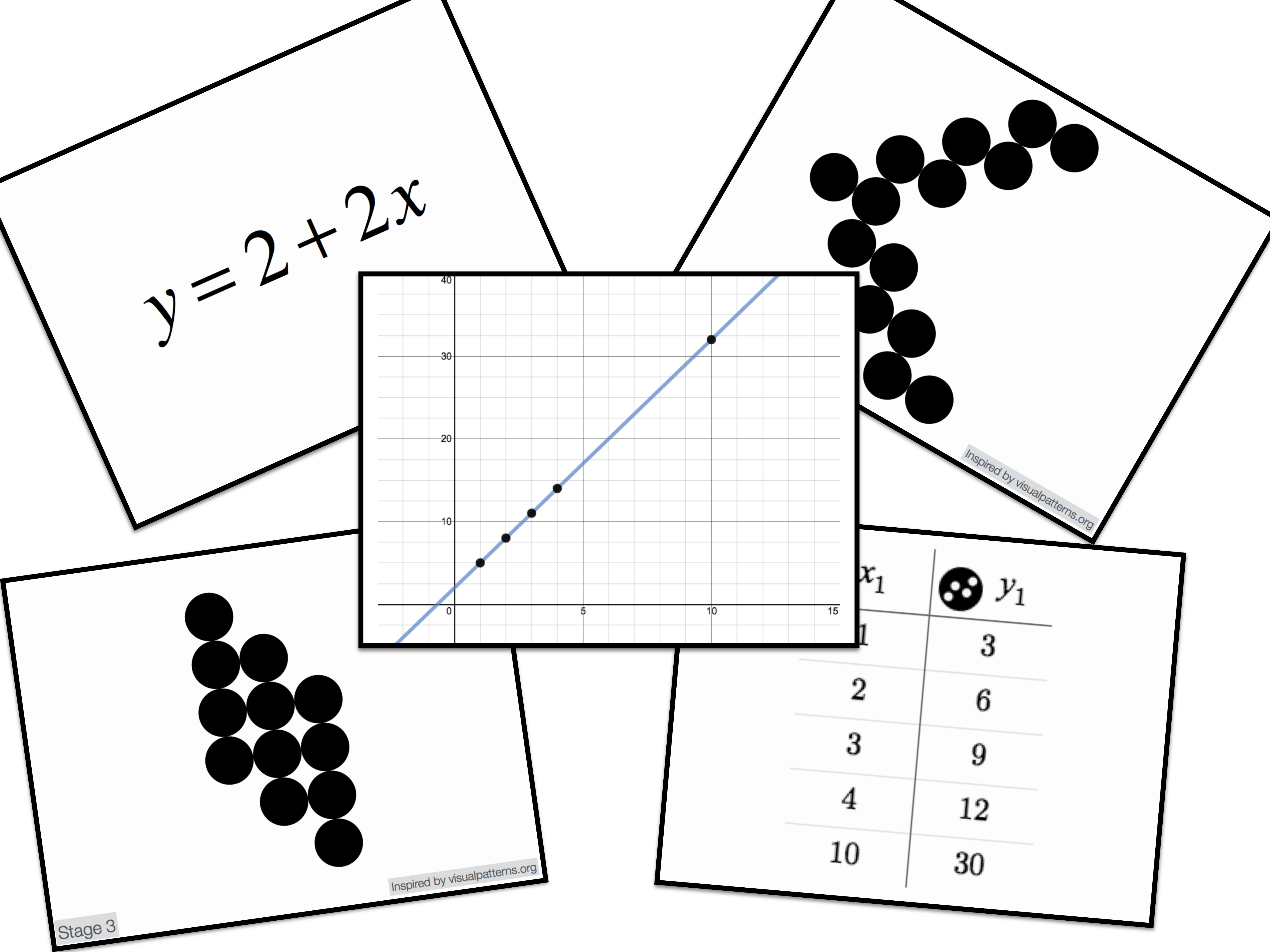
Create an intellectual need for new mathematical skills.

Integrate strategy and practice.

Create activities that are easy to start, difficult to finish.

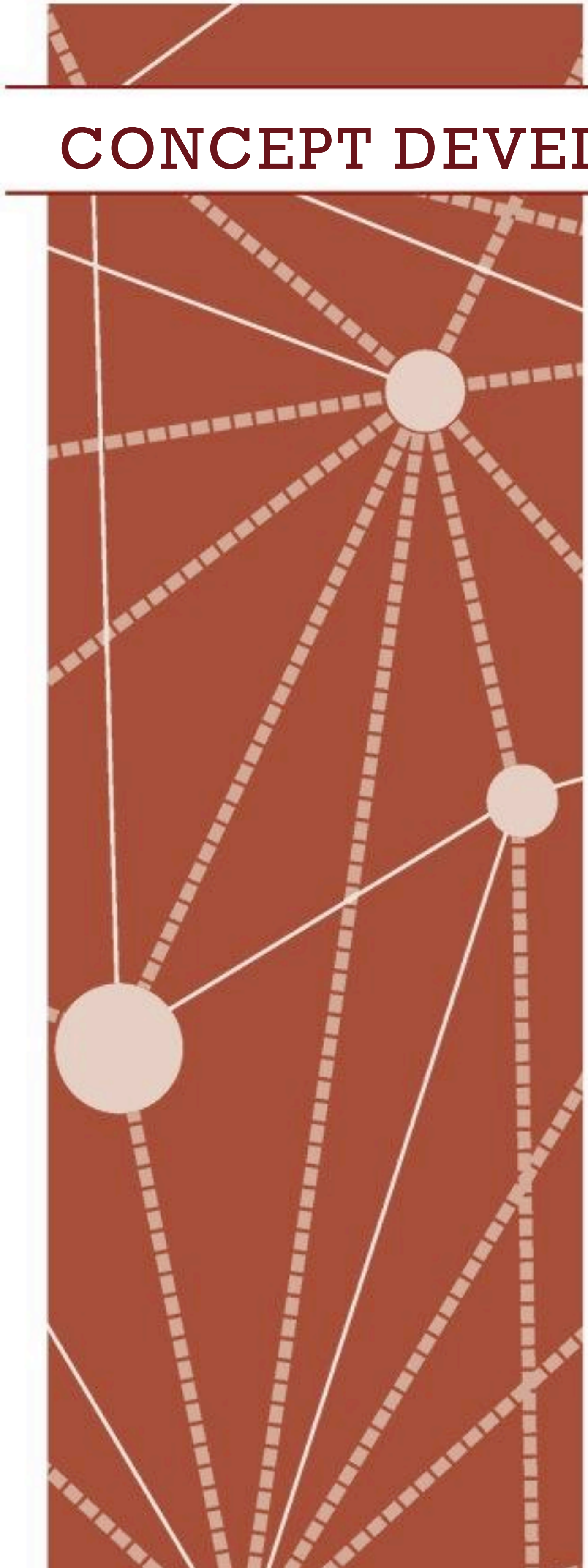
“Low floor, high ceiling.”

Round 3


40
30
20
10
0
5
10
15
Inspired by visualpatterns.org
Stage 3
Inspired by visualpatterns.org

$$y = 2 + 2x$$

x_1	● y_1
1	3
2	6
3	9
4	12
10	30

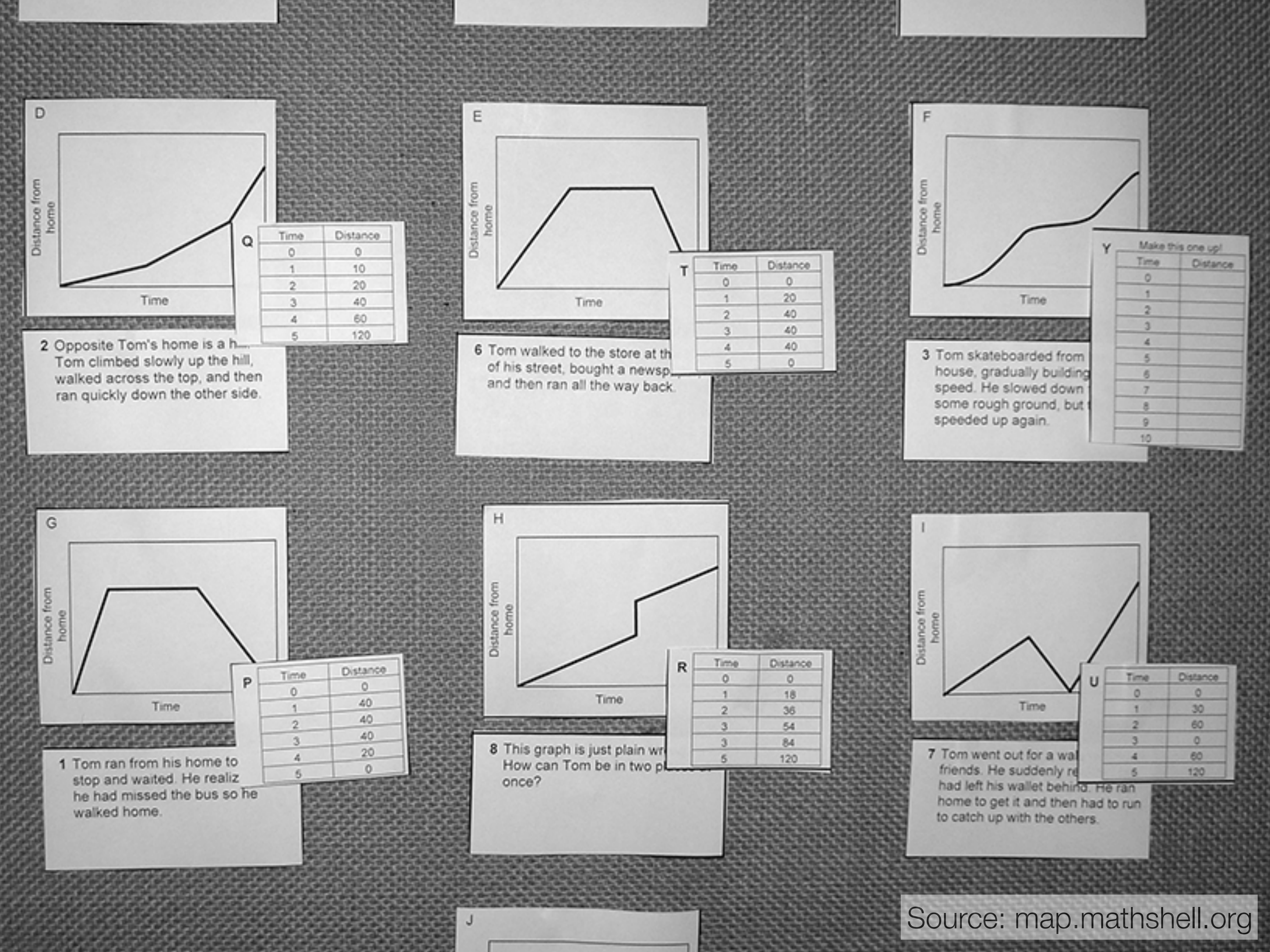


CONCEPT DEVELOPMENT

Mathematics Assessment Project
CLASSROOM CHALLENGES
A Formative Assessment Lesson

Interpreting Distance-Time Graphs

Source: map.mathshell.org



Q

Time	Distance
0	0
1	10
2	20
3	40
4	60
5	120

2 Opposite Tom's home is a h
Tom climbed slowly up the hill,
walked across the top, and then
ran quickly down the other side.

T

Time	Distance
0	0
1	20
2	40
3	40
4	40
5	0

6 Tom walked to the store at th
of his street, bought a newsp
and then ran all the way back.

Y

Make this one up!

Time	Distance
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

3 Tom skateboarded from
house, gradually building
speed. He slowed down
some rough ground, but
speeded up again.

P

Time	Distance
0	0
1	40
2	40
3	40
4	20
5	0

1 Tom ran from his home to
stop and waited. He realiz
he had missed the bus so he
walked home.

R

Time	Distance
0	0
1	18
2	36
3	54
3	84
5	120

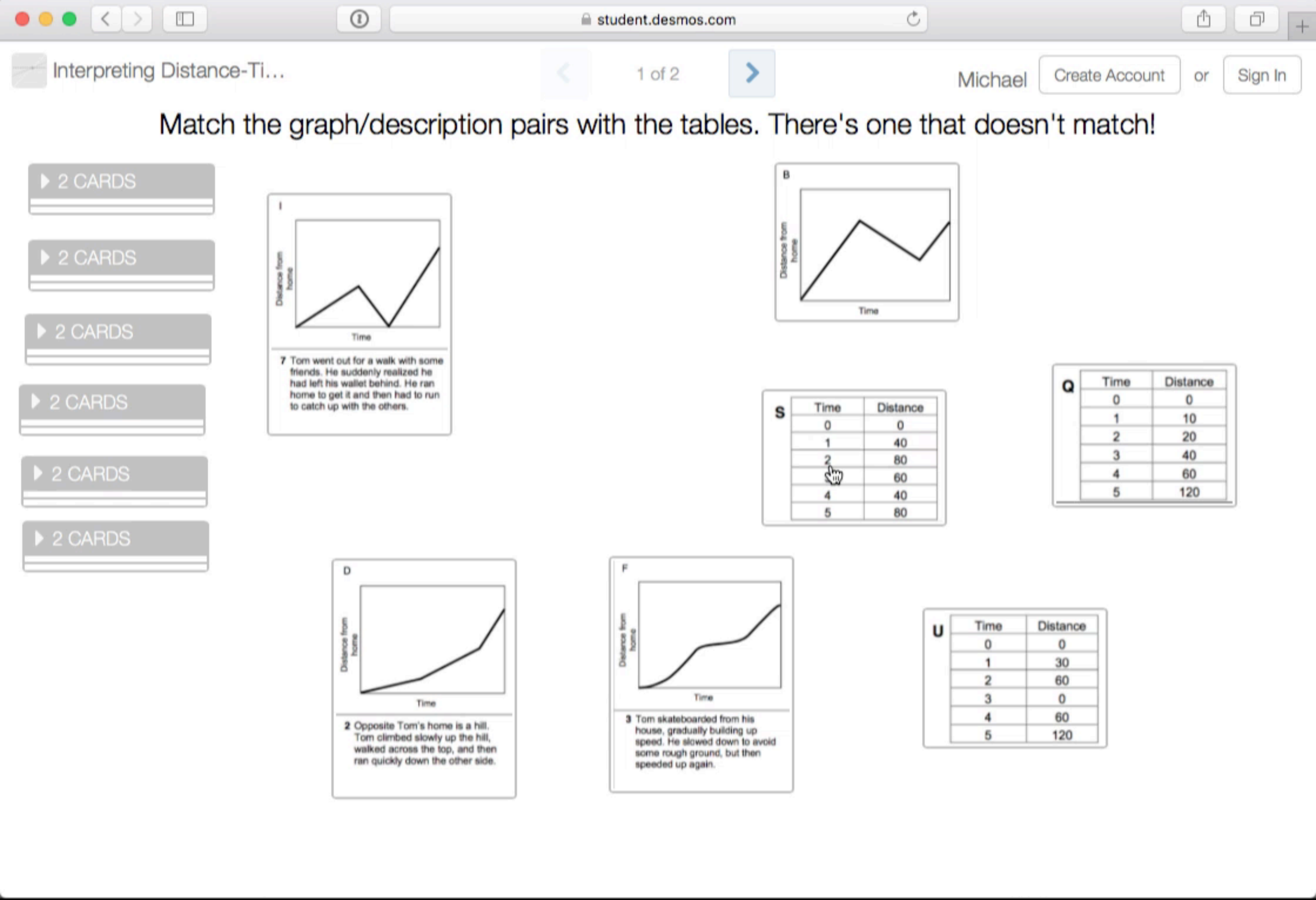
8 This graph is just plain wr
How can Tom be in two pl
once?

U

Time	Distance
0	0
1	30
2	60
3	0
4	60
5	120

7 Tom went out for a wal
friends. He suddenly re
had left his wallet behind. He ran
home to get it and then had to run
to catch up with the others.

Source: map.mathshell.org



Match the graph/description pairs with the tables. There's one that doesn't match!

7 Tom went out for a walk with some friends. He suddenly realized he had left his wallet behind. He ran home to get it and then had to run to catch up with the others.

S

Time	Distance
0	0
1	40
2	80
3	60
4	40
5	80

Q

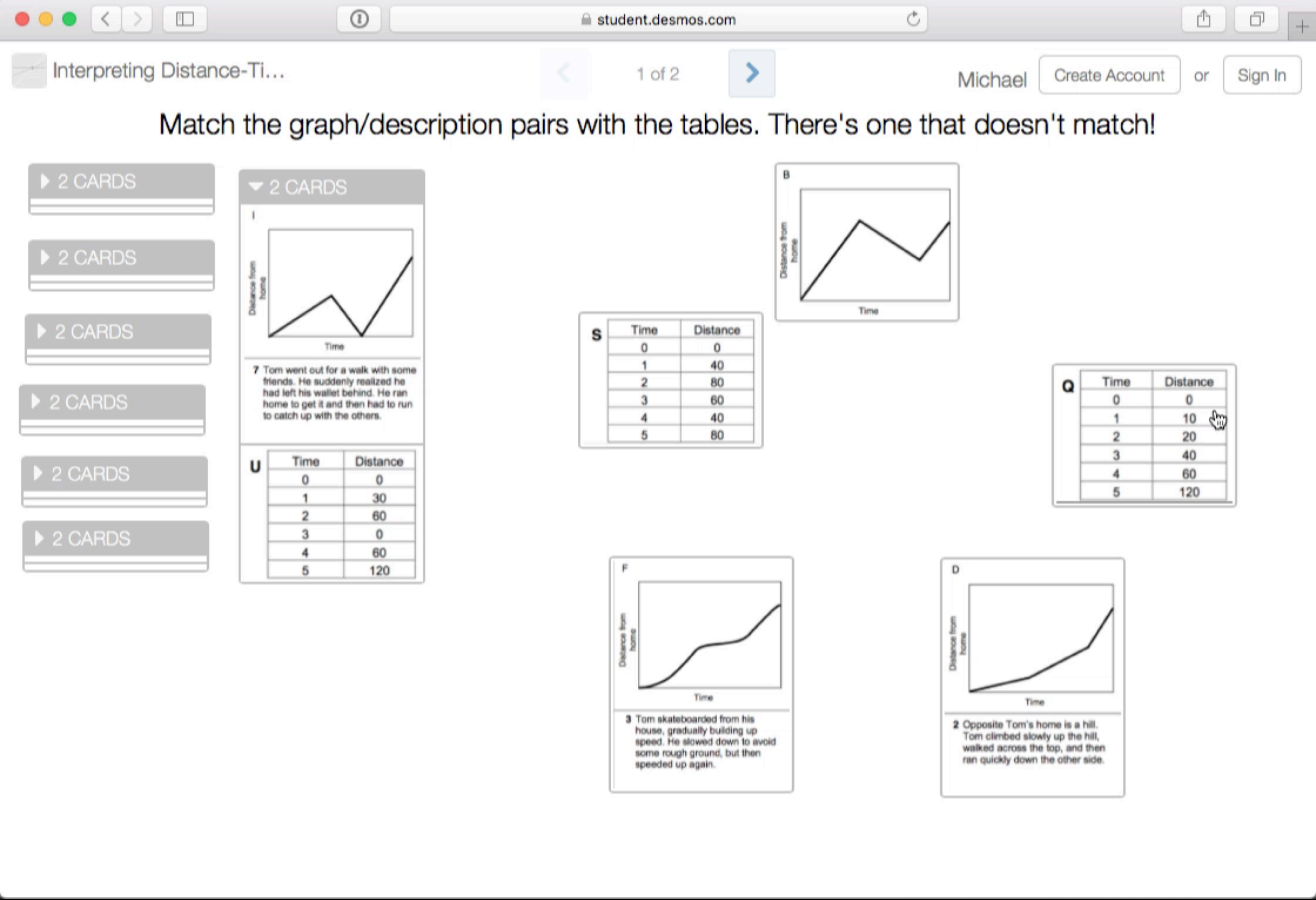
Time	Distance
0	0
1	10
2	20
3	40
4	60
5	120

2 Opposite Tom's home is a hill. Tom climbed slowly up the hill, walked across the top, and then ran quickly down the other side.

3 Tom skateboarded from his house, gradually building up speed. He slowed down to avoid some rough ground, but then speeded up again.

U

Time	Distance
0	0
1	30
2	60
3	0
4	60
5	120



Match the graph/description pairs with the tables. There's one that doesn't match!

7 Tom went out for a walk with some friends. He suddenly realized he had left his wallet behind. He ran home to get it and then had to run to catch up with the others.

U

Time	Distance
0	0
1	30
2	60
3	0
4	60
5	120

S

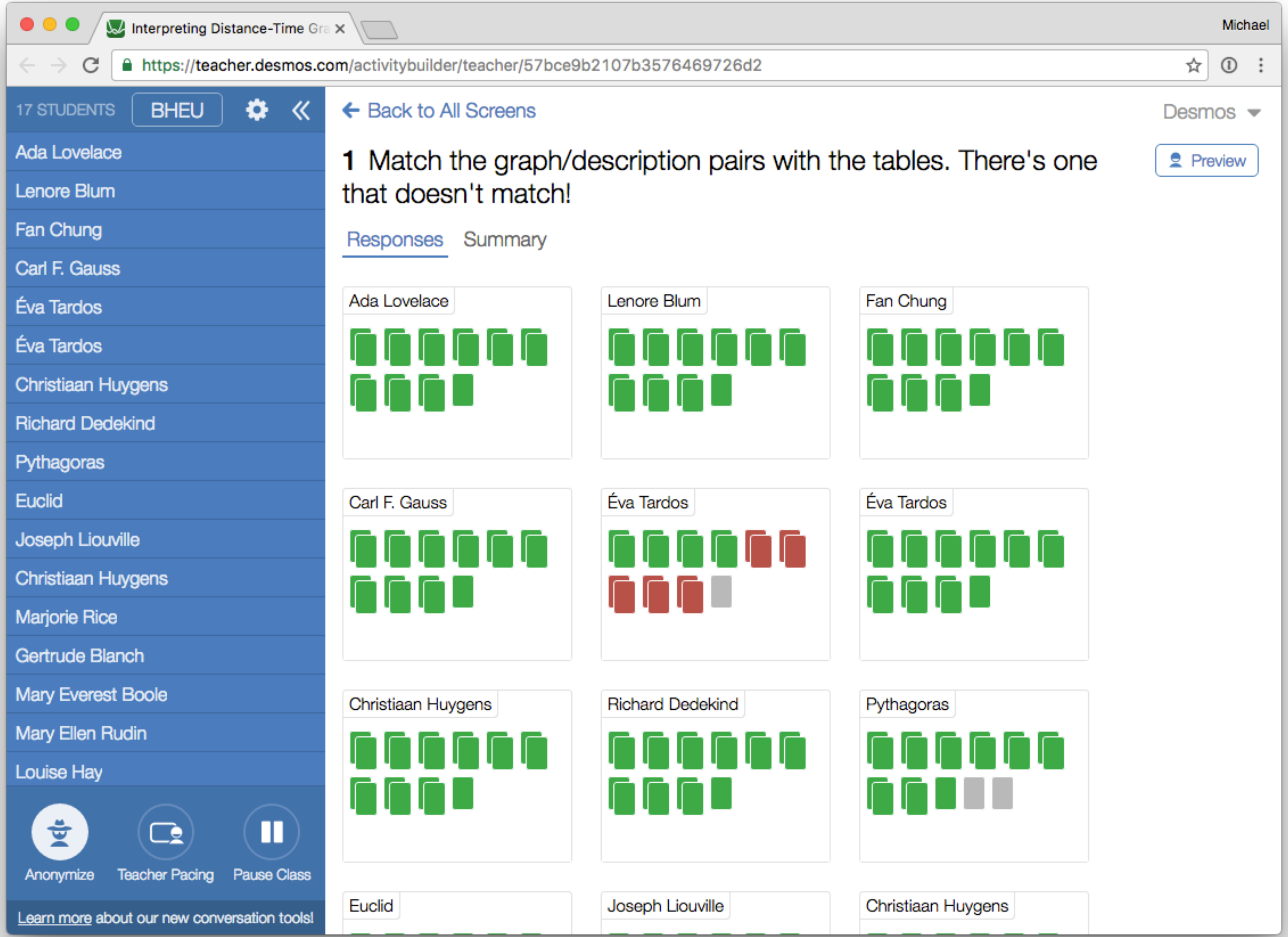
Time	Distance
0	0
1	40
2	80
3	60
4	40
5	80

Q

Time	Distance
0	0
1	10
2	20
3	40
4	60
5	120

3 Tom skateboarded from his house, gradually building up speed. He slowed down to avoid some rough ground, but then speeded up again.

2 Opposite Tom's home is a hill. Tom climbed slowly up the hill, walked across the top, and then ran quickly down the other side.


Interpreting Distance-Time Gra
Michael
https://teacher.desmos.com/activitybuilder/teacher/57bce9b2107b3576469726d2
17 STUDENTS
BHEU
Back to All Screens
Desmos
Preview
Responses
Summary
Anonymize
Teacher Pacing
Pause Class
Learn more about our new conversation tools!

Ada Lovelace
Lenore Blum
Fan Chung
Carl F. Gauss
Éva Tardos
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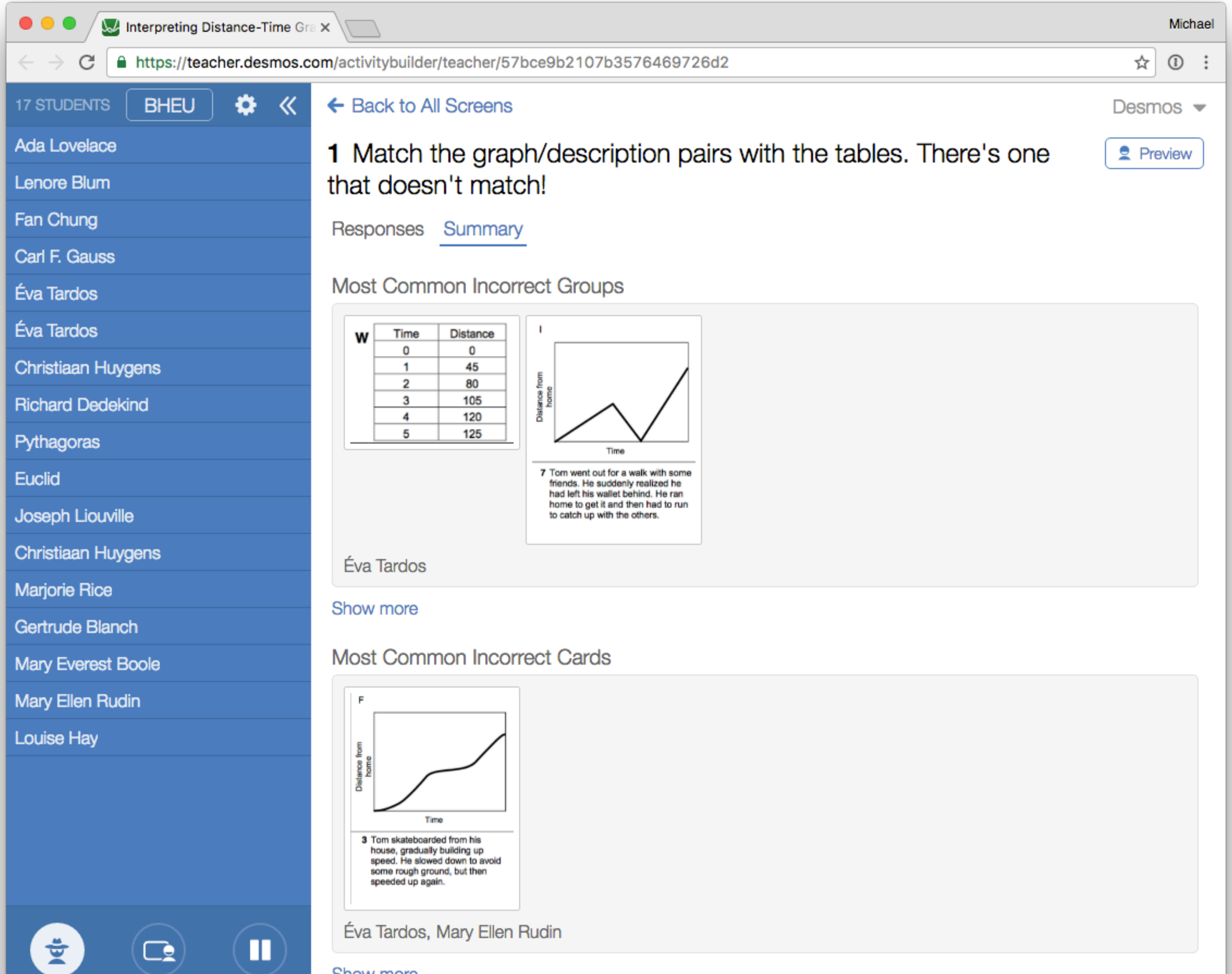
Christiaan Huygens
Richard Dedekind
Pythagoras
Euclid
Joseph Liouville
Christiaan Huygens
Marjorie Rice
Gertrude Blanch
Mary Everest Boole
Mary Ellen Rudin
Louise Hay

1 Match the graph/description pairs with the tables. There's one that doesn't match!

Ada Lovelace	Lenore Blum	Fan Chung
Carl F. Gauss	Éva Tardos	Éva Tardos
Christiaan Huygens	Richard Dedekind	Pythagoras
Euclid	Joseph Liouville	Christiaan Huygens



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1 Match the graph/description pairs with the tables. There's one that doesn't match!

Responses Summary

Most Common Incorrect Groups

W

Time	Distance
0	0
1	45
2	80
3	105
4	120
5	125

7 Tom went out for a walk with some friends. He suddenly realized he had left his wallet behind. He ran home to get it and then had to run to catch up with the others.

Éva Tardos

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Most Common Incorrect Cards

3 Tom skateboarded from his house, gradually building up speed. He slowed down to avoid some rough ground, but then speeded up again.

Éva Tardos, Mary Ellen Rudin

Responses Summary

Most Common Incorrect Groups

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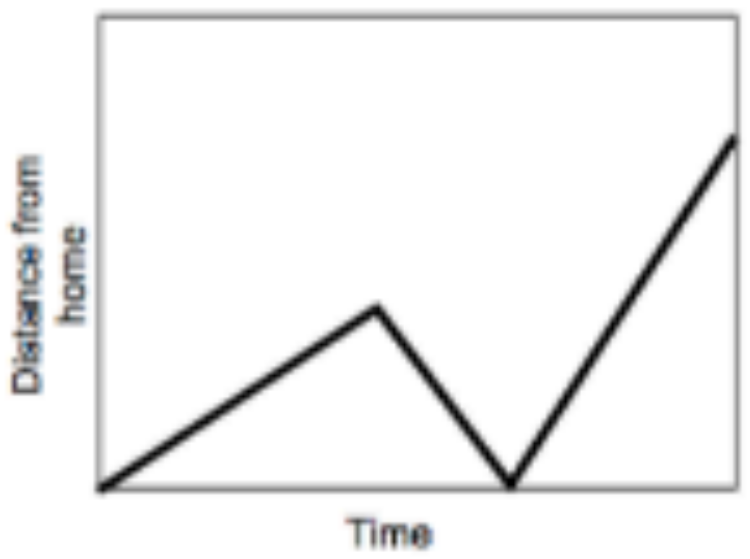
I



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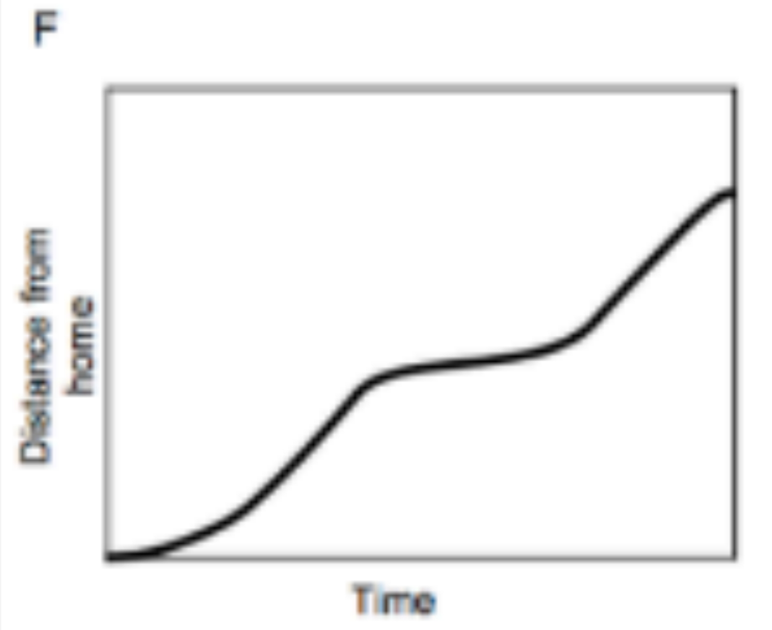

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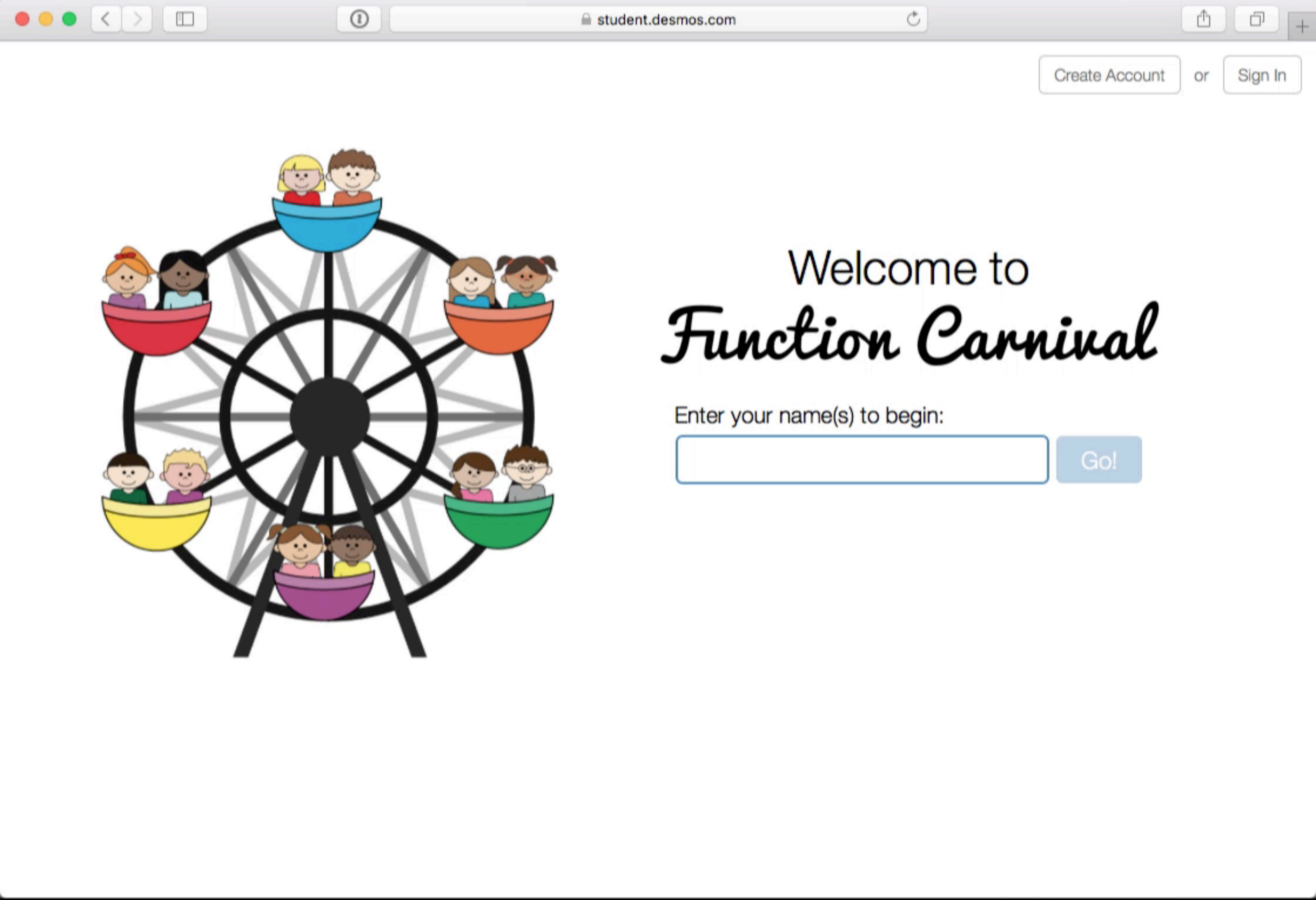

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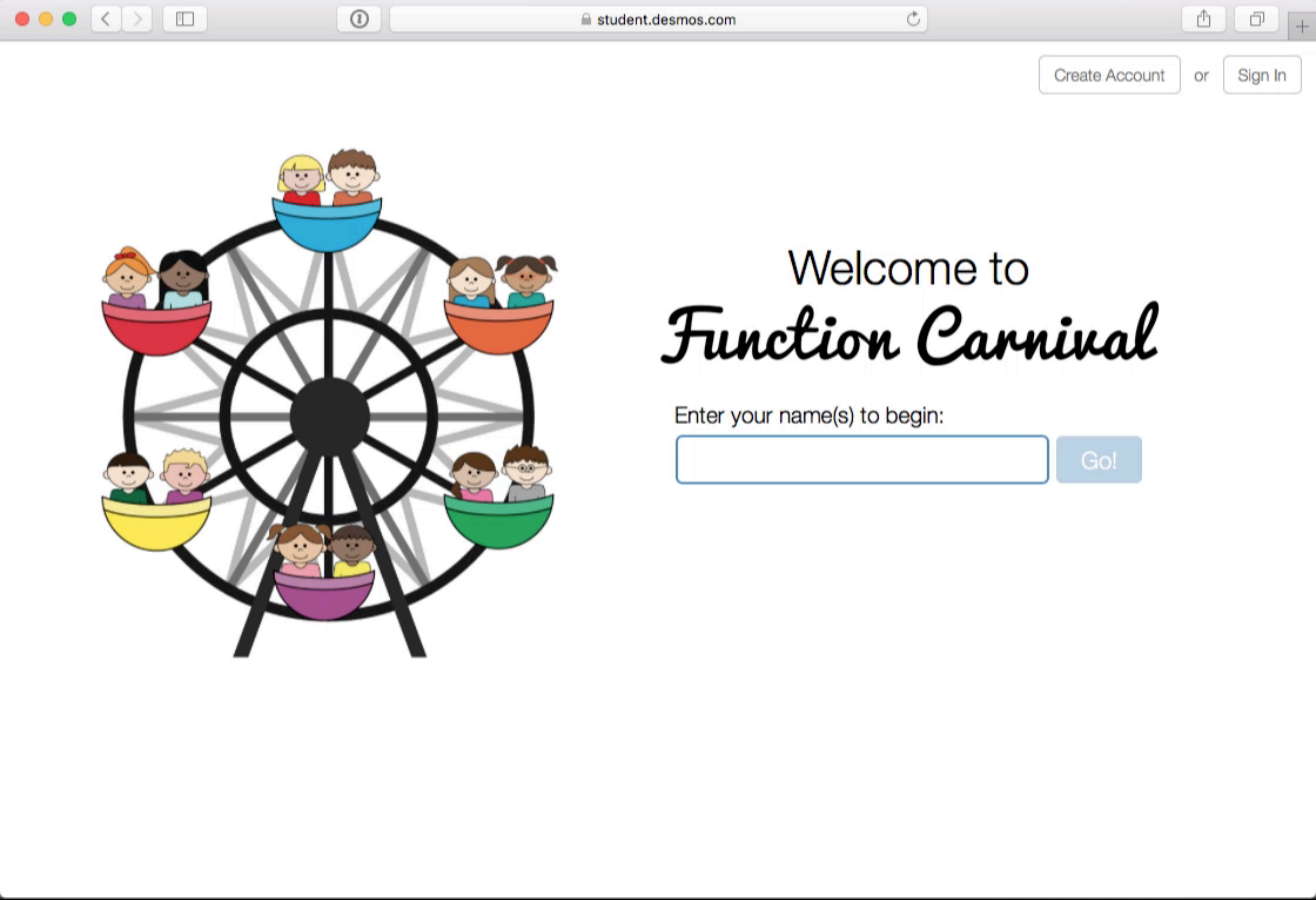

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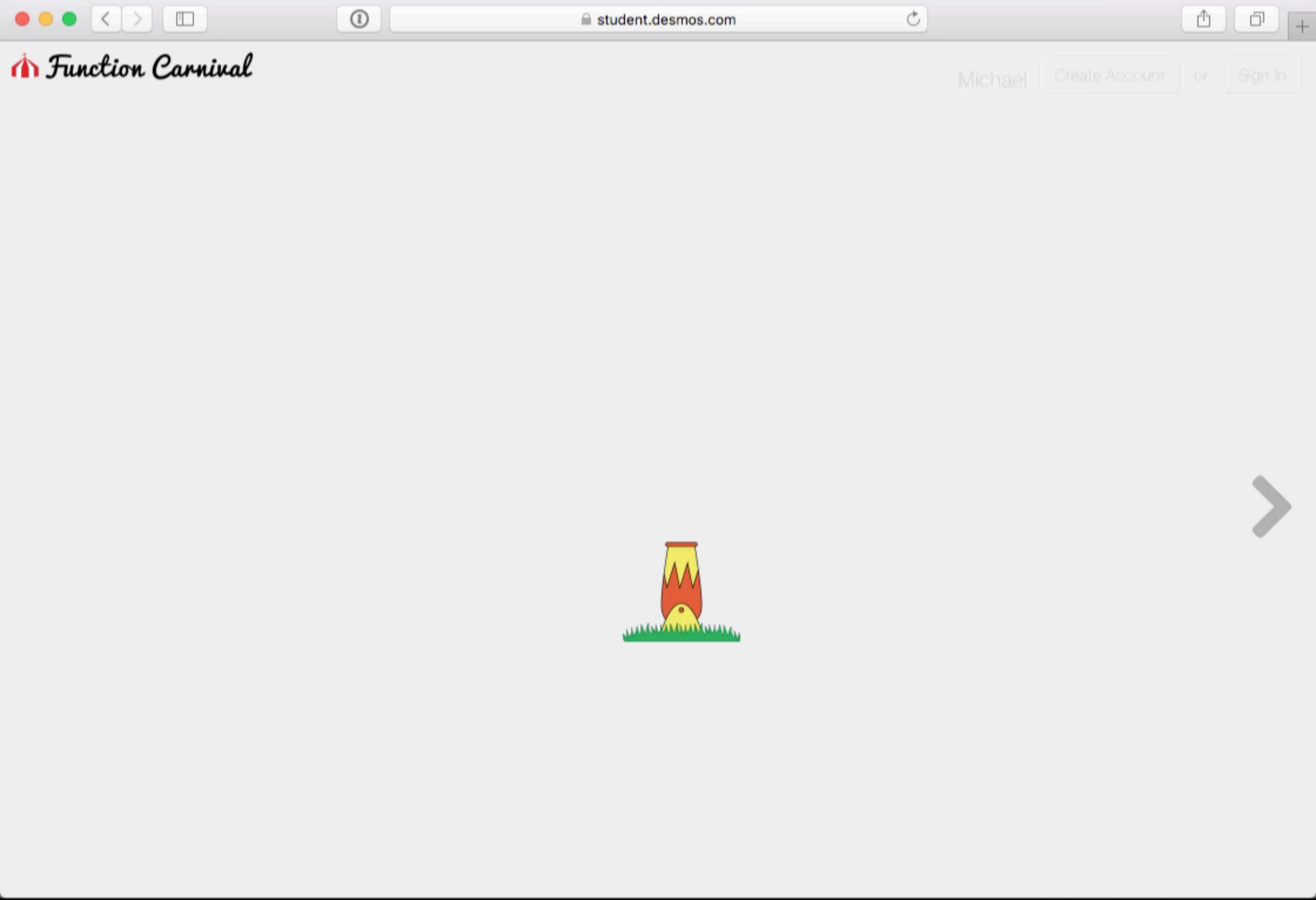
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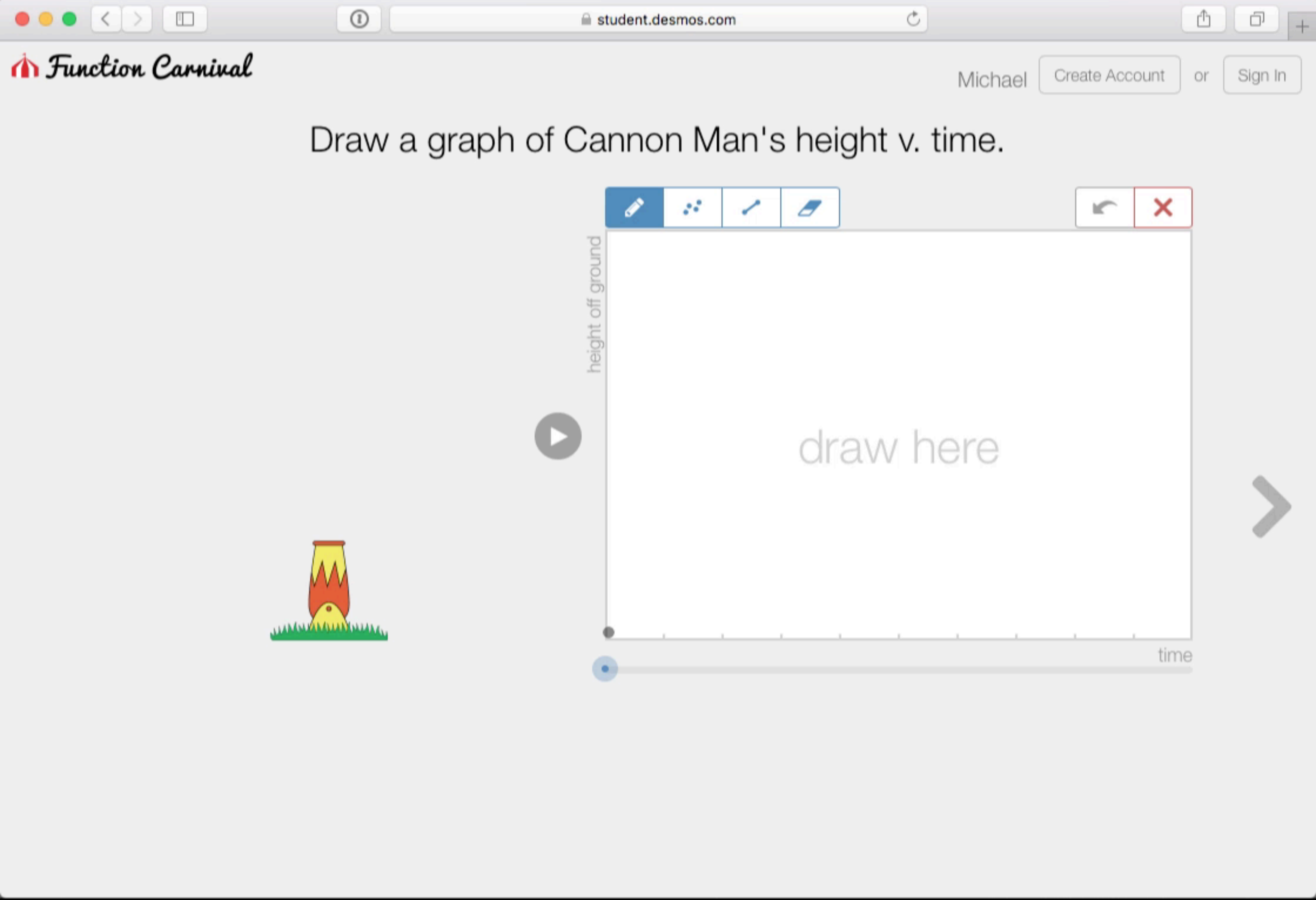
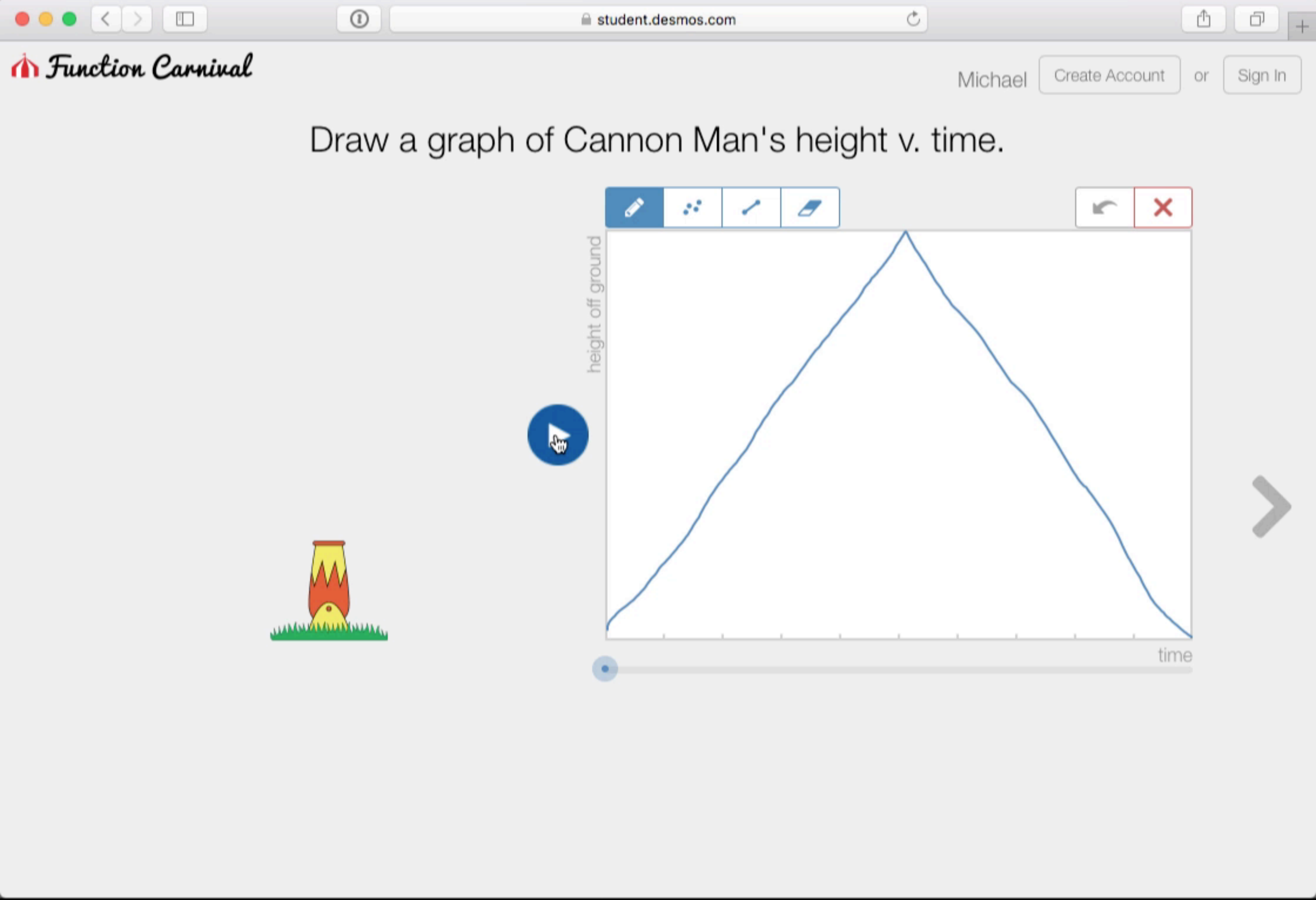


Draw a graph of Cannon Man's height v. time.



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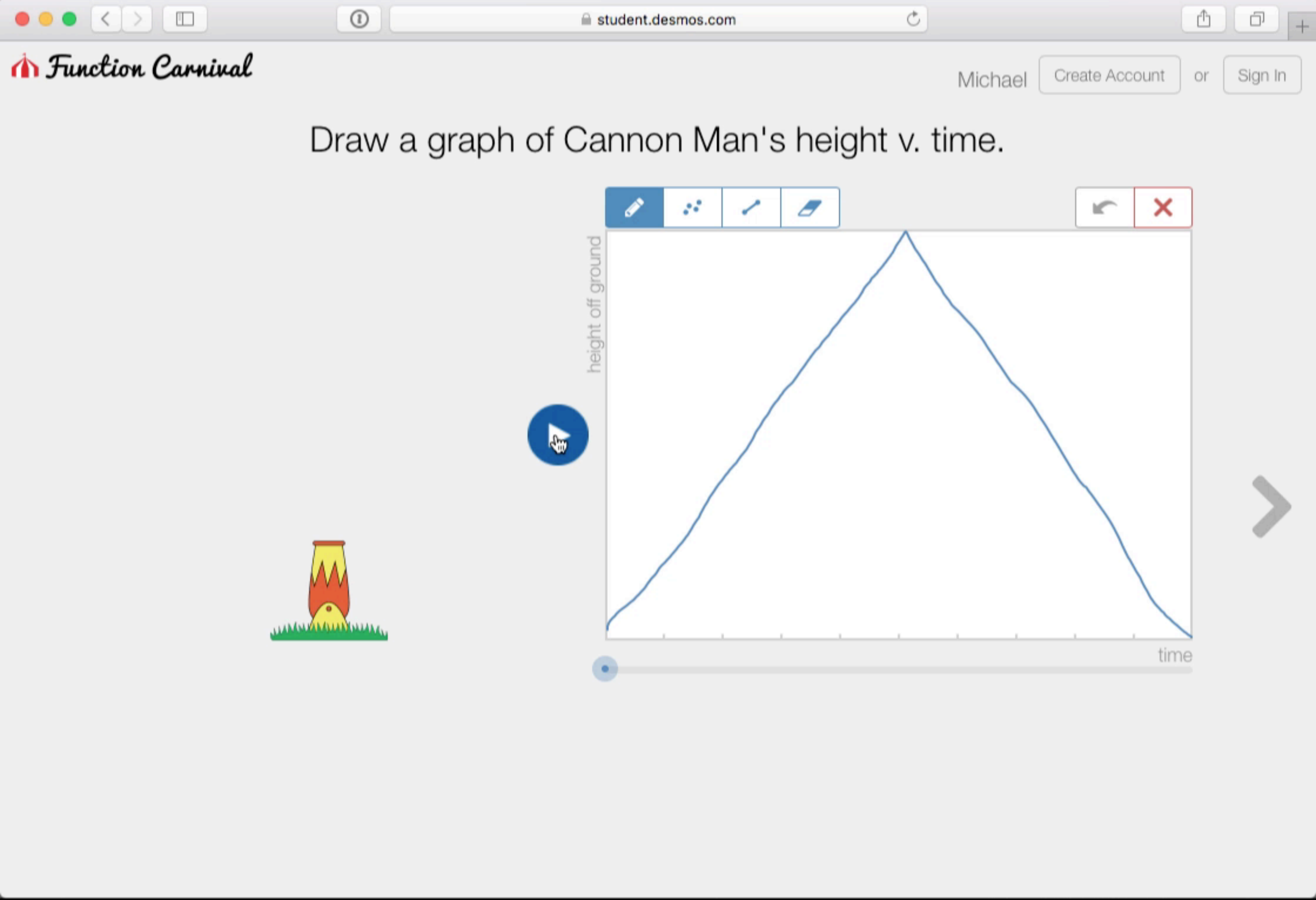

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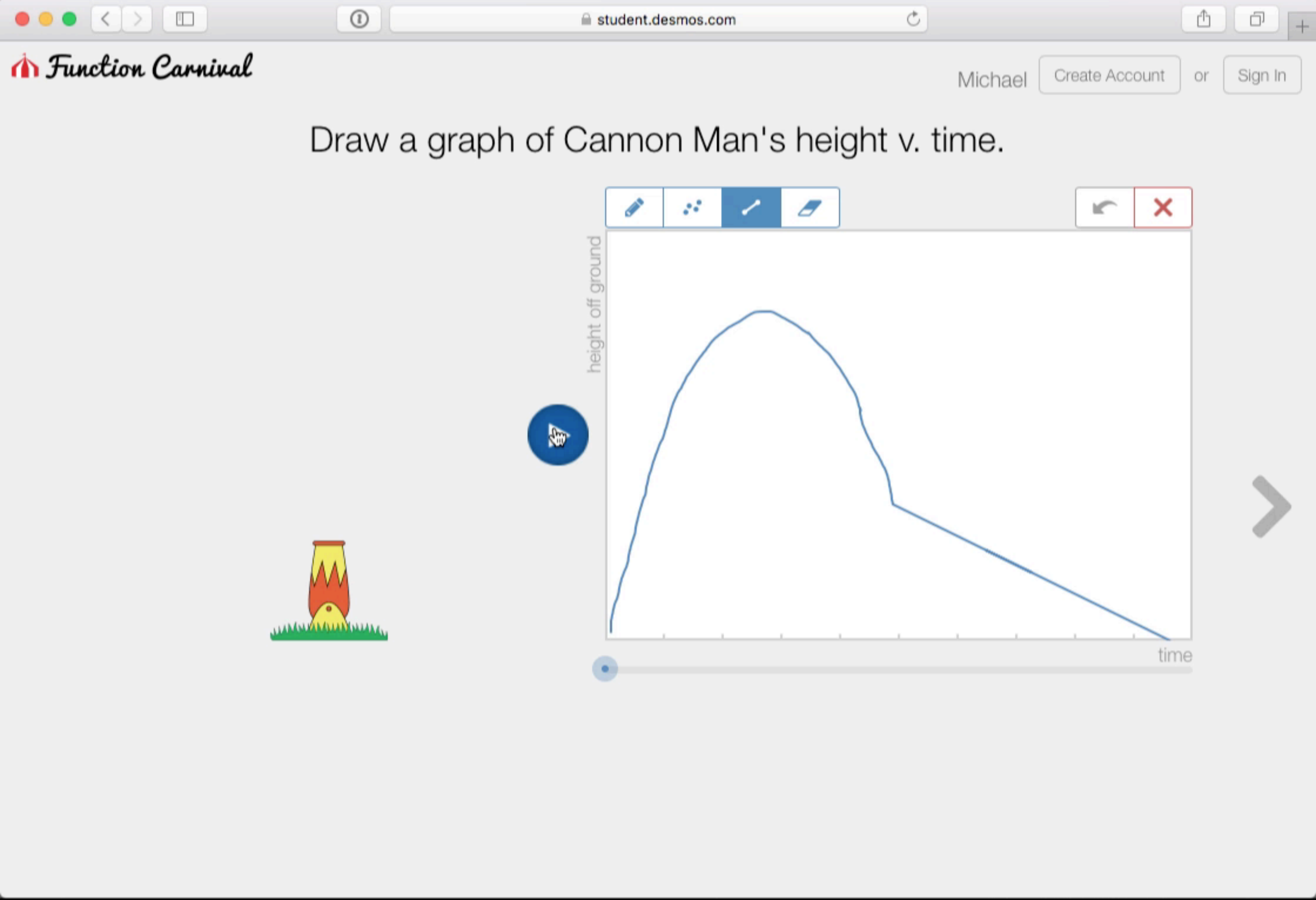

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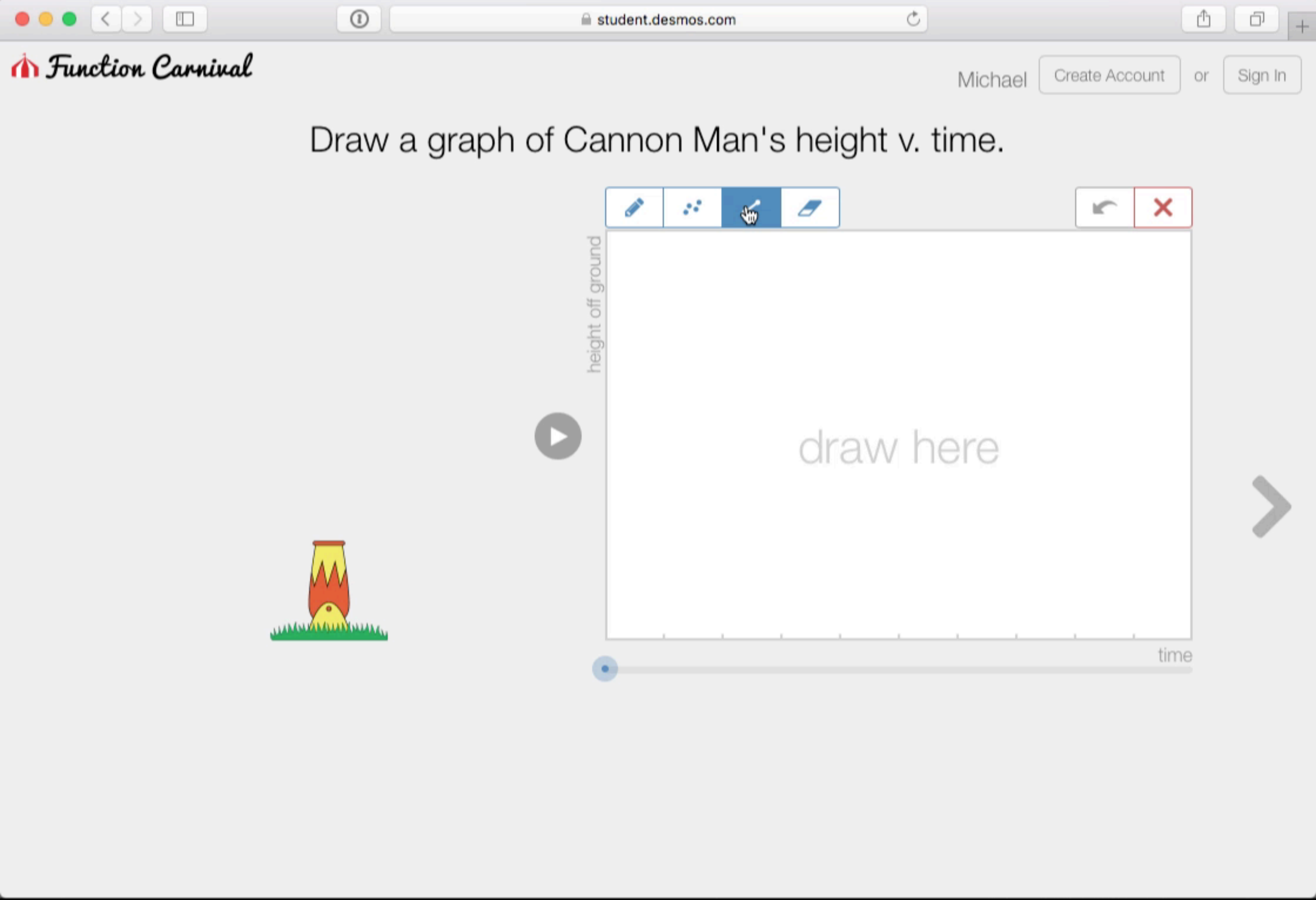

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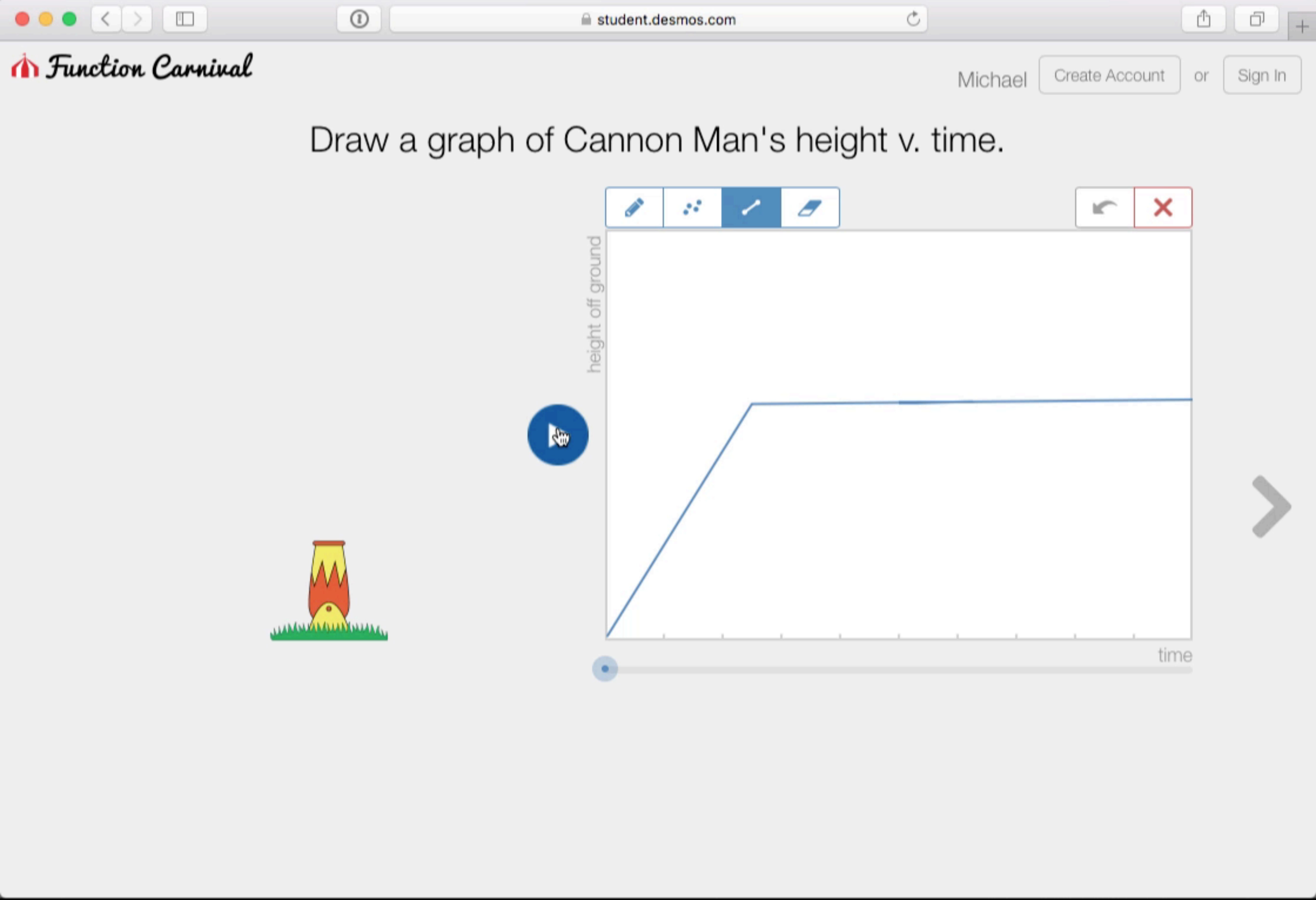

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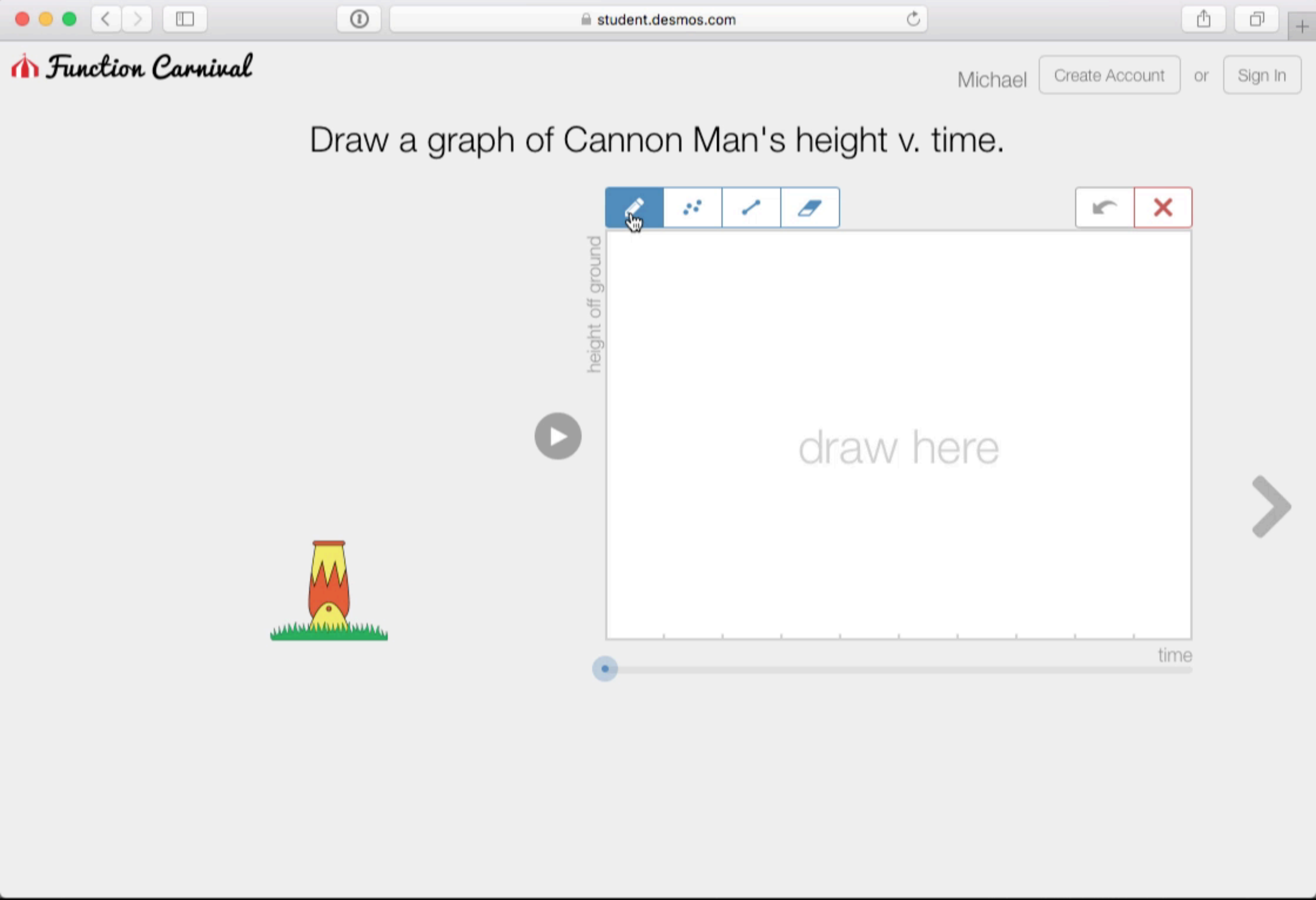

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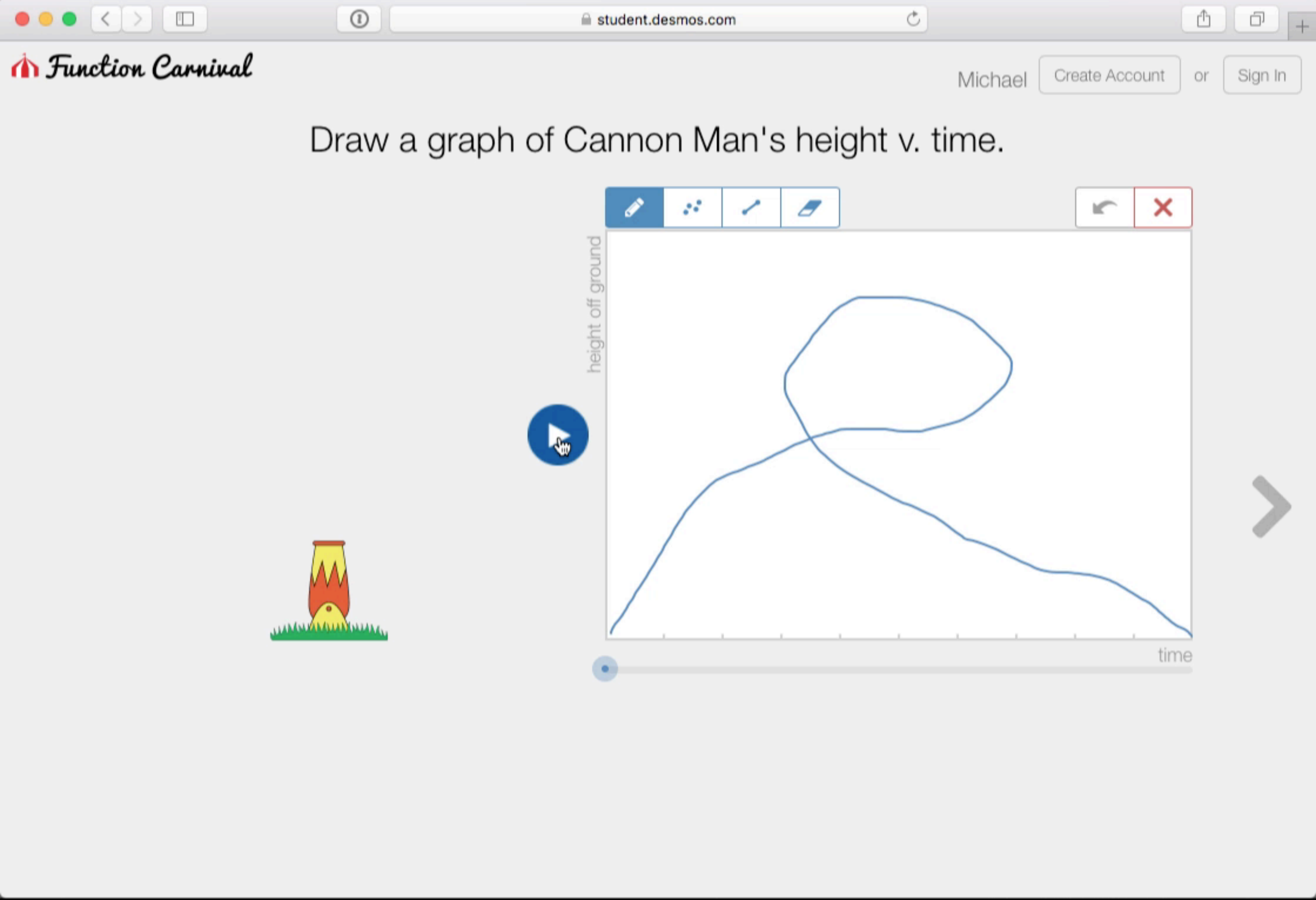

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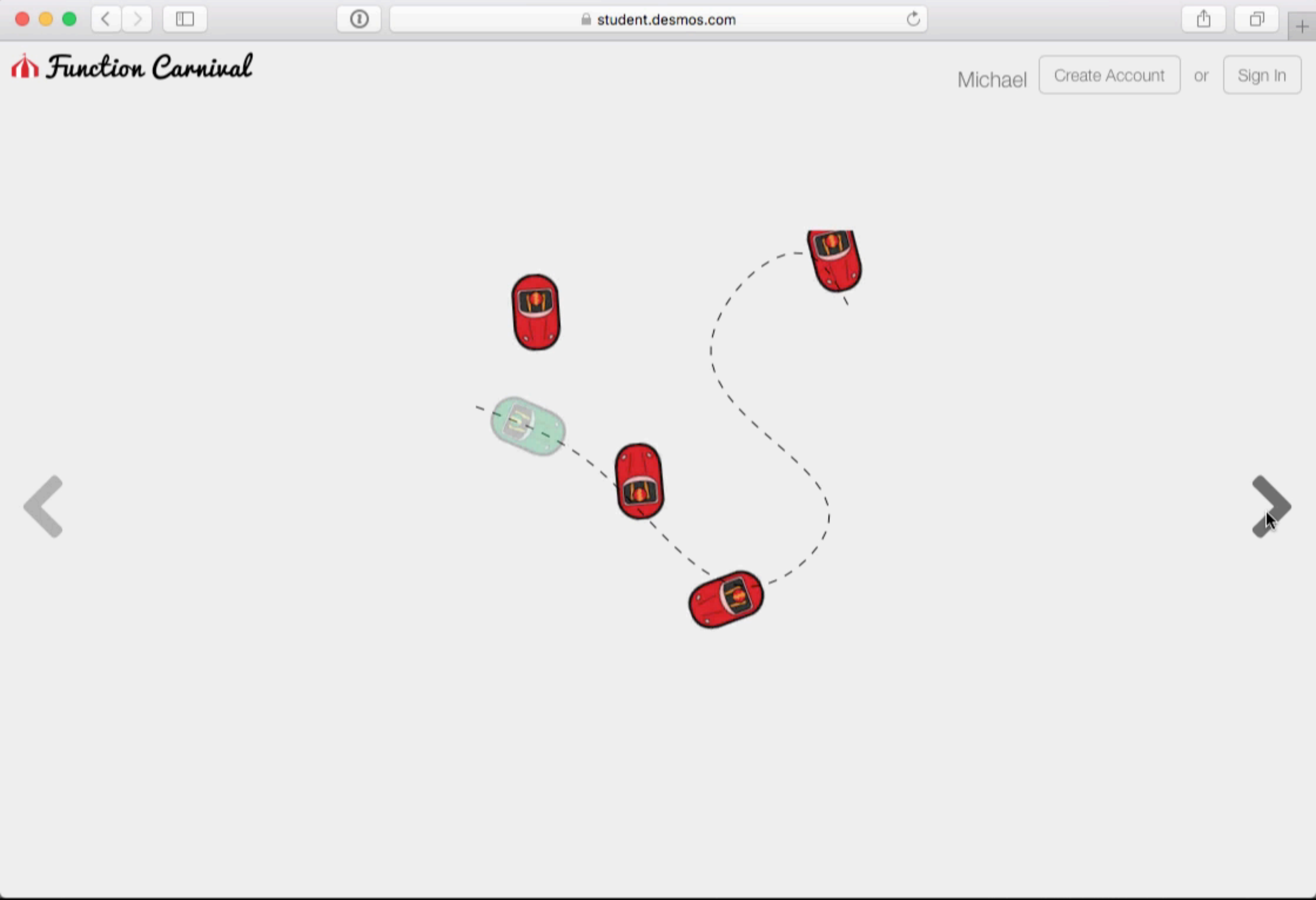
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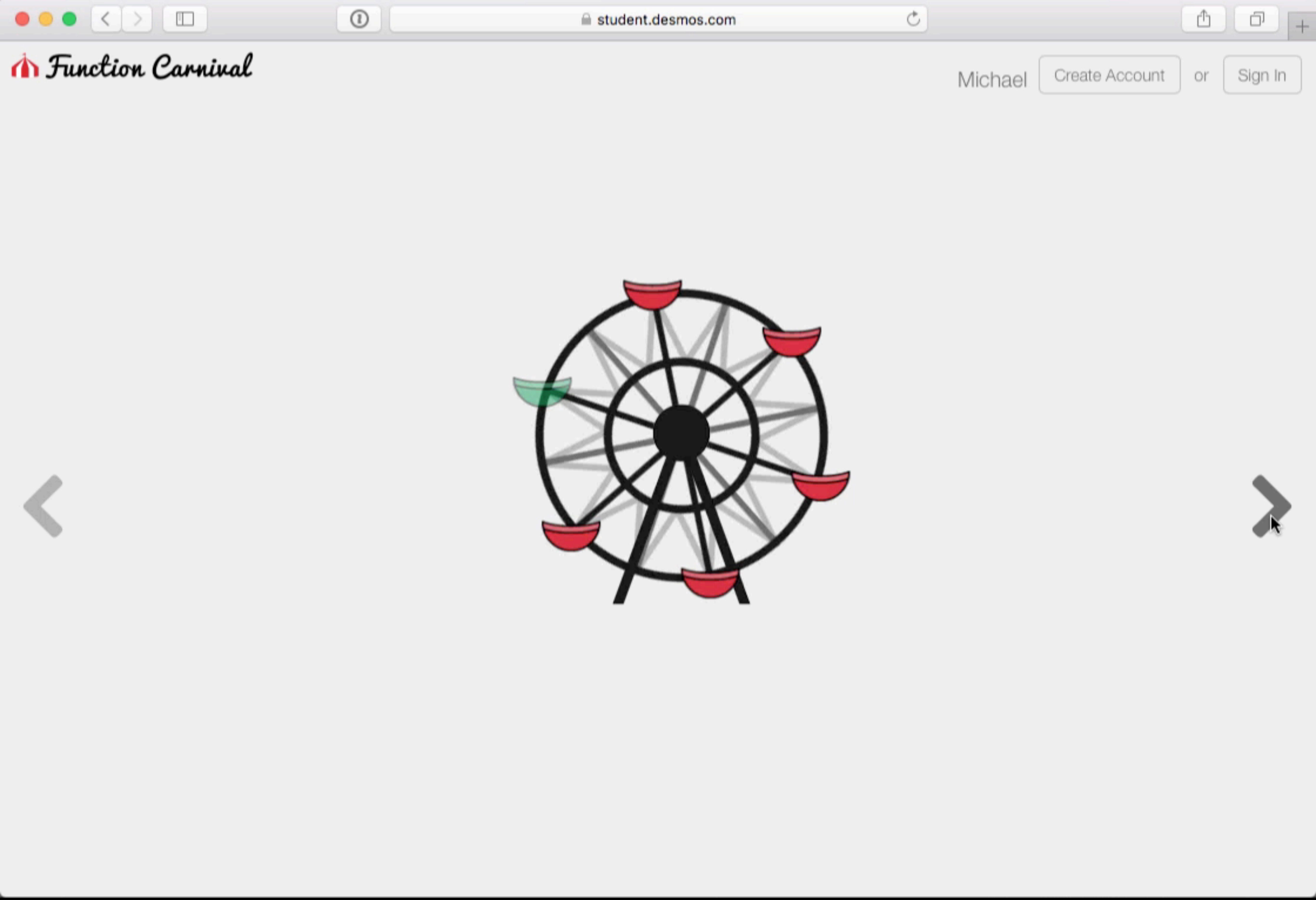
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Connect representations.

Create an intellectual need
for new mathematical skills.

Integrate strategy and practice.

Create activities that are
easy to start, difficult to finish.

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Create an intellectual need for new mathematical skills.

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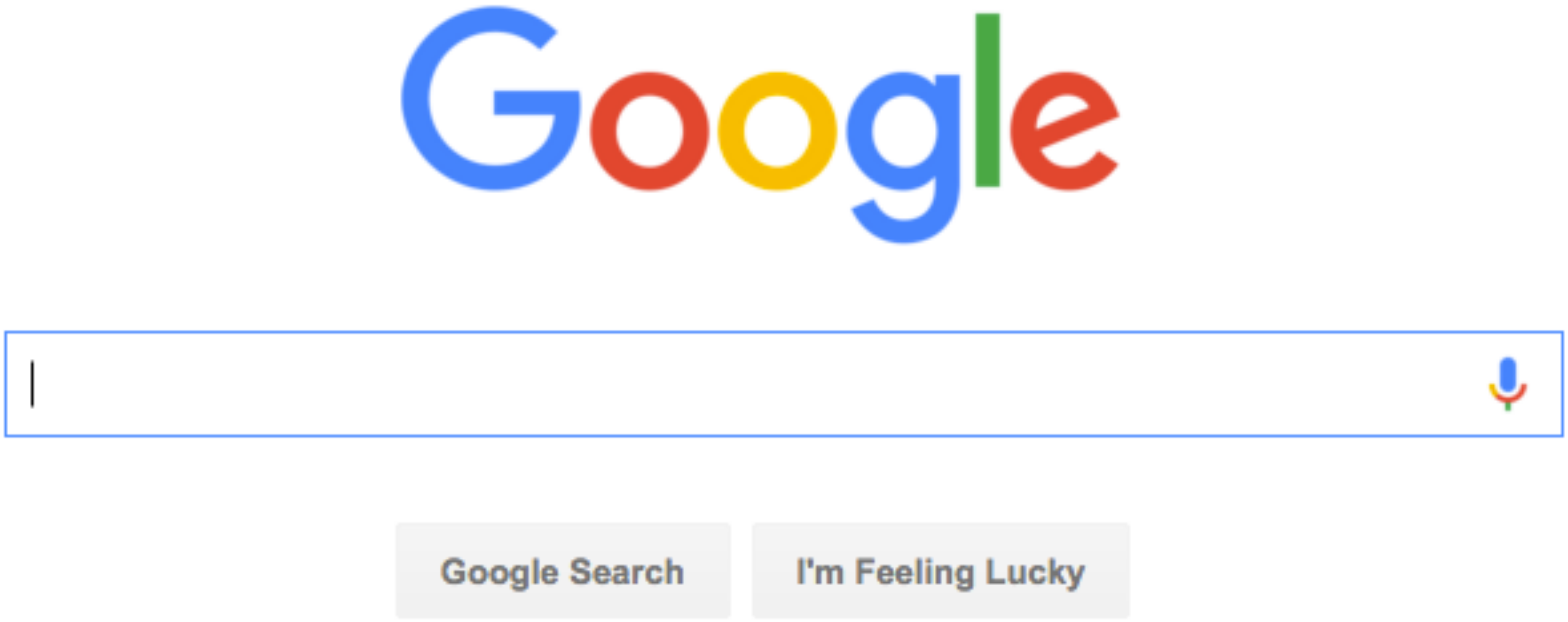
“…the joy in
being the cause.”

– Jean Piaget

Round 4



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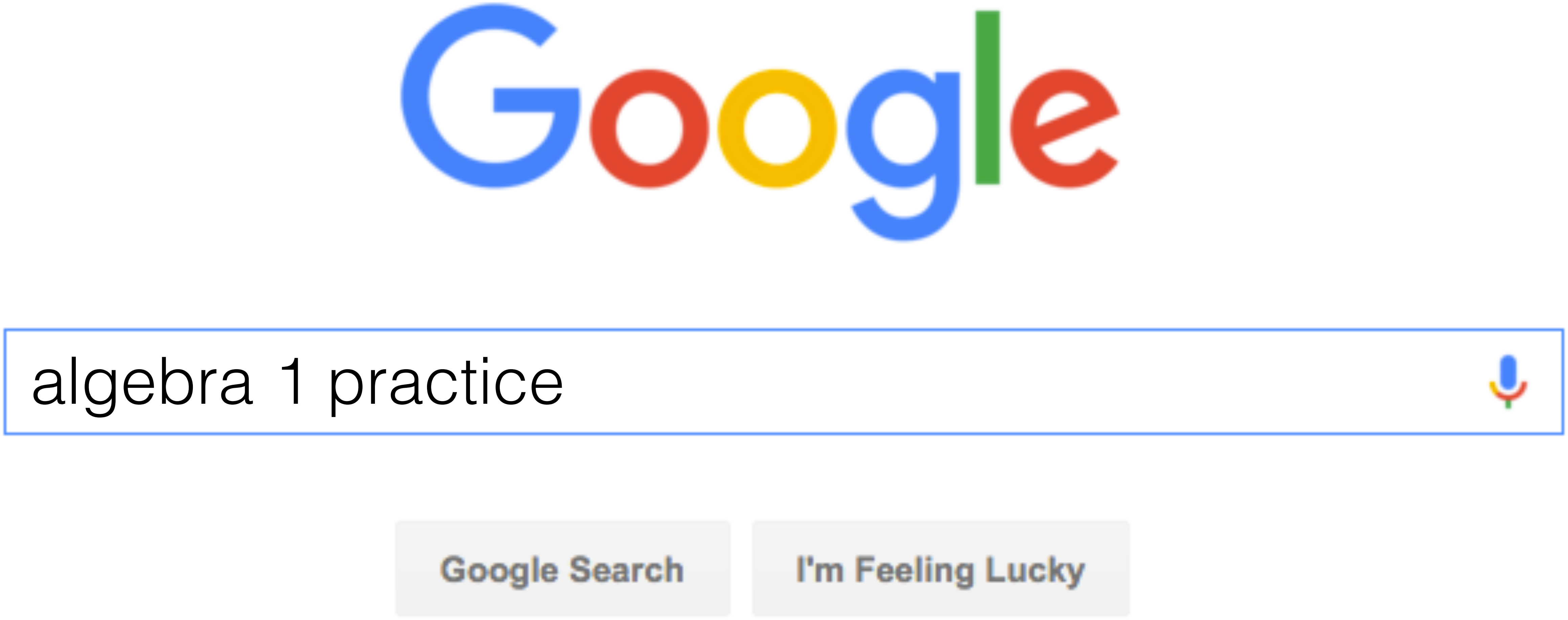

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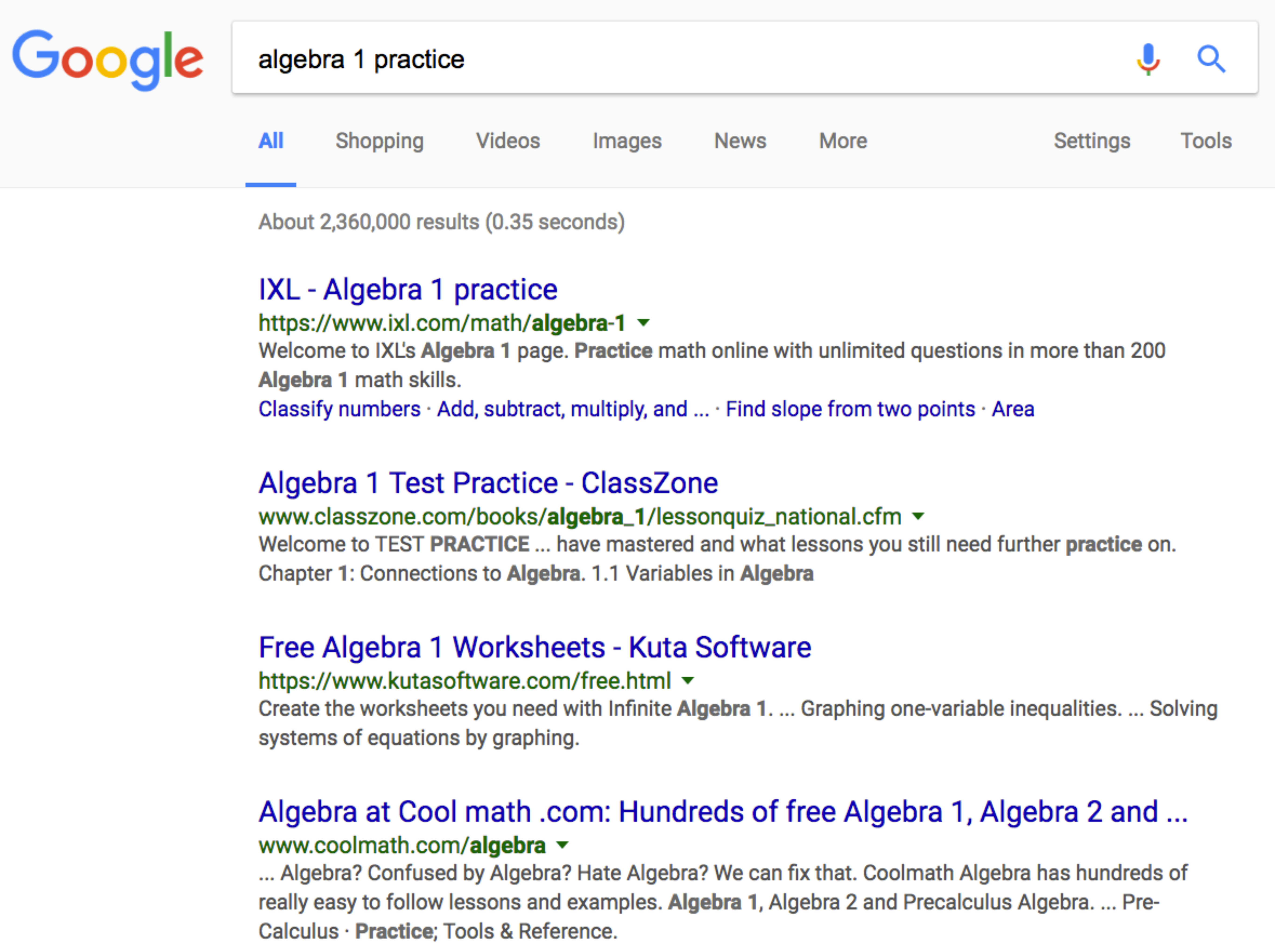

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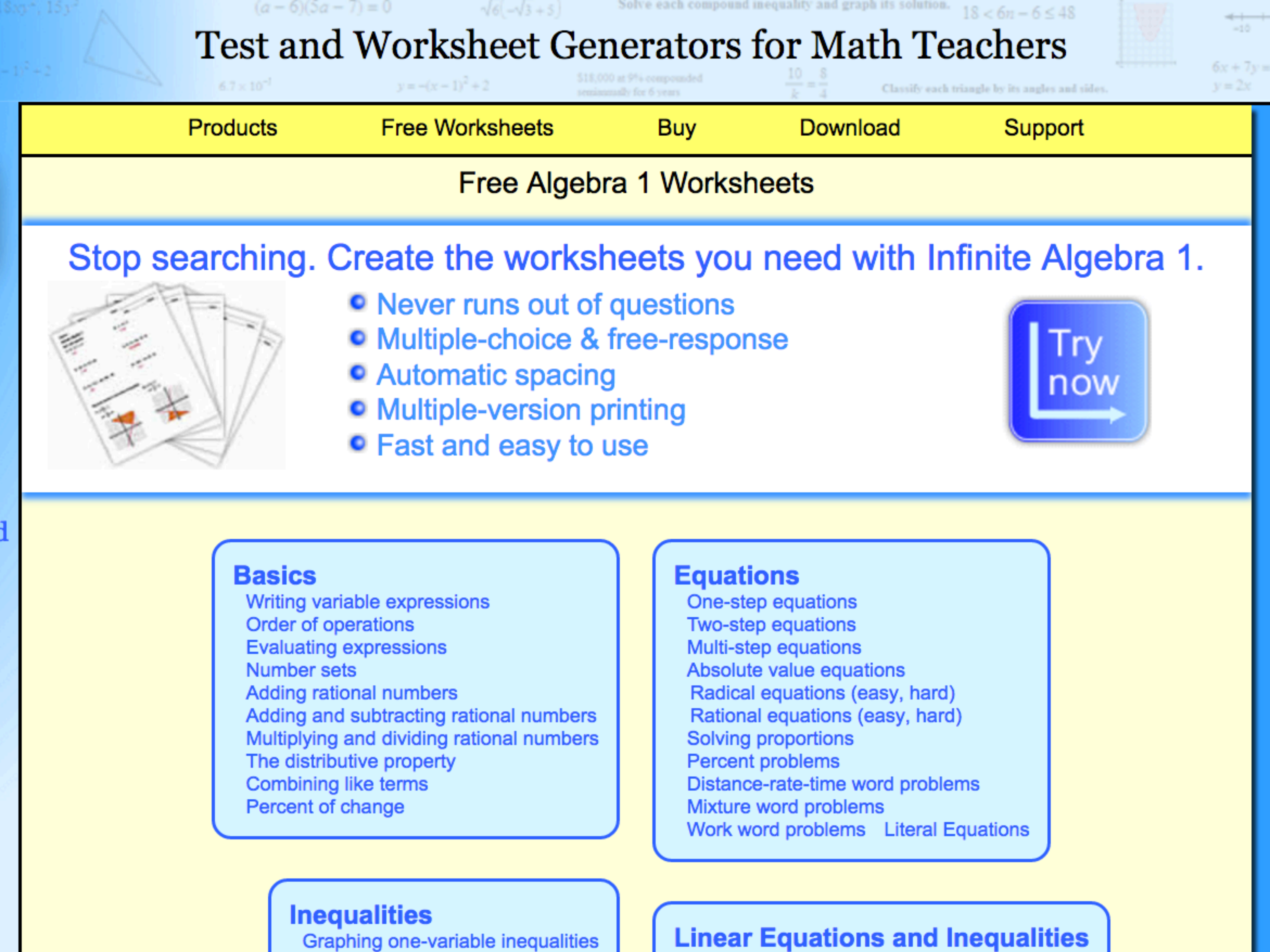

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Evaluating expressions
Number sets
Adding rational numbers
Adding and subtracting rational numbers
Multiplying and dividing rational numbers
The distributive property
Combining like terms
Percent of change

Equations
One-step equations
Two-step equations
Multi-step equations
Absolute value equations
Radical equations (easy, hard)
Rational equations (easy, hard)
Solving proportions
Percent problems
Distance-rate-time word problems
Mixture word problems
Work word problems Literal Equations

Inequalities
Graphing one-variable inequalities

Linear Equations and Inequalities

Name___________________________________

Evaluating Expressions

Date________________ Period____

Evaluate each using the values given.

1) $y \div 2 + x$; use $x = 1$, and $y = 2$

2) $a - 5 - b$; use $a = 10$, and $b = 4$

3) $p^2 + m$; use $m = 1$, and $p = 5$

4) $y + 9 - x$; use $x = 1$, and $y = 3$

5) $m + p \div 5$; use $m = 1$, and $p = 5$

6) $y^2 - x$; use $x = 7$, and $y = 7$

7) $z(x + y)$; use $x = 6$, $y = 8$, and $z = 6$

8) $x + y + y$; use $x = 9$, and $y = 10$

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Name_____________________________________

Two-Step Equations

Date__________________ Period____

Solve each equation.

1) $6 = \frac{a}{4} + 2$

2) $-6 + \frac{x}{4} = -5$

3) $9x - 7 = -7$

4) $0 = 4 + \frac{n}{5}$

5) $-4 = \frac{r}{20} - 5$

6) $-1 = \frac{5 + x}{6}$

7) $\frac{v + 9}{} = 8$

8) $2(n + 5) = -2$

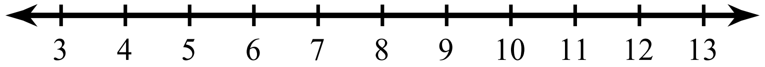
Kuta Software - Infinite Algebra 1 Name___________________________________

Two-Step Inequalities

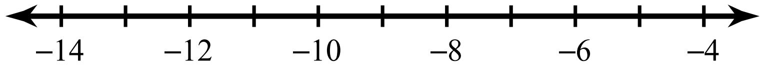
Date________________ Period____

Solve each inequality and graph its solution.

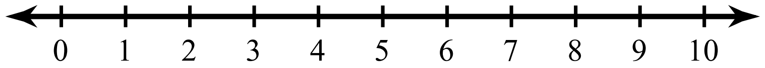
1) $2x + 4 \geq 24$



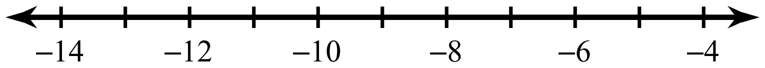
2) $\frac{m}{3} - 3 \leq -6$



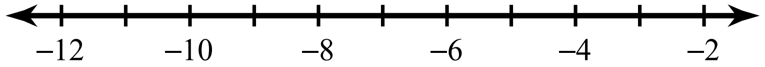
3) $-3(p + 1) \leq -18$



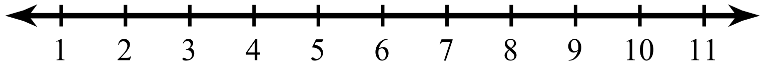
4) $-4(-4 + x) > 56$



5) $-b - 2 > 8$

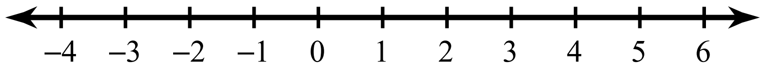


6) $-4(3 + n) > -32$



7) $4 + \frac{n}{3} < 6$

8) $-3(r - 4) \geq 0$



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Name________________________________

Writing Linear Equations

Date________________ Period____

Write the slope-intercept form of the equation of each line.

1) $3x - 2y = -16$

2) $13x - 11y = -12$

3) $9x - 7y = -7$

4) $x - 3y = 6$

5) $6x + 5y = -15$

6) $4x - y = 1$

7) $11x - 4y = 32$

8) $11x - 8y = -48$

Algebra 2 · Day 1 HW

Like Terms, Distributive Property, and Simplifying

1. Given $-r^5t$, name the coefficient.

2. Given $\frac{2}{3}gh^2$, name the coefficient.

3. Given $7y-3+8y^3$, name the constant term.

4. Given $4a^6$, name the exponent.

5. Are $5d$ and $5d^5$ like terms?

6. Are $-\frac{1}{2}st$ and $9st$ like terms?

7. Simplify: $-6e+12+9e-20$

11. Simplify: $-4(n-2)$

12. Simplify: $\frac{1}{3}(3-12r)$

13. Simplify: $2(m-7)+15$

14. Simplify: $-9k+3(3+5k)$

15. Simplify: $12-8(x+3)$

16. Simplify: $4z^2+9(1-3z^2)$

17. Simplify: $-1+4(2-3w)+18w$

Algebra 2 • Day 18 HW

Addition, Subtraction, Multiplication, Division, and Powers of Monomials

1. Simplify: $-6xy + 2xy$

2. Write $-3f^2 - 11f + 8f^2$ in simplest form.

3. Write $7de - 5d^2e + 3d^2e$ in simplest form.

4. Simplify: $8 + 4r - 13 - r$

5. Simplify: $2 - 11z^3 + 6z^3 - 5$

6. Which expression is equivalent to $4t + 7t + 3t$?
   - a. $14t^3$
   - b. $14t + t$
   - c. $14t - t$
   - d. $12t + 3t - t$

7. Simplify: $x^3 \cdot x^4 \cdot x$

8. Simplify: $\left(-2x^2\right)\left(-3x^5\right)$

12. The length and width of a rectangle are $\left(3r^5\right)$ and $\left(8r^7\right)$, respectively. What is the area?

13. Simplify: $\left(x^3\right)^5$

14. Simplify: $\left(-2d^4e\right)^3$

15. Write $\left(\frac{1}{3}rs^3t^8\right)^2$ in simplest form.

16. Simplify: $\frac{4f^8}{20f^2}$

17. Simplify: $\frac{y^2}{y^{16}}$

Algebra 2 · Day 33 HW

Multiplication, Division, and Powers of Monomials

FIRST, write your answers with positive exponents.
THEN, with all variables in the numerator.

1. Simplify: $\left(6tu^{4}\right)\left(-4t^{5}u^{-3}\right)$

2. Find the product of $\frac{2}{5}d^{-6}e^{2}$ and $-8d^{-3}e^{-1}$.

3. Write $\left(-7x^{9}y^{-8}\right)^{2}$ in simplest form.

6. Divide $5u^{9}v^{-7}w$ by $30u^{-9}v^{-8}w$.

7. Write $\dfrac{16k^{50}l^{12}m^{-3}}{\left(4k^{15}l^{-2}m^{3}\right)\left(k^{10}m^{2}\right)}$ in simplest form.

8. Find the quotient: $\dfrac{\left(-5f^{-1}g^{3}\right)^{2}}{-25f^{-3}g^{10}}$

Algebra 2 • Day 47 HW

Solving Equations by Factoring

1. True or False: $x^2 + 3x + 2$ is an equation.

2. What is the **Zero Product Property**?
   Write the property, then give an example of an equation easily solved with the property. (Do not solve it.)

3. When can the zero product property **not** be used to solve an equation?

4. Solve: $g\left(g-4\right)\left(2g+1\right)=0$

5. Find the x-intercepts of the graph of $y = x^2 - 5x$.

6. Solve: $t^2 = 8t$

10. Solve: $-f^2 = -8f - 33$

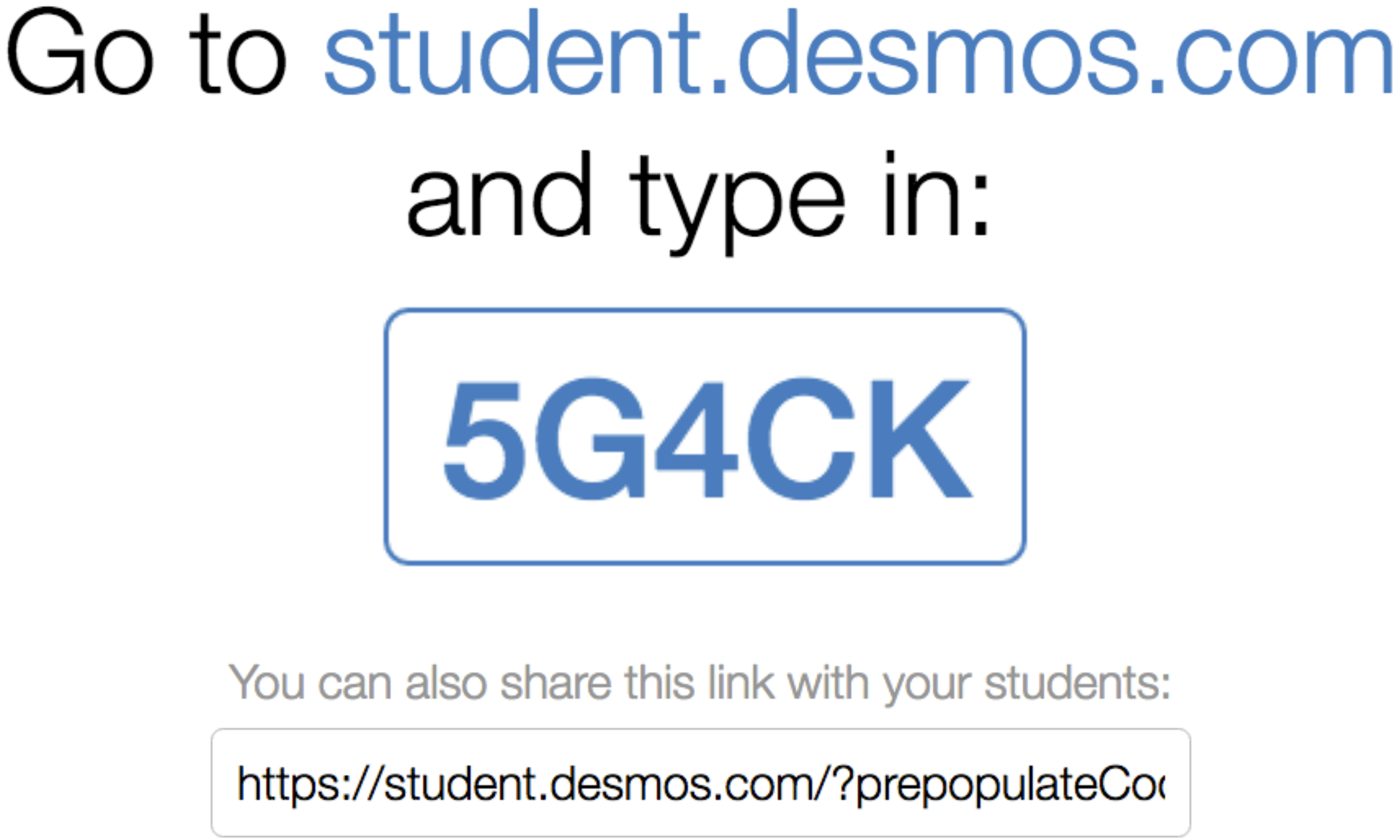
11. Solve: $\frac{1}{5}h^2 - \frac{9}{5} = 0$

12. Find all solutions: $p^3 + 9p^2 = -14p$

13. Solve the quadratic equation: $2k^2 - 14k + 20 = 0$

14. Solve: $5m - 3 = -2m^2$

Let’s Play



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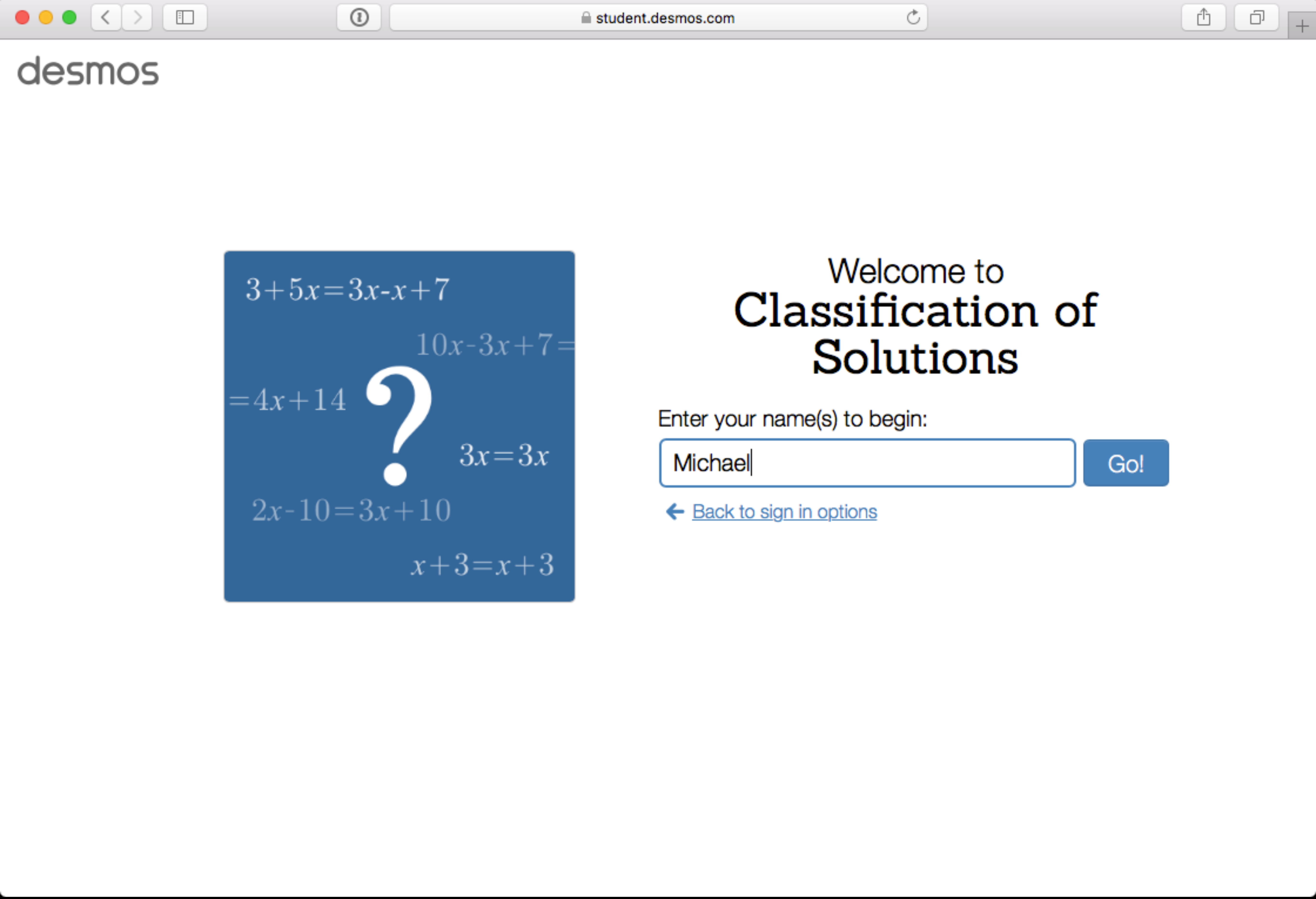

Welcome to

Classification of Solutions

Enter your name(s) to begin:

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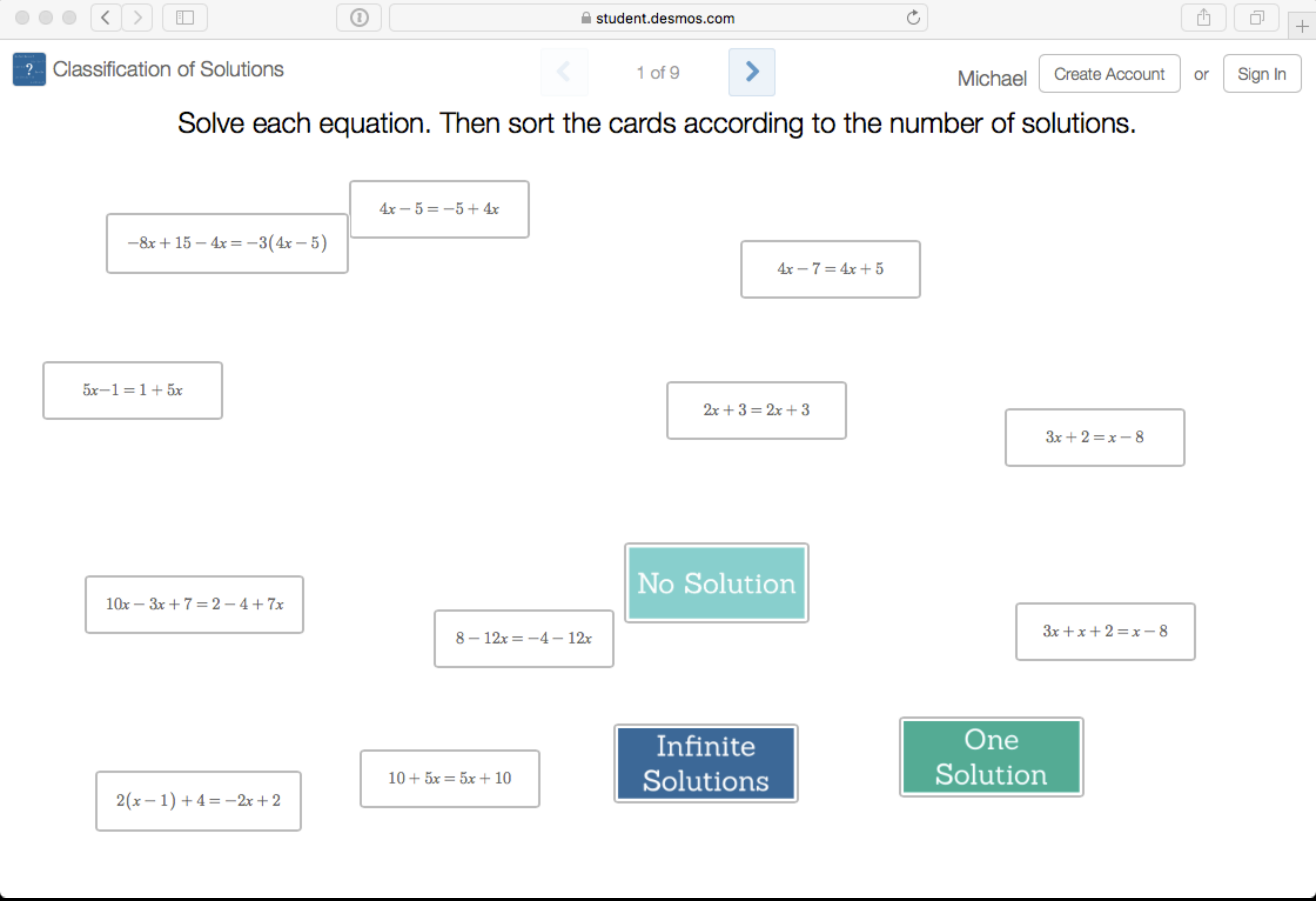


Solve each equation. Then sort the cards according to the number of solutions.

$4x-5=-5+4x$

$-8x+15-4x=-3(4x-5)$

$4x-7=4x+5$

$5x-1=1+5x$

$2x+3=2x+3$

$3x+2=x-8$

No Solution

$10x-3x+7=2-4+7x$

$8-12x=-4-12x$

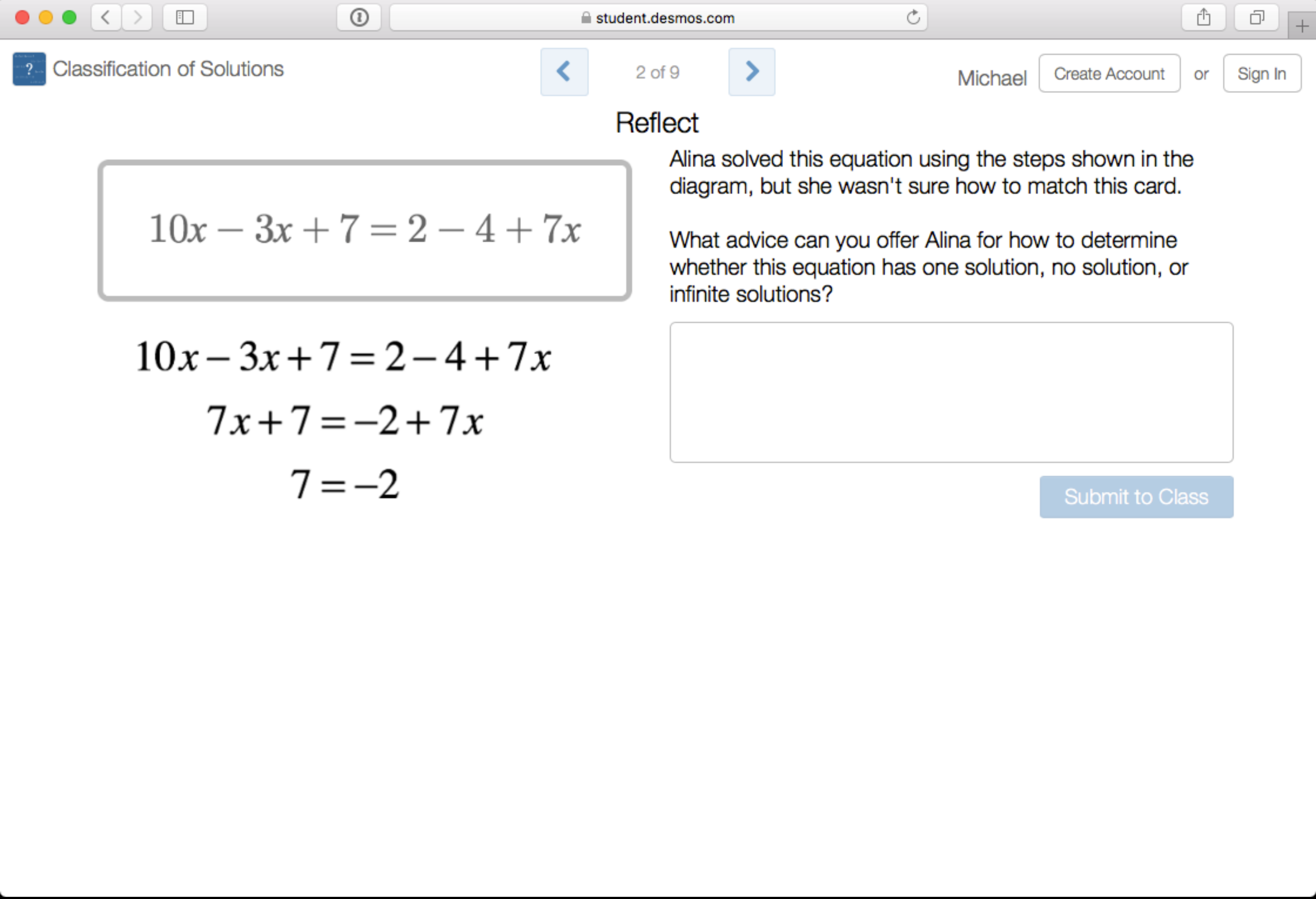
$3x+x+2=x-8$

Infinite Solutions

One Solution

$10+5x=5x+10$

$2(x-1)+4=-2x+2$



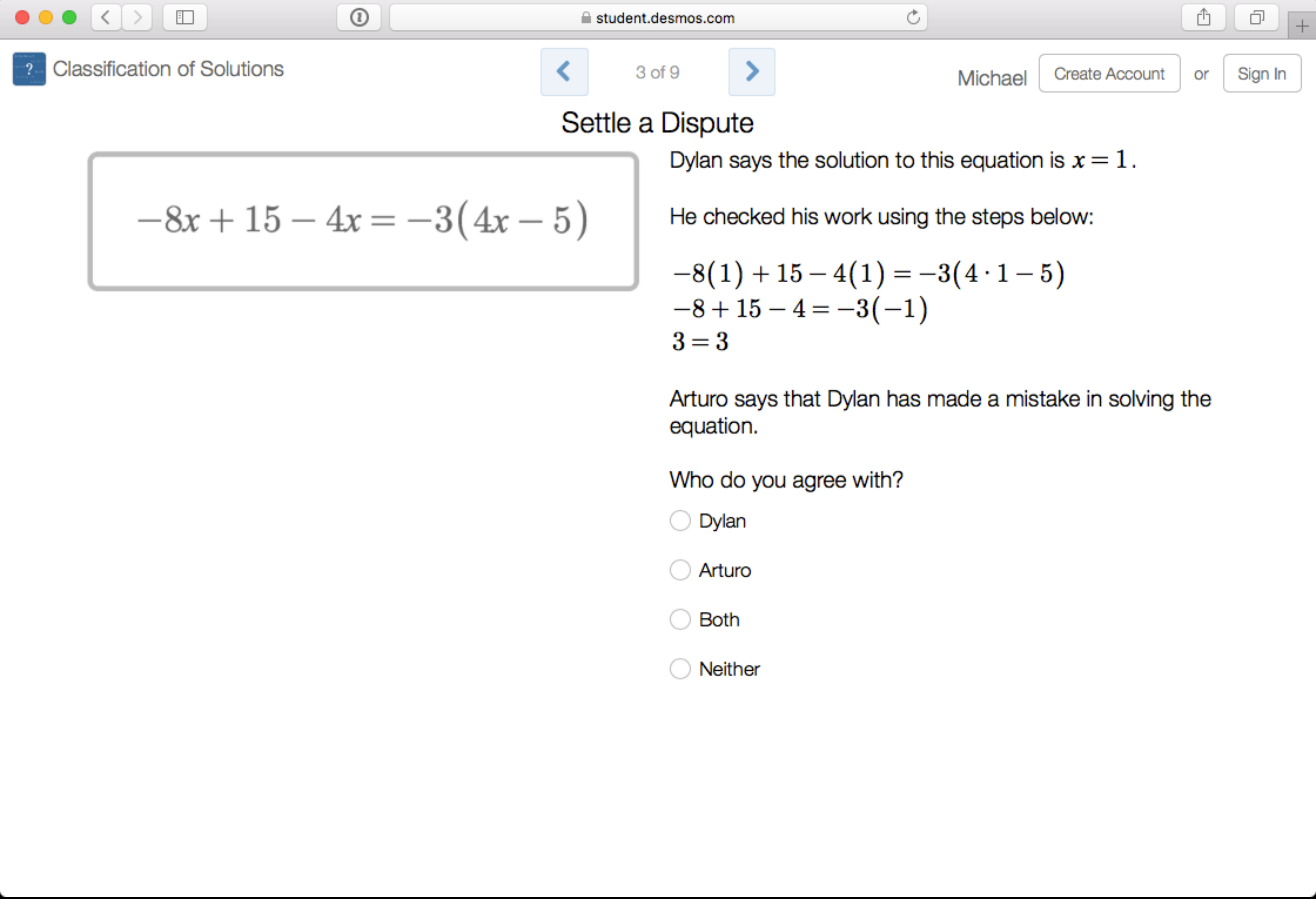
Reflect

$$10x - 3x + 7 = 2 - 4 + 7x$$

$$10x - 3x + 7 = 2 - 4 + 7x$$
$$7x + 7 = -2 + 7x$$
$$7 = -2$$

Alina solved this equation using the steps shown in the diagram, but she wasn't sure how to match this card.

What advice can you offer Alina for how to determine whether this equation has one solution, no solution, or infinite solutions?



Settle a Dispute

$$-8x+15-4x=-3(4x-5)$$

Dylan says the solution to this equation is $x=1$.

He checked his work using the steps below:

$$-8(1)+15-4(1)=-3(4\cdot 1-5)$$
$$-8+15-4=-3(-1)$$
$$3=3$$

Arturo says that Dylan has made a mistake in solving the equation.

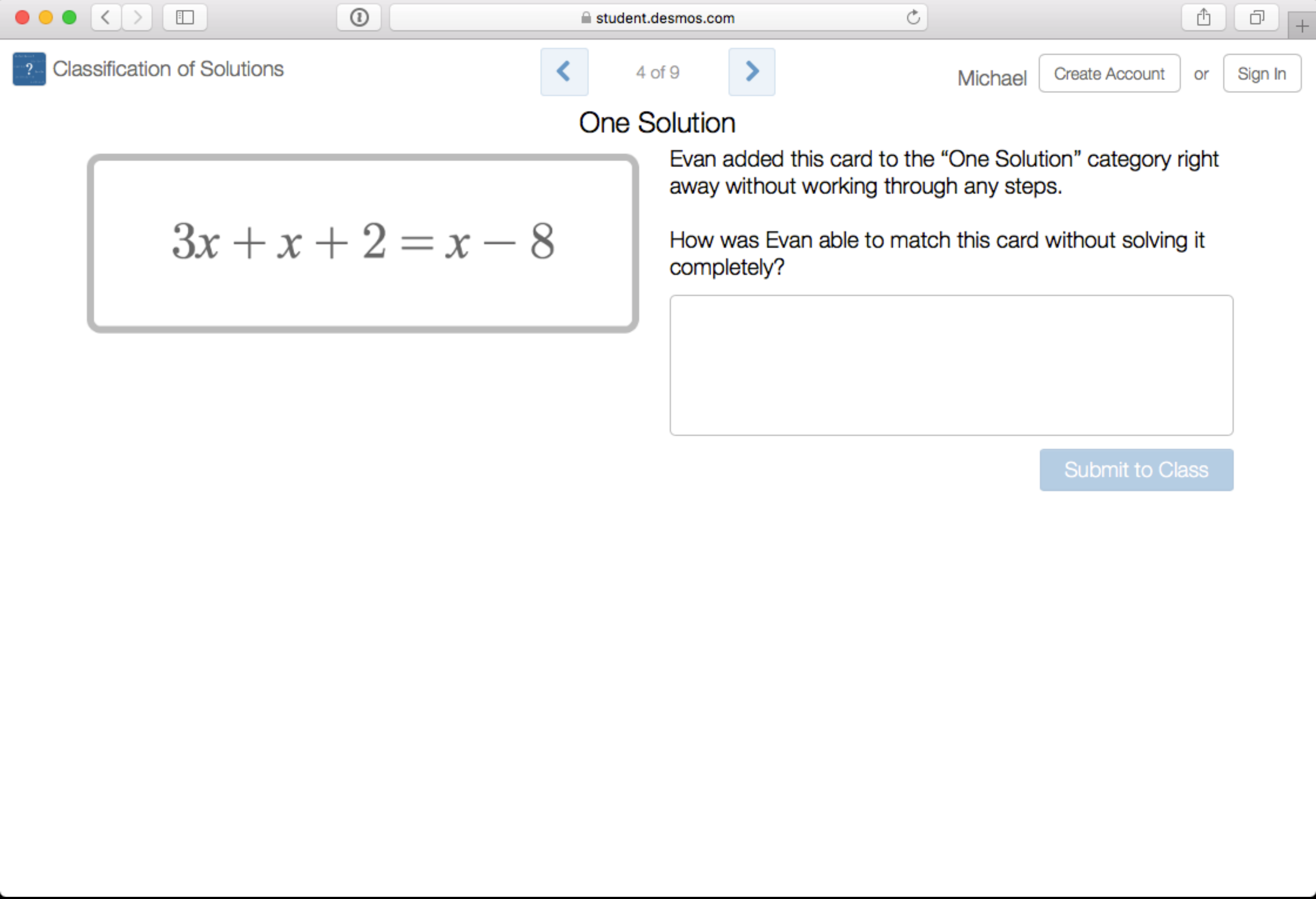
Who do you agree with?

○ Dylan

○ Arturo

○ Both

○ Neither

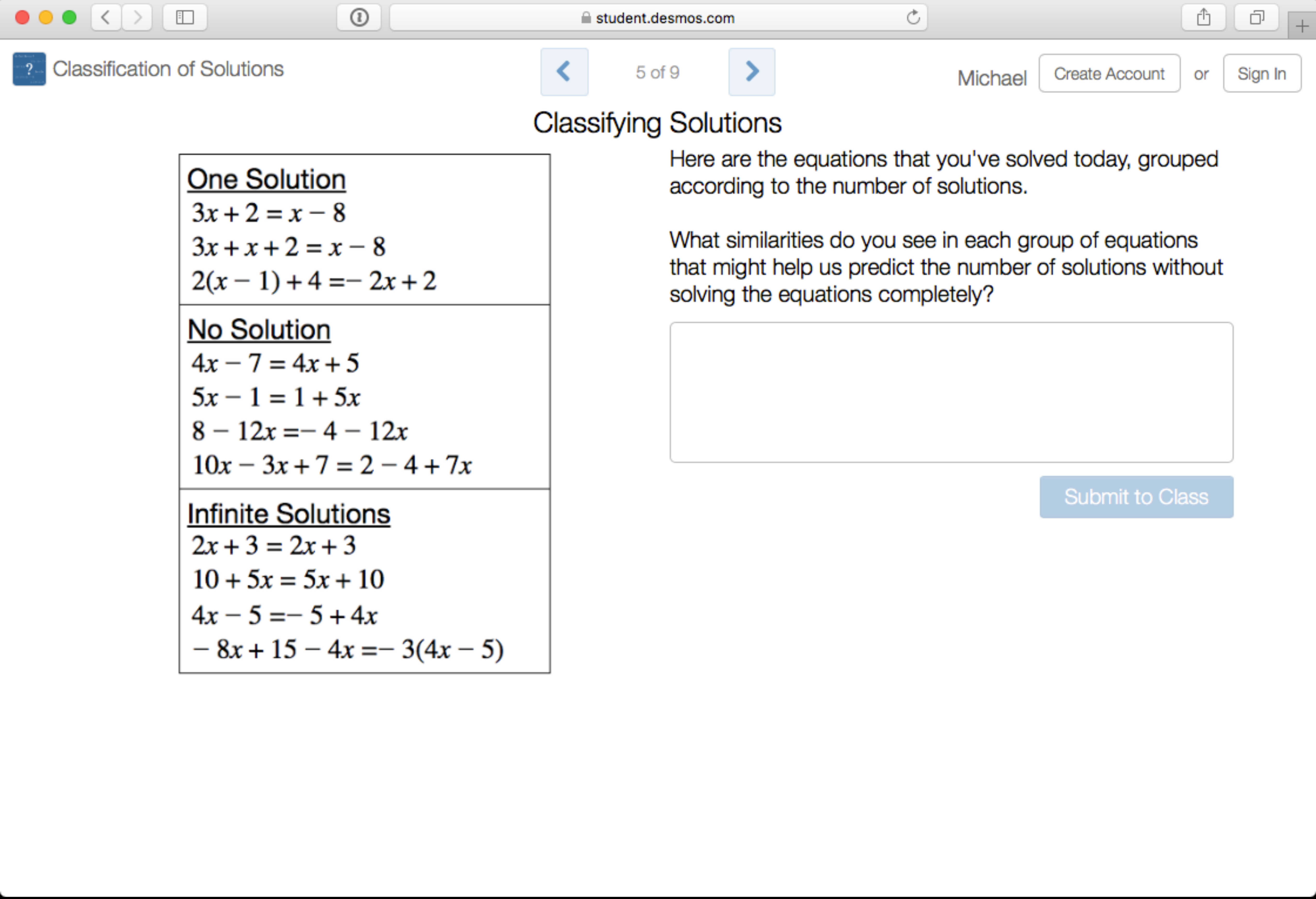


One Solution

$$3x + x + 2 = x - 8$$

Evan added this card to the "One Solution" category right away without working through any steps.

How was Evan able to match this card without solving it completely?



Classifying Solutions

One Solution

$3x + 2 = x - 8$

$3x + x + 2 = x - 8$

$2(x - 1) + 4 = -2x + 2$

No Solution

$4x - 7 = 4x + 5$

$5x - 1 = 1 + 5x$

$8 - 12x = -4 - 12x$

$10x - 3x + 7 = 2 - 4 + 7x$

Infinite Solutions

$2x + 3 = 2x + 3$

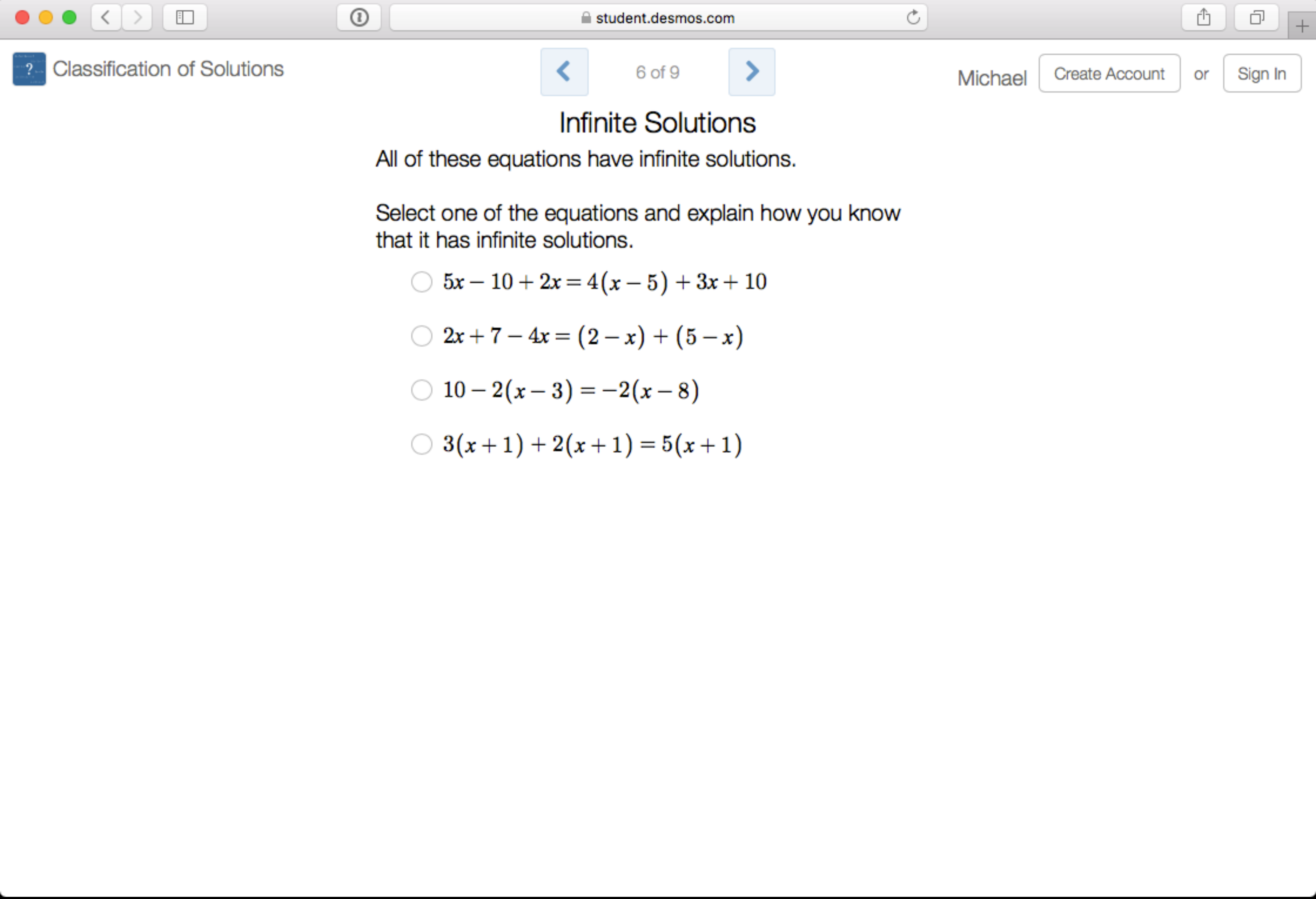
$10 + 5x = 5x + 10$

$4x - 5 = -5 + 4x$

$-8x + 15 - 4x = -3(4x - 5)$

Here are the equations that you've solved today, grouped according to the number of solutions.

What similarities do you see in each group of equations that might help us predict the number of solutions without solving the equations completely?

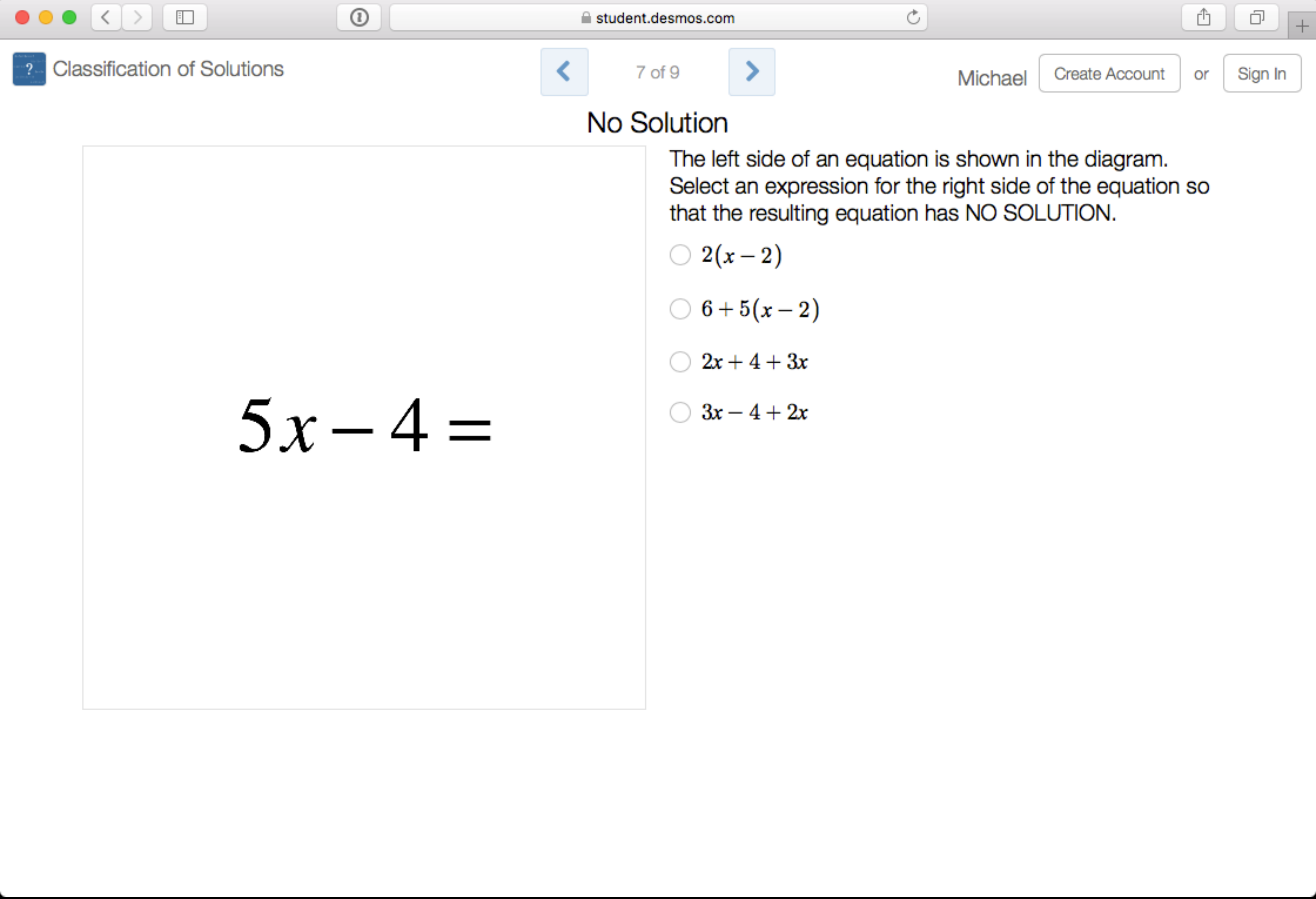


Infinite Solutions

All of these equations have infinite solutions.

Select one of the equations and explain how you know that it has infinite solutions.

- ○ $5x - 10 + 2x = 4(x - 5) + 3x + 10$
- ○ $2x + 7 - 4x = (2 - x) + (5 - x)$
- ○ $10 - 2(x - 3) = -2(x - 8)$
- ○ $3(x + 1) + 2(x + 1) = 5(x + 1)$

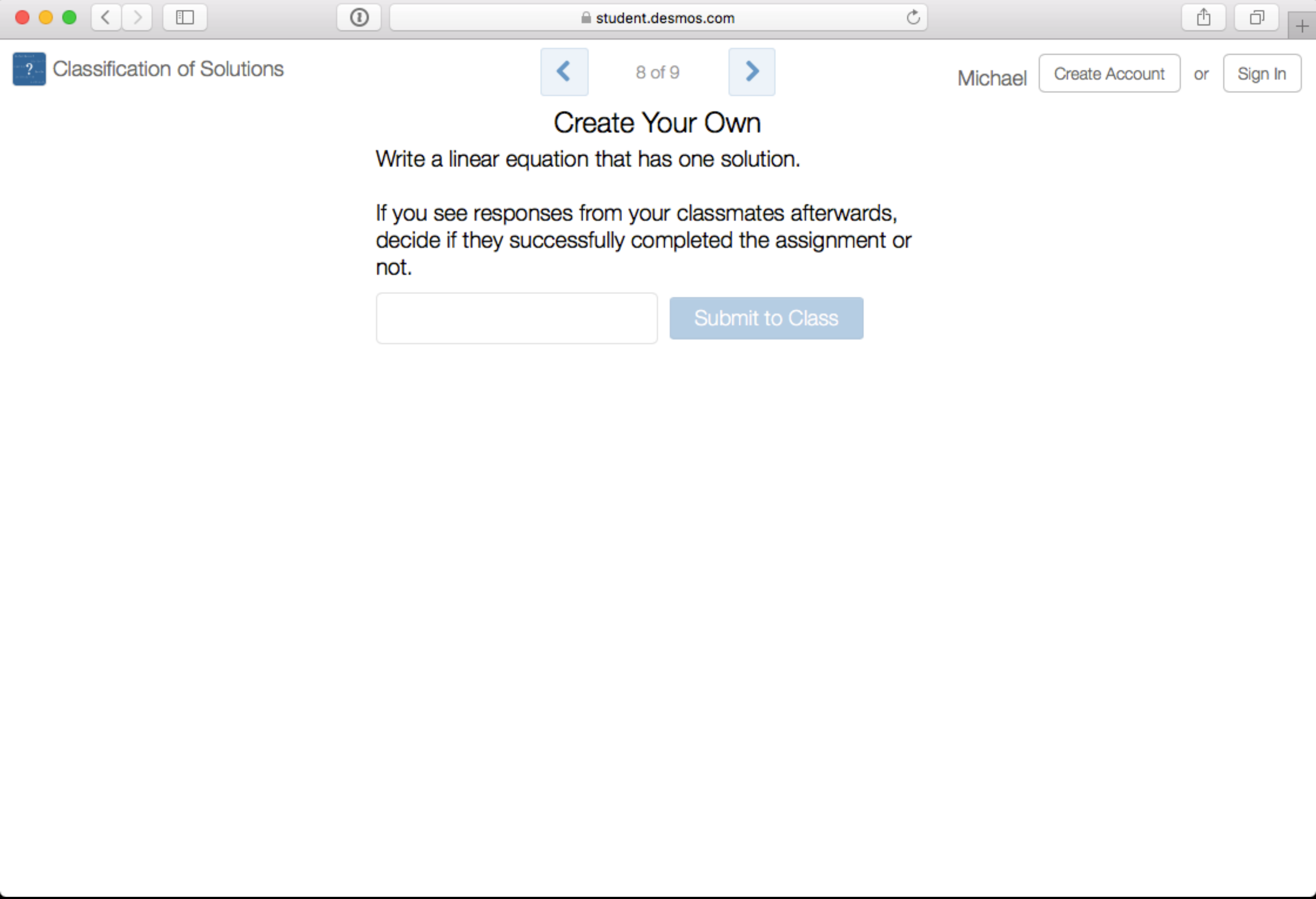


No Solution

$$5x - 4 =$$

The left side of an equation is shown in the diagram. Select an expression for the right side of the equation so that the resulting equation has NO SOLUTION.

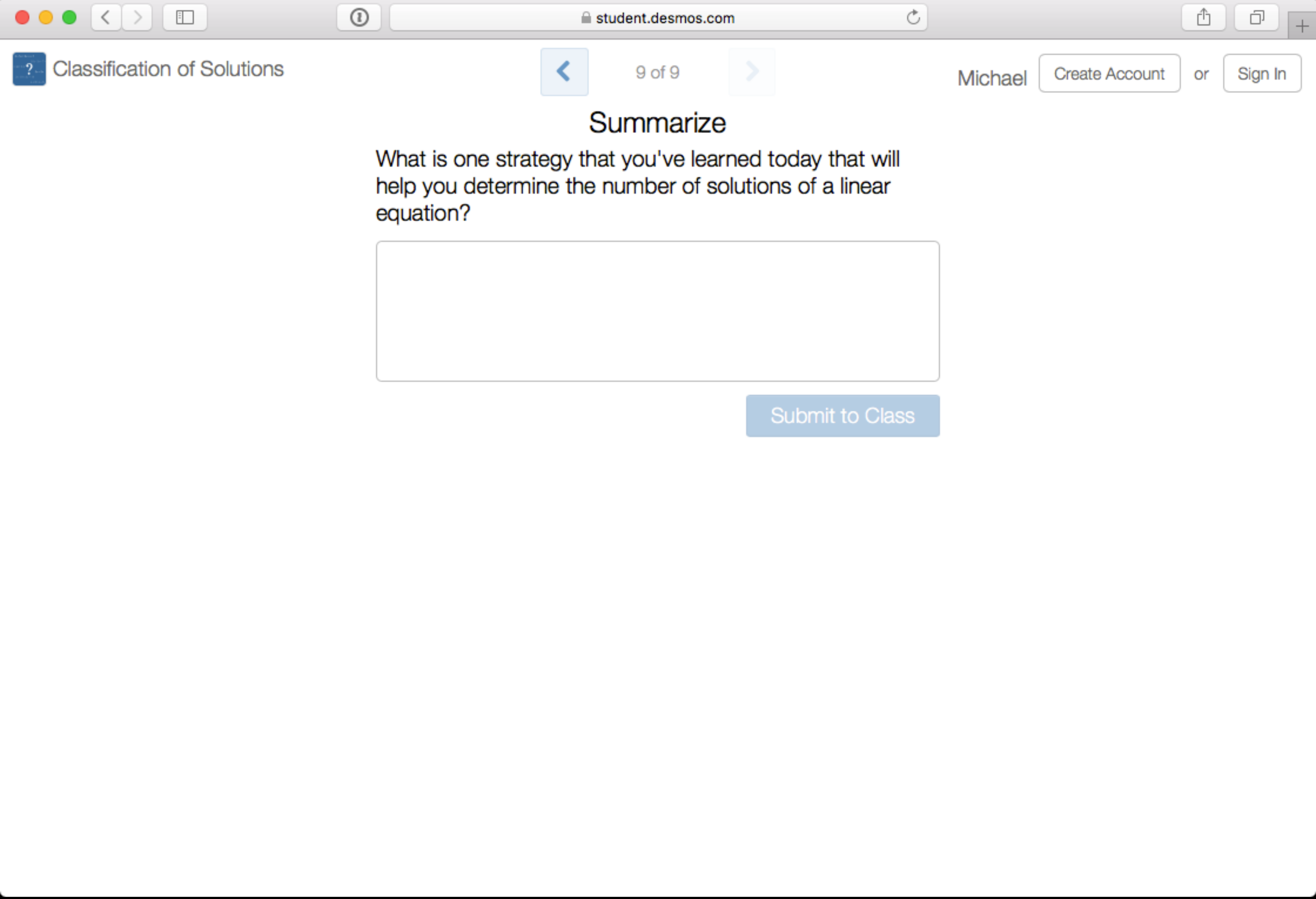
- ○ $2(x-2)$
- ○ $6+5(x-2)$
- ○ $2x+4+3x$
- ○ $3x-4+2x$



Create Your Own

Write a linear equation that has one solution.

If you see responses from your classmates afterwards, decide if they successfully completed the assignment or not.



Summarize

What is one strategy that you've learned today that will help you determine the number of solutions of a linear equation?

How was this different from a typical set of practice problems?

Connect representations.

Create an intellectual need
for new mathematical skills.

Integrate strategy and practice.

Create activities that are
easy to start, difficult to finish.

Connect representations.

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Integrate strategy and practice.

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Pop Quiz

#1

Skittles

Make a guess that is…

Too low
Too high
Just right

Let's get precise.

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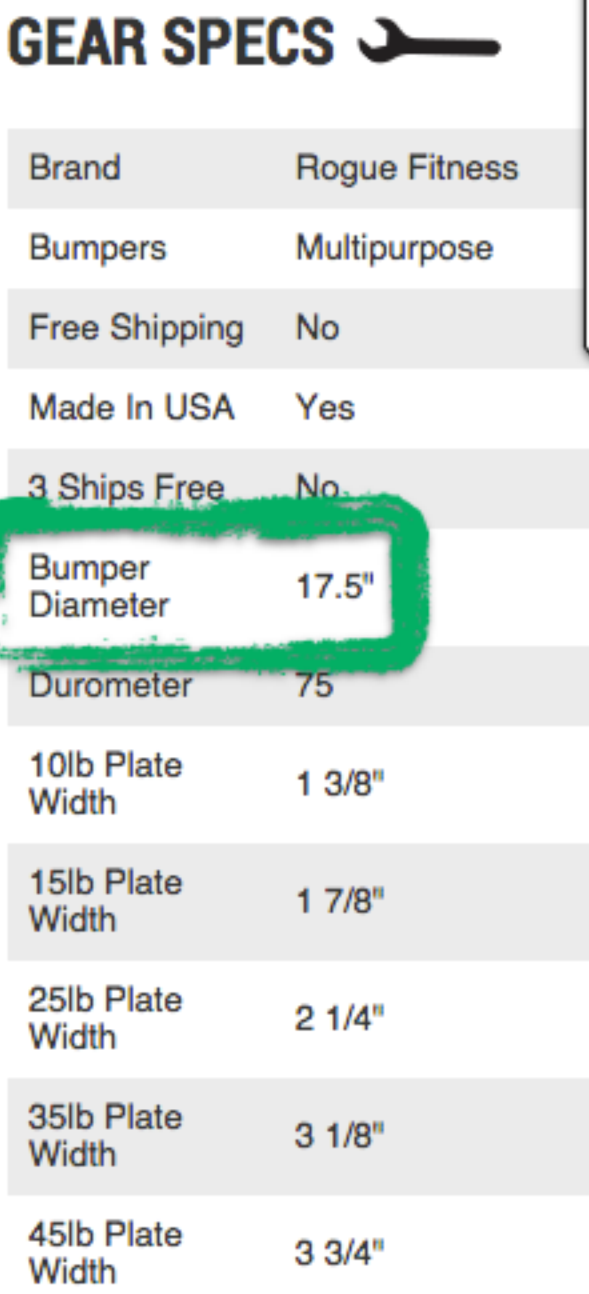
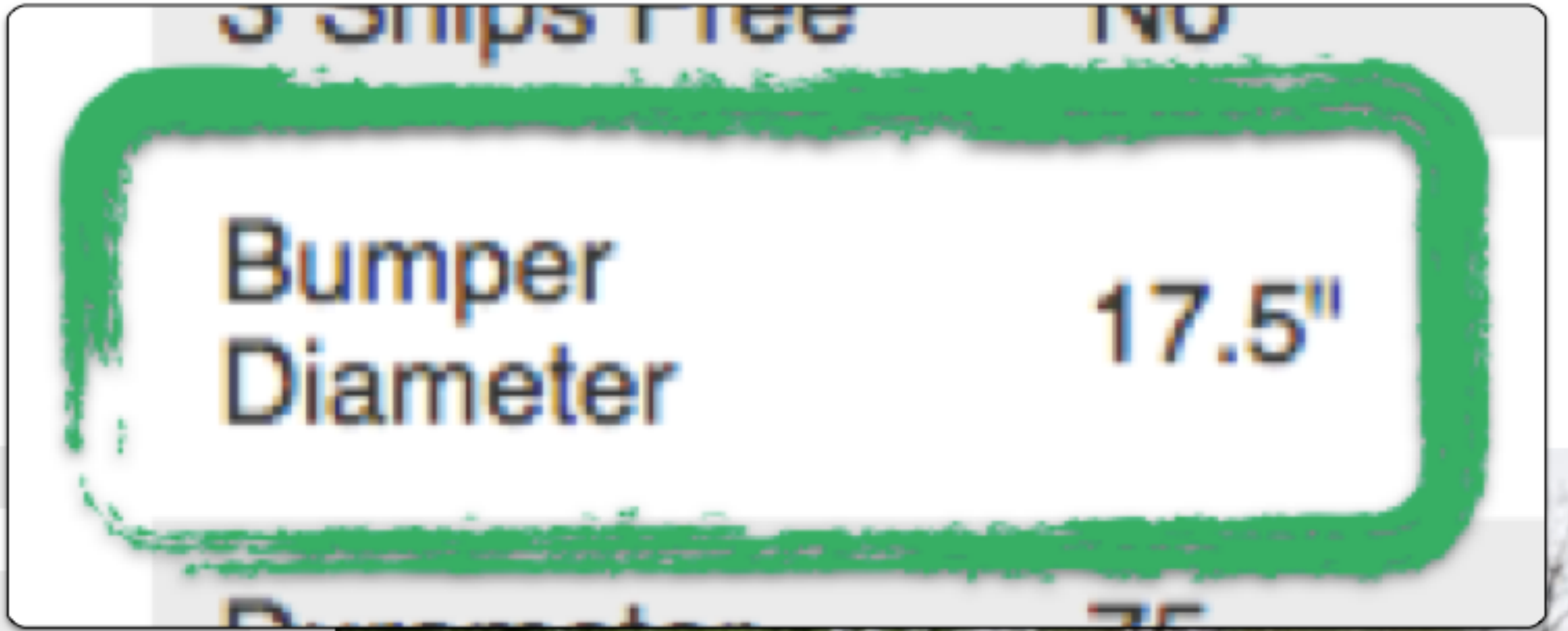


GEAR SPECS

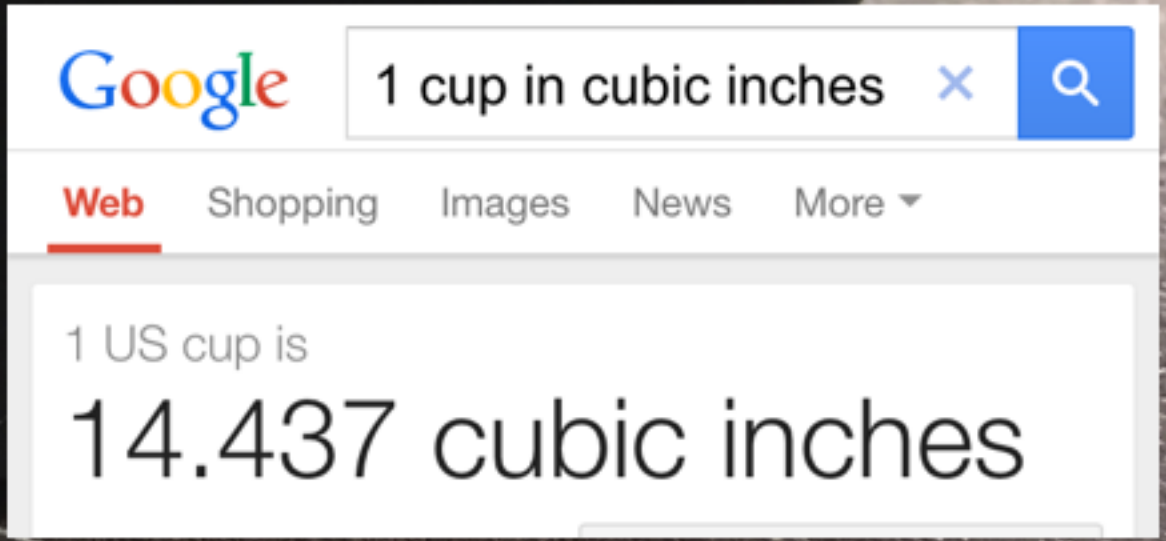
Brand	Rogue Fitness
Bumpers	Multipurpose
Free Shipping	No
Made In USA	Yes
3 Ships Free	No
Bumper Diameter	17.5"
Durometer	75
10lb Plate Width	1 3/8"
15lb Plate Width	1 7/8"
25lb Plate Width	2 1/4"
35lb Plate Width	3 1/8"
45lb Plate Width	3 3/4"



Bumper Diameter 17.5"

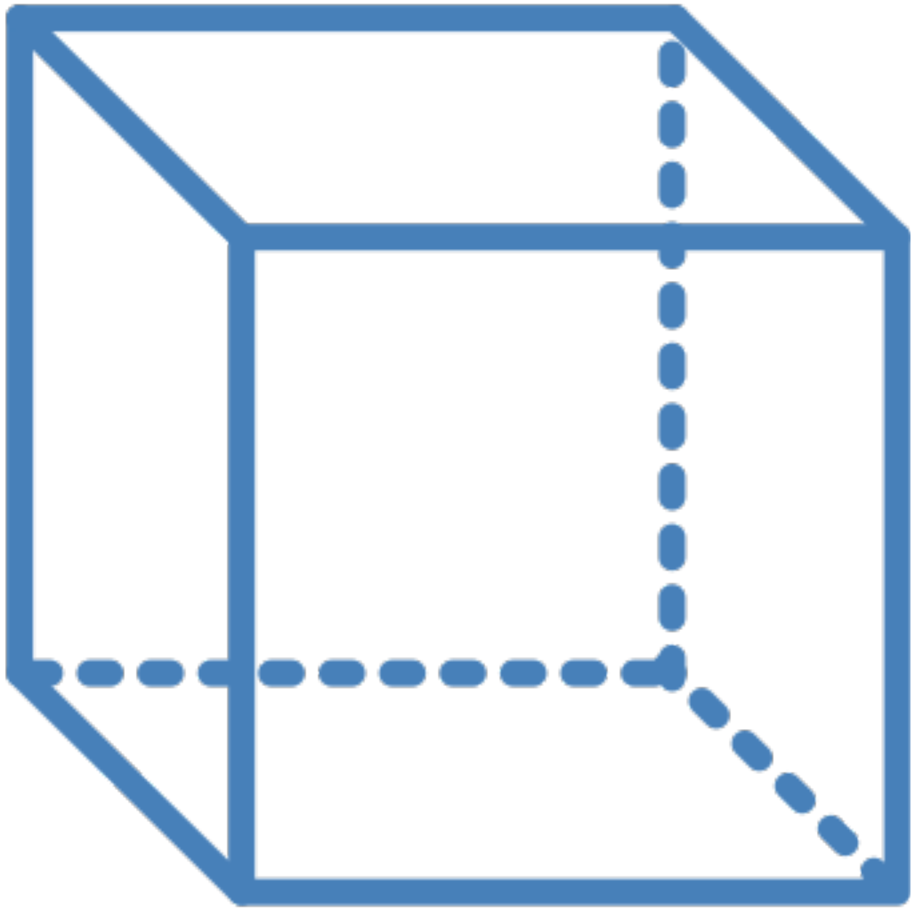
1 cup

199 Skittles

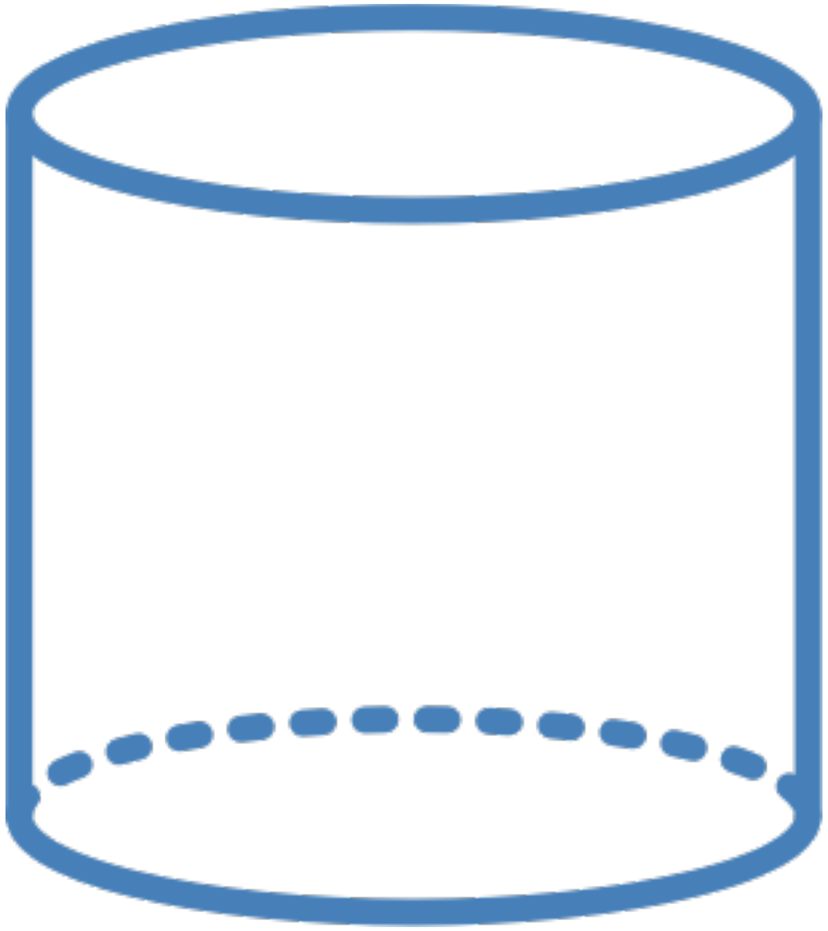


1 US cup is

14.437 cubic inches

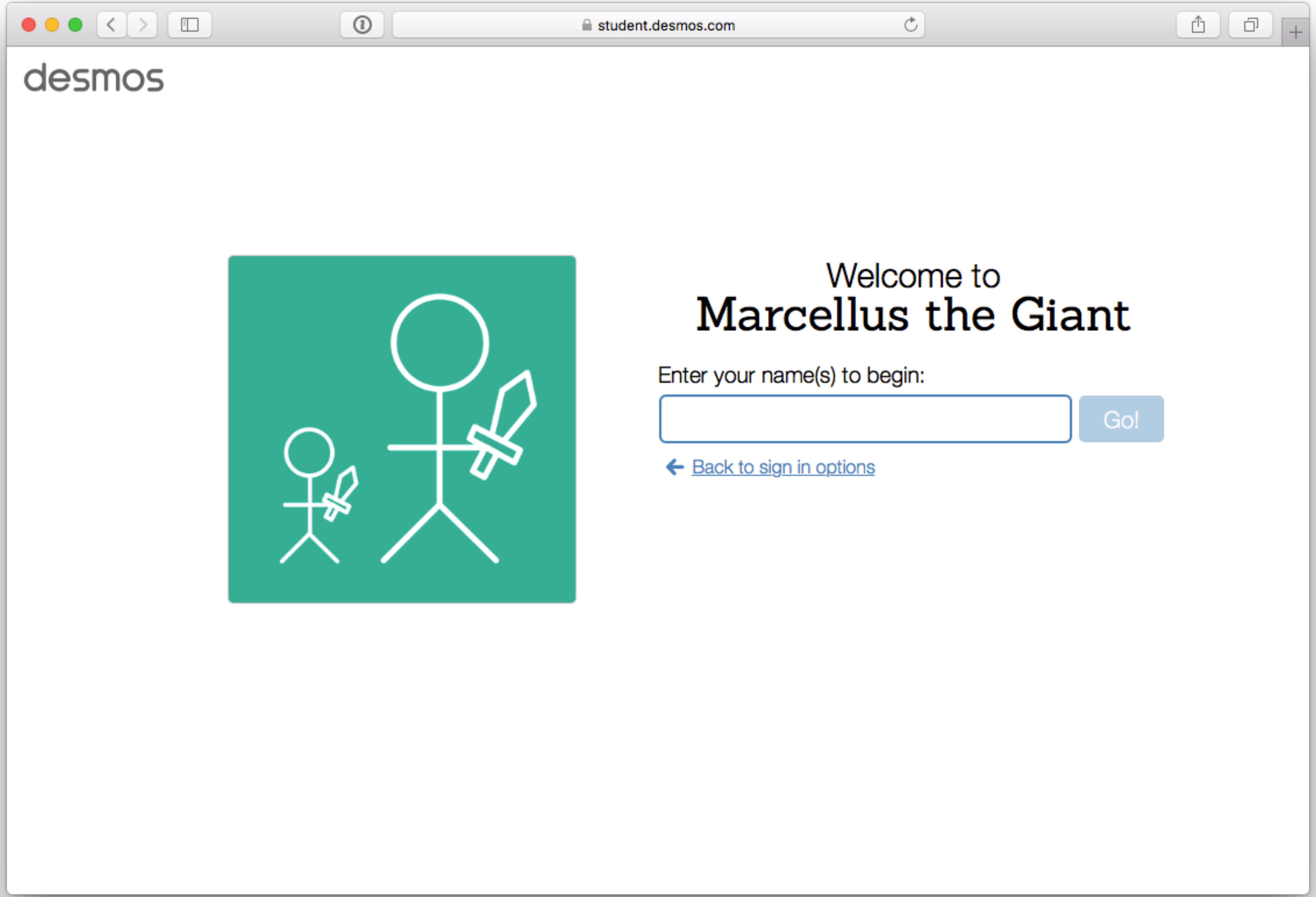


$$V = s^3$$



$$V = \pi r^2 h$$

@mjfenton



Welcome to
Marcellus the Giant

Enter your name(s) to begin:

@mjfenton

Connect representations.

Create an intellectual need for new mathematical skills.

Integrate strategy and practice.

Create activities that are easy to start, difficult to finish.

Connect representations.

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Integrate strategy and practice.

Create activities that are
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Take the number **25**, and break it up into as many pieces as you want.

$$25 = 10 + 10 + 5$$

$$25 = 2 + 23$$

$$\begin{aligned} 25 = {} & 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 \\ & + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 \\ & + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 \end{aligned}$$

What is the biggest **product** you can make if you multiply those pieces together?

Author: Dan Meyer

Source: playwithyourmath.com

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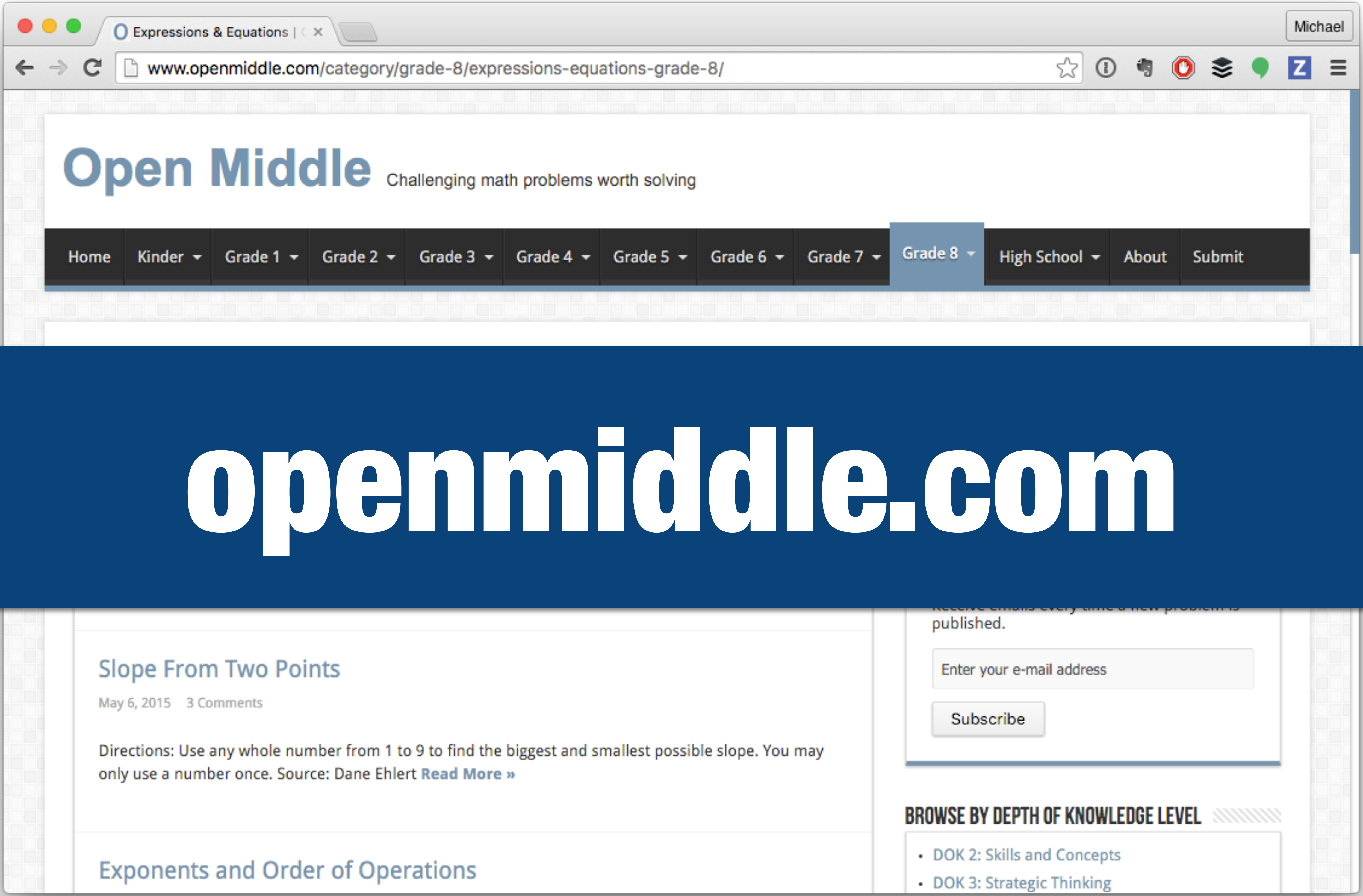
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Slope From Two Points

May 6, 2015 3 Comments

Directions: Use any whole number from 1 to 9 to find the biggest and smallest possible slope. You may only use a number once. Source: Dane Ehlert **Read More »**

Exponents and Order of Operations

BROWSE BY DEPTH OF KNOWLEDGE LEVEL

- DOK 2: Skills and Concepts
- DOK 3: Strategic Thinking

openmiddle.com

4 Principles for

Building

12 Principles for

Building

Incorporate a variety of verbs and nouns.

Incorporate a variety
of verbs and nouns.

Ask for informal analysis
before formal analysis.

Incorporate a variety of verbs and nouns.

Ask for informal analysis before formal analysis.

Create an intellectual need for new mathematical skills.

Incorporate a variety of verbs and nouns.

Ask for informal analysis before formal analysis.

Create an intellectual need for new mathematical skills.

Create problematic activities.

Give students opportunities to be right and wrong in different, interesting ways.

Give students opportunities to be right and wrong in different, interesting ways.

Delay feedback for reflection, especially during concept development activities.

Give students opportunities to be right and wrong in different, interesting ways.

Delay feedback for reflection, especially during concept development activities.

Connect representations.

Give students opportunities to be right and wrong in different, interesting ways.

Delay feedback for reflection, especially during concept development activities.

Connect representations.

Create objects that promote conversations between teachers and students.

Create cognitive conflict.

Create cognitive conflict.

Keep expository screens short, focused, and connected to student thinking.

Create cognitive conflict.

Keep expository screens short, focused, and connected to student thinking.

Integrate strategy and practice.

Create cognitive conflict.

Keep expository screens short, focused, and connected to student thinking.

Integrate strategy and practice.

Create activities that are easy to start and difficult to finish.

bit.ly/desmos-building-code

@mjfenton

Principles for

Building **Facilitating**

Michael Fenton

@mjfenton

twitter

michael@
desmos.com

email

reasonand
wonder.com

blog