Build Equity and Engagement in the Classroom with Desmos Activity Builder

Jade White & Linda Saeta

NCTM
April 2018
Workshop Goals

- Use Desmos Activity Builder to transform a static worksheet into an interactive classroom activity
- Build in more access points and opportunities for all learners in the classroom through the use of Activity Builder
- Collaborate with colleagues during the design process
- Have fun!
Common Core Math Standards

The CCSSM include two types of standards:

- Eight Mathematical Practice Standards
- Mathematical Content Standards

“Together these standards address both “habits of mind” that students should develop to foster mathematical understanding and expertise and skills and knowledge – what students need to know and be able to do.” - CA Dept. of Ed
Eight Mathematical Practices

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning
Graphing Worksheet

- What were the goals for having students complete this worksheet?
- What content knowledge are students displaying by completing this worksheet?
- What mathematical practice standards are students using by completing this worksheet?
- What can you, as the teacher, learn about your students learning/critical thinking/understanding from this worksheet?
Graphing Worksheet

1. Find the slope of the line that goes through the points \((-1, -4)\) and \((0, 2)\).
2. Graph the line that goes through the point \((-3, -4)\) and has slope of \(-1\).
3. Graph the line that goes through the point \((-3, 8)\) and has a slope of \(-3\).
4. Graph the line that goes through the point \((-2, -3)\) and has a slope of 0.
5. Graph the equation \(y = -6\).
6. Graph the equation \(y = x + 4\).
7. Determine the equation of the line with x-intercept \(-5\) and y-intercept \(-5\).
8. Find the slope of the line using the graph.
Equity is attained when students receive the differentiated supports (e.g., time, instruction, curricular materials, programs) necessary to ensure that all students are mathematically successful.

Equity - ensuring that all students have access to high-quality curriculum, instruction, and the supports that they need to be successful - applies to all settings.

Effective teaching practices (e.g., engaging students with challenging tasks, discourse, and open-ended problem solving) have the potential to open up greater opportunities for higher-order thinking and for raising the mathematics achievement of all students, including poor and low-income students.
How can we transform this worksheet, using Desmos AB, to make the content more accessible and engaging to ALL students?
WiFi Information

Username: NCTM
Password: NCTM2018
Partner Up!

Find a shoulder partner

Exchange names and where and what you teach.
Hey, students!

Go to student.desmos.com and type in:

Q8RXT4
Teacher Desmos link

https://goo.gl/NXz7Zr

NCTM - Building Equity & Engagement with Desmos AB
by Jade White  Created by you

⚠️ Mobile  ✅ Tablet  ✅ Laptop
Some Basics of Desmos Activity Builder
Desmos AB Debrief

- What were the goals for having students complete this Activity Builder?
- What content knowledge are students displaying by completing this AB?
- What mathematical practice standards are students using by completing this AB?
- What can you, as the teacher, learn about your students learning/critical thinking/understanding from this AB?
WORK TIME

● Explore premade Desmos AB at teacher.desmos.com and read teacher guide

● Look through slides of other AB examples from Linda (slides 21 – 30)

● Begin to build your own Desmos Activity (slides 17 – 19)
Questions to Ponder as you Work.

● How will this activity engage all learners in my class?
● How does this activity provide multiple entry points?
● How does this activity allow for students to access the mathematical content AND the mathematical practice standards?
● Does my activity have a low floor AND a high ceiling?
Getting to Desmos Activity Builder

Go to: teacher.desmos.com

Click on Sign In on the top right corner.

- It is easiest to sign in with a Google account if you have one
Getting Started with Desmos Activity Builder

Once you are logged in, your name will appear.

Click on the arrow next to your name and then select Desmos Labs.

Select Marbleslides and Card Sort to turn on these two features.
Getting Started with Desmos Activity Builder

Select the Custom option in the left column.

Then “New Activity” on the top right.

Give your activity a name and start building!
Examples of AB in the Classroom
Which one doesn't belong?

- **cone**
  - 10 students
  - Diego Rodríguez, Ngô Bảo Châu, Concha Gomez, Evelyn Granville, Helsuke Hironaka, Olga Tausky-Todd, Kelly Miller, Anna Pell Wheeler, Terence Tao, Herta Freitag

- **cylinder**
  - 9 students
  - Maria Chudnovsky, Shing Shen Chern, Grace Chisholm Young, Mary Ellen Rudin, Frances Kirwan, Sophie Picard, Wen Tsun Wu, Manjul Bhargava, Shing-Tung Yau

- **cube**
  - 13 students
  - Shigefumi Mori, Ismail Mustafa al-Faliki, Kunihiko Kodaira, Christine Lackenby, Franklin, Katherine Coleman Johnson, Artur Avila, Euphemia Lofton Hayes, Scott Williams, Al-Khwarizmi, Mary Jackson, Vivienne Malone-Mayes, Alice Schafer, Jean Taylor

- **pyramid**
  - 2 students
  - Mary Ross, Hannah Fry

- **cylinder**
  - It is the only shape without a sharp edge
  - Concha Gomez

- **cone**
  - The cone has only one base, while the others have more than 2
  - Mary Ross

- **pyramid**
  - Only shape with five faces
  - Evelyn Granville

- **cone**
  - The cone only has one side. While the rest have more than one.
  - Helsuke Hironaka

- **cone**
  - Because when you cut the other shapes horizontally, their cross sections would be a quadrilateral while the cone is a circle.
  - Ismail Mustafa al-Faliki

- **cube**
  - Because its the only one that has 6 sides.
  - Mary Ellen Rudin
The two data sets have the same mean and median which is 4. They also share the same Q1=3 and Q3=5.5. The first data set is skewed left. The second data set is more symmetrical. If you move a data point, the mean will change.

Doris Schattschneider

All the conclusions are the same, as in, Q1, Q3, etc. It's interesting though that the data is different.

Karen Uhlenbeck

I think what is interesting is that you have to move more than one data to even significantly change the data, as well as move it to extreme numerical values. It more difficult than it appears to change data sets. The to graphs have the same median of four and almost have the same mean they also have different mode values.

Alice Schafer

The first one is skewed left and the red one is skewed right. The quartile range stays the same but mean and media change when points are moved.
My favorite “No” or other checks

Choose the best answer

<table>
<thead>
<tr>
<th>The line $y = 0$ is a horizontal asymptote</th>
<th>11 students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sophie Germain, Hermann Minkowski, Gotthold Eisenstein, Ingrid Daubechies, Richard Dedekind, Euphemia Lofton Hayes, John Urschel, Peter Drichlet, Leonhard Euler, Artur Avila, Mary Ross</td>
<td></td>
</tr>
<tr>
<td>Because the limit at infinity to the left is not the same as that to the right, the graph has no horizontal asymptotes.</td>
<td>0 students</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Both</th>
<th>0 students</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 students</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Neither</th>
<th>23 students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neither</td>
<td>The graph shows the asymptotes and the limits</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Neither</th>
<th>The graph does have a horizontal asymptote but it isn’t $y=0$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hermann Minkowski</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The line $y = 0$ is a horizontal asymptote</th>
<th>When approaching infinity, the graph approaches $y=0$.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gotthold Eisenstein</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The line $y = 0$ is a horizontal asymptote</th>
<th>Approaching infinity the limit is 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingrid Daubechies</td>
<td></td>
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<table>
<thead>
<tr>
<th>The line $y = 0$ is a horizontal asymptote</th>
<th>As $x$ goes to infinity the limit is approaching $y=0$</th>
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<tbody>
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<table>
<thead>
<tr>
<th>Neither</th>
<th>The graph does have a horizontal asymptote at $y=-4$.</th>
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<td>George Birkhoff</td>
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<table>
<thead>
<tr>
<th>Neither</th>
<th>Both are false</th>
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<tbody>
<tr>
<td>Richard Dedekind</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>The line $y = 0$ is a horizontal asymptote</th>
<th>It is $y=0$ because we have to look at positive or negative infinity</th>
</tr>
</thead>
</table>
What is the factored form of the equation? (Write it down to enter on the next screen)

You can "check" your conjecture by graphing it below and seeing if it matches the given function.

\[ y = \]

Multiply the factors and write the function in standard form. \((ax^2 + bx + c)\)

\[ y = \]
The original parangula is the graph of a function called $f(x)$. You can match the orange parangula by typing $f(x - 4)$. Try it.

<table>
<thead>
<tr>
<th>Expression</th>
<th>Students</th>
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</thead>
<tbody>
<tr>
<td>$f(x - 4)$</td>
<td>John Urschel, Maria Chudnovsky, Christiaan Huygens, Grace Hopper, Annie Easley, Richard Dedekind, Henri Lebesgue, Diophantus, Diego Rodriguez, Hermann Minkowski, Pythagoras, Pafnuti Chebyshev, Maria Agnesi, Georg Cantor, Hipparchus, Johann Bernoulli, Diana Taimina, Émile Borel, Stefan Banach, Jean Taylor, Sophie Piccard, Mary Ross, Grace Chisholm Young, Gertrude Blanch, Dorothy Vaughan</td>
</tr>
<tr>
<td>$F(x - 4)$</td>
<td>Mary Somerville</td>
</tr>
<tr>
<td>$x = f(y)$</td>
<td>Caroline Series</td>
</tr>
<tr>
<td>$f(x - 3.9)$</td>
<td>William Hamilton</td>
</tr>
<tr>
<td>$f(x - 0)$</td>
<td>Felix Klein</td>
</tr>
<tr>
<td>$f(x - 4.1)$</td>
<td>Wen Tsun Wu</td>
</tr>
</tbody>
</table>
Welcome to Yellowstone National Park

The picture at the left was taken at Yellowstone National Park.

What do you know about Yellowstone National Park?

What do you wonder?

Carl Siegel

How often does the geyser erupt and why does the geyser erupt?

Mary Cartwright

Yellowstone National Park is beautiful and attracts many tourists. I wonder how many people go there each year.

Julia Robinson

It has many beautiful sights. Why does Old Faithful erupt so much?

Lenore Blum

It is a national park that is protected by the government that is beautiful and attracts many tourists. I wonder how often the geysers erupt there.

Mina Rees

Yogi Bear lives in jellystone. Is yogi bear like bigfoot… a never before seen legend?
Sketch

Sketch the anti derivative. Make an orange dot for a max, green for a min, and red for POI.
Marble Slide
### Teacher Dashboard

<table>
<thead>
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<th></th>
<th>1 Choose</th>
<th>2 Choose</th>
<th>3 Choose</th>
<th>4 Choose</th>
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</thead>
<tbody>
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<td></td>
<td>●</td>
<td>●</td>
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<tr>
<td>Sophie Garman</td>
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<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Aristotle</td>
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<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Hermann Minkowski</td>
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<td>●</td>
<td>●</td>
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<tr>
<td>Gotthold Eisenstein</td>
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<tr>
<td>Caroline Series</td>
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</tr>
<tr>
<td>David Blackwell</td>
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<td>●</td>
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<tr>
<td>George Birkhoff</td>
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<td>●</td>
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<tr>
<td>Richard Dedekind</td>
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<td></td>
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<tr>
<td>Henri Poincaré</td>
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<td>Heisuke Hironaka</td>
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<td>Shing-Tung Yau</td>
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<tr>
<td>Pierre-Simon Laplace</td>
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<td>●</td>
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<tr>
<td>Mary Cartwright</td>
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<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Leonardo Fibonacci</td>
<td>●</td>
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<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>
Collective Share Out

● What are you excited about?
● What did you learn?
● What questions do you still have?
Contact Information

Jade White

Email: jade.mohr.white@gmail.com

Website: http://www.theingeniousclassroom.com/

Linda Saeta

Email: lsaeta@cusd.claremont.edu
Link to Shared Folder

https://goo.gl/RBpVFV