

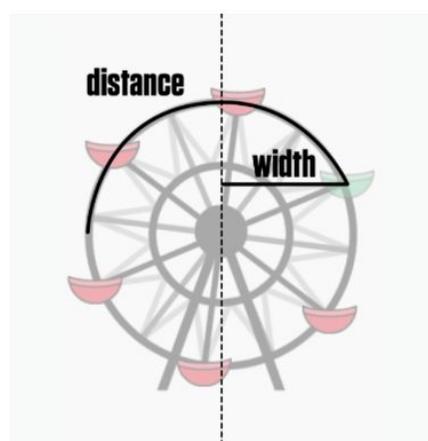
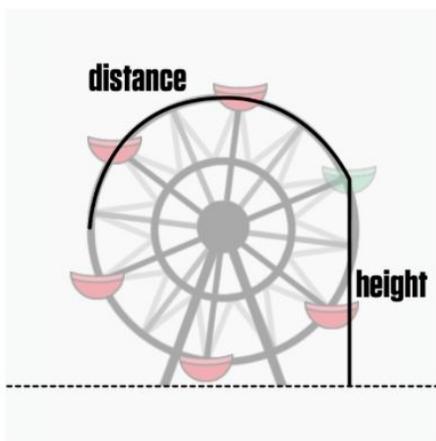
# Facilitation Guide for Ferris Wheel Techtivities

**How can a point on a graph represent a relationship between variables?**

*(estimated time ~50 minutes for both Techtivities)*

Often students plot points first, then sketch a graph. In the Ferris Wheel activities, students sketch different graphs, then reflect on what a point on those graphs could represent.

The Ferris Wheel activities could complement a unit on trigonometric functions. However, students do not need to be familiar with trigonometric functions to work with the Ferris Wheel activities. The Ferris Wheel activities can provide opportunities for students to use relationships between variables to make sense of graph curvature. Questions can help students to focus on relationships. For example, “How is the width changing when the green car is nearing the top of the Ferris wheel?”



Reprinted from: <https://teacher.desmos.com/curriculum/view/5b60949dd5e0c30f58408405>

The Ferris Wheel activities use Teacher Desmos. If you are new to Teacher Desmos, start with the Techtivities User Guide (on the last page) to set up your class code and prepare for the use of Techtivities.

## Facilitation Guide for Ferris Wheel: Height vs. Distance

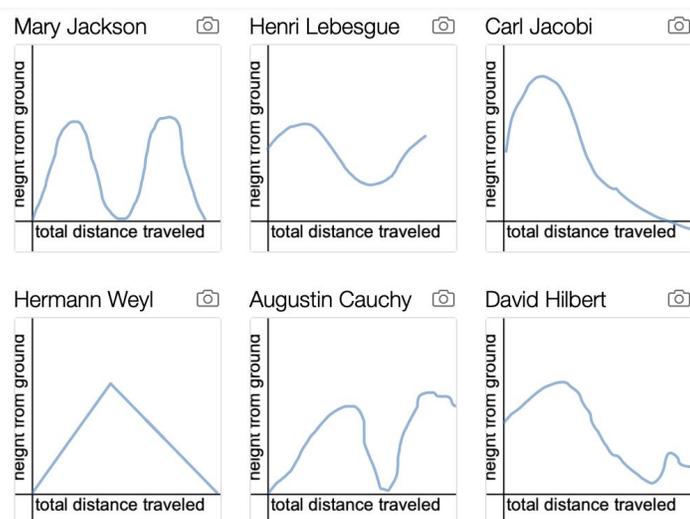
### 1. Set Teacher Pacing

After students sketch their own graphs, they can see a computer graph. To give students opportunities to reflect on their graphs, set up [teacher pacing](#). To begin, restrict students to Screens 1-6, so students cannot rush through the activity. If students finish their graphs early, tell them to share their graphs with other students.

Provide opportunities for students to make connections

### 2. Show Student Work, then Discuss.

Show different students' graphs to give a range of possible responses. Choose graphs with features that students can compare and contrast. For example, some students may sketch graphs with a smooth curve. Other students may sketch line graphs.



From the teacher dashboard, go to Screen 6. Select "Responses" to display individual student graphs. Before projecting responses, anonymize student names.

Once students see others' graphs they may want to change their answers. Tell students to avoid "fixing" their graphs.

To encourage student talk, post discussion questions. Tell students to discuss in small groups or write down their reflections. Below are a few sample questions.

- *How are the graphs similar? How are they different?*
- *How do you see the height AND the distance in the graphs?*
- *Some graphs include the origin. Others do not. How do you decide if the origin should be on the graph?*

### 3. Promote Student Reasoning

Now restrict students to Screens 1-13. When students see the computer graph on Screen 7, they may want to fix their graph. Tell students not to erase the graph they drew first. Encourage students to explain their thinking in the box on Screen 8. Focus more on students' reasoning than on their graph accuracy.

Focus on "What if?" rather than "What is?"

#### 4. Focus on Student Thinking

Olga Taussky-Todd

The green cart is on the middle left side where it usually starts. It has yet to move at all. I can tell because the total distance travelled has not moved at all

Katie Bouman

The point is the ferris wheel halfway to the top I think because the height of the point is still going higher from the ground.

Eugenia Cheng

it is on the left side of the ferris wheel because that is where it started at and it hasn't moved any amount of distance yet

On Screen 9 students view a graph of a single point and explain where the green cart is at on the Ferris Wheel. Display sample responses that highlight student thinking. Select responses that include distance attributes. To guide discussion, ask students to compare different forms of reasoning. For example:

*“Look at Olga and Eugenia’s responses. What is similar? What is different?”*

#### 5. Debrief the Techtivity

On the final screen, students agree or disagree with a statement from a hypothetical student, Max. Students respond before they see class results.

Max says this point shows more than one location on the Ferris wheel.

I agree.

7 students

Benjamin Banneker, Carl Jacobi, Eugenia Cheng, Ngô Bảo Châu, Albert Einstein, Jacqueline Ferrand, Jacob Bernoulli

I disagree.

17 students

Gaspard Monge, Grigory Margulis, Ingrid Daubechies, Gertrude Blanch, Girolamo Cardano, Diophantus, Johann Lambert, Olga Taussky-Todd, Katie Bouman, Sophie Germain, Archimedes, Pafnuty Chebyshev, Liu Hui, Ernst Kummer, Anna Pell Wheeler, Christiaan Huygens, Aristotle

#### Quick Tip:

Allow students to change their minds and reflect on why they changed it.

From the teacher dashboard, teachers can view the total number of students in each response category. Once most students have responded, display the responses.

Students may want to change their mind after they see others’ responses. Allow students to do this. If students change their minds, ask them what convinced them.

#### 6. After the Techtivity

Give students an opportunity to reflect on their work and make further connections. You can do this with a one-minute quick write. Pass out index cards to students at the end of class and ask them to write for one minute on what was their biggest take-away from the activity and what is still unclear. Collect the index cards. Use the responses to assess student understanding and inform future instruction.

Every student is capable of every task. How do you practice this?

## Facilitation Guide for Ferris Wheel: Width vs. Distance

### 1. Set Teacher Pacing & Define 'Width from Center'

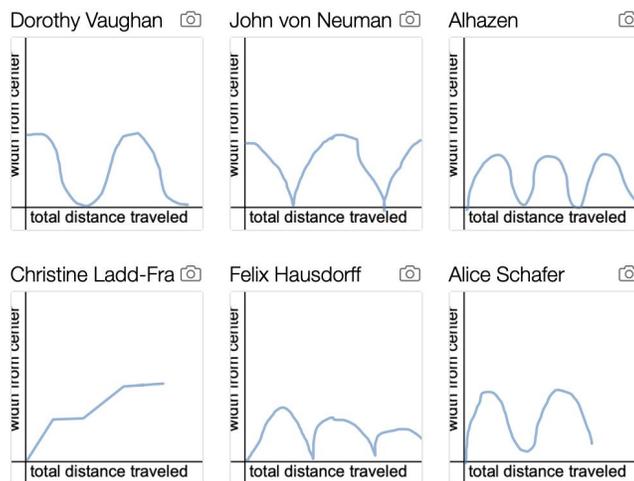
To begin, restrict students to Screens 1-6, so they cannot rush through the activity. If students finish their graphs early, encourage them to share their graphs with other students.

How do you see the width?

Students might think the width from the center is the length of a spoke connecting the cart to the center of the Ferris Wheel. Help students see the width as the distance of the cart from the vertical line of symmetry passing through the center of the Ferris Wheel.

### 2. Focus on Relationships

From the teacher dashboard, go to Screen 6. Select "Responses" to display individual student graphs. Before projecting responses, anonymize student names.



Show different students' graphs to give a range of possible responses. Choose graphs with features that students can compare and contrast.

Write questions on the board, and tell students to discuss in small groups. Walk around the room and listen to student responses. When you hear an interesting response, ask permission to call on that student and have them share their reasoning with the whole class. Below are some sample questions:

- *How are the graphs similar? How are they different?*
- *Many of these graphs start at the origin. What does this mean for the Ferris wheel?*
- *Does it make sense for the graphs to show a cyclical pattern? Why or why not?"*

### 3. Promote Student Reasoning

Now restrict students to Screens 1-13. When students see the computer graph on Screen 7, they may want to fix their graph. Tell students not to erase the graph they drew first. Tell students that their explanation in Screen 8 is more important than their graph accuracy.

Position students as powerful thinkers and learners.

4. Allow Classroom Discourse

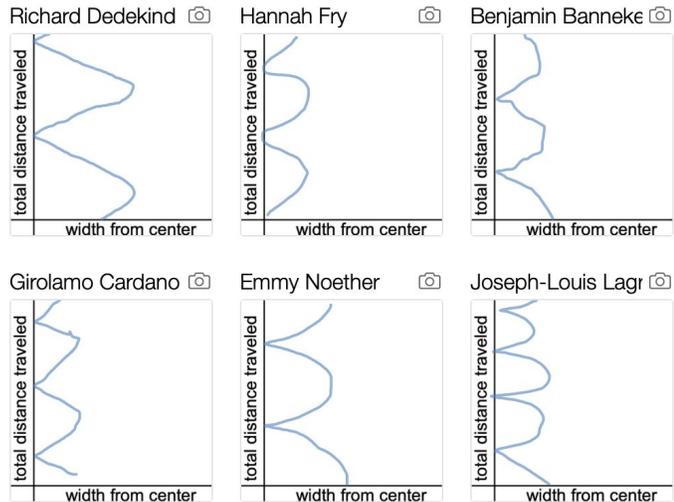
The teacher is not the only expert in the room

Vary discussion questions and pedagogical strategy to de-center the teacher as the only expert in the room and allow all voices the opportunity to be heard.

Once students have sketched their second graph on slide 13, either show the graph overlay, or have students look at a sample of individual student graphs.

One strategy is a quick talk. Have students partner up. Tell each student to talk to their partner for one minute, without interruptions. Then switch roles. Post discussion questions to guide the talk. Below are a few sample questions:

- What do you notice? What do you wonder?
- How can you tell if a graph will be curved or pointy? Why?
- When is the width from the center the greatest? How do you know?

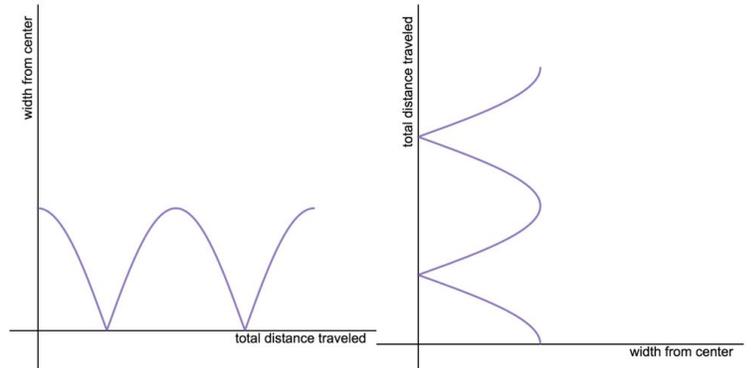


5. Debrief the Activity

After students discuss Screen 13, turn off teacher pacing so students can see all screens. On Screen 17, students are asked to either agree or disagree with the following: *Val says both graphs show the SAME relationship between width and total distance traveled.*

It is important for students to understand that two different looking graphs can represent the same relationship between variables.

To encourage student thinking, ask a "how can it be" question: "How can it be that different looking graphs can represent the same relationship?" Have students turn and talk with table partner.



6. After the Tectivity

After students complete Ferris Wheel Height v. Distance and Ferris Wheel Height v. Width, you can assign students the [Ferris Wheel: Height vs. Width](#) activity to complete on their own.

# *Techtivities Start-Up Guide*

## *1) Register for a Desmos Teacher Account*

You will first need to register for a Desmos teacher account (if you have an existing account sign in through teacher Desmos). These accounts are free and allow you to create a classroom environment where your students can work on the activities in the same shared space. To create a new account:

- a) Go to [teacher.desmos.com](https://teacher.desmos.com)
- b) Select the Create Account icon and fill in the required information

## *2) Access the Activities*

Once registered and logged in to teacher Desmos, you can find all of the Techtivities at <https://itscore.cu.studio/techtivities/english/>. There are 7 provided on this landing page and clicking on any will bring you to the associated activity in teacher Desmos.

## *3) Create your Class Code and Access the Teacher Guide*

In order for your students to participate in the activity together, click the Create Class Code icon. This will generate a 6-character code which will allow your students to access the activity in the same virtual classroom environment. If you plan on using the activities with more than one class, we suggest creating multiple class codes to keep them separate.

After creating your class code, you can explore the activity in more detail by looking through the student preview and accessing the associated Teacher Guide. This guide provides a helpful checklist for best practices facilitation of the activity along with instructions on how to use the Pacing and Pause features in Desmos.

## *4) Customize your Classroom Activity*

Customizing your techtivity will allow you to set parameters to guide the student experience. Start by clicking on the 6-digit classroom code you generated earlier. This will bring you to the activity landing page for your specific class. Once inside your classroom activity you can utilize the following customization tools to your advantage.

- a) Anonymize. This option allows you to anonymize each individual student by assigning them a random mathematician pseudonym.
- b) Pacing & Pause. The pacing and pause options allow you to control the speed which the class goes through the activity. These options also allow you to create stopping spots to bring the class together for whole class discussion on important topics.
- c) Snapshots. This option allows for you to take screen captures of student work and sequence them in an order beneficial to discussion.

## *5) Facilitation Start-Up*

It is important that students are given previous notice about the activities so they can be prepared by bringing in a laptop or tablet. Most activities also work well on a smartphone, but they are not optimized for all ios systems. Students can also work in pairs to complete the activities if there is a device shortage. On activity day students will need to do the following:

- a) Go to [student.desmos.com](https://student.desmos.com)
- b) Enter the 6-character classroom code
- c) Either sign in with their Desmos account or continue on as a Guest
- d) Enter their name or codename