Start a New Sketch in Geometer’s Sketchpad

Under the Graph menu select Show Grid. This will create axes and points.

Experiment with clicking and dragging the unit point (the point located at (1,0)). Notice, how the scale changes. Move your unit and point and adjust your window so that it looks similar to the one below. You need to be able to see both $x \approx \pm 6.28$

Select the origin point and the unit point in that order by clicking on them. Under the Construct menu, select Circle By Center + Point. This should create a unit circle.

After the circle is created it should be highlighted. While the circle is highlighted, select Circumference under the Measure menu. This will put a measurement in the top left hand corner of your screen. The number may vary depending on the size of your coordinate grid. Don’t worry if your measured value for circumference doesn’t match the one in the diagrams.

Make sure the new circumference measurement is highlighted and select Mark Distance under the Transform menu.

First deselect everything by clicking in a blank area on the sketch. Select the origin point by clicking on it. Under the Transform menu, select Translate… This should bring up the window shown at the right as shown in the window at the right. Under the magnitude box, there should be a check next to “By Marked Distance”. Leave the direction box at 0° and click on Translate.

Deselect everything by clicking in a blank spot and select the origin point again by clicking on it. Under the Transform menu, select Translate… This should bring up the same window again. Under the magnitude box, there should be a check next to “By Marked Distance”. This time change the direction to 180° and click on Translate. You should notice two new points, that are roughly located at (–6.28, 0) and (6.28,0).

Click in a blank area of the screen to deselect everything. Then, highlight both of the newly created points (selecting the one at (–6.28,0) first). Next, select Segment under the Construct menu. This will create a segment between the two points.

While the new segment is still highlighted under the Display menu change the Line Style ► to Thick.

The line segment should still be highlighted. Select Point On Segment under the Construct menu. This will create a point that will always be on the segment. Label this point “T” with the text tool.
Highlight the point “T” and the x-axis at the same time. Select **Perpendicular Line** under the **Construct** menu.

Using the segment tool, create a radius of the circle a shown in the diagram below. Label the new point “H”.

Highlight the point “H” and the x-axis. Select **Perpendicular Line** under the **Construct** menu.

Using the segment tool, create a radius of the circle a shown in the diagram below.

Highlight the point “H” and the x-axis. Select **Perpendicular Line** under the **Construct** menu.

Click in a blank area of the sketch to deselect everything. Highlight the perpendicular line that you just created and the x-axis. Select **Point at Intersection** under the **Construct** menu. This will create a new point. Label this point “x”.

Click in a blank area of the sketch to deselect everything. Select just the newly created perpendicular line and select **Hide Perpendicular Line** under the **Display** menu. Using the segment tool create a segment from point “H” to the new point “x”.

If we know that from the origin (“A”) to point “H” has a distance of 1 then what does the length of $XH$ represent?

Click in a blank area of the sketch to deselect everything. Highlight the point “H” and the x-axis. Under the **Construct** menu select **Parallel Line**.

Using the selection tool, click on the intersection point of the newly created line and the line that is perpendicular to the x-axis passing through “T”. (see diagram) Label this point “P”.

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While “P” is still highlighted, select **Trace Intersection** under the **Display** menu.

Click in a blank area of the sketch to deselect everything. Select point “T” and the point “H”. Under the **Edit** menu select **Action Button ►** and choose **Animation…**. This should bring up an “Animation” window. Point “T” should only move ‘forward’ on the segment. Click on the down arrow and change direction to “forward”. Click **OK** to close the animation window. This should create a new animation button on the sketch. Finally, click on **Animate Points** once to start the animation and again to stop the animation.

For a more accurate sine wave, erase the traces by selecting **Erase Traces** under the **Display** menu and follow the steps below.

Click in a blank area of the sketch to deselect everything. Select point T and then the origin point “A” in that order. Under the **Edit** menu select **Action Button ►** and choose **Movement…**. This should bring up another window just click **OK**. Click in a blank area of the sketch to deselect everything. Select point H and then the unit point “B” in that order. Under the **Edit** menu select **Action Button ►** and choose **Movement…**. This should bring up another window just click **OK**. There should be two new buttons. Click on each to reset your sketch and then, double click on animate for the perfect Sine wave.

Sometimes the ‘traces’ can get messy. It may help to set the ‘traces’ to fade over time. This setting can be found by selecting **Preferences…** under the **Edit** menu. At the top of the preferences window select the “Color” tab and check the box “Fade Traces Over Time”.

Have some fun turn it into a Ferris Wheel and the graph will represent a passengers height over time. The trick is to create the carts and passengers so that they remain upright as the Ferris wheel spins. Experiment with the Translate command under the Transform menu to create carts.

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First double click on the origin point. The point should flash denoting it has been marked as a center.

Click in a blank space to deselect everything and then highlight point H on the circle. Then, select Rotate... under the Transform menu. Rotate point H by a fixed angle. You need to select an angle that is a factor of 360°.
(i.e. 120° = 3 carts, 90° = 4 carts, 72° = 5 carts, 60° = 6 carts)
Continue rotating each new point until you come back around to your original point H.

Next in the bottom left hand corner of your screen create a cart and a person in the cart. Make certain that a point exists where you wish to “connect” each cart to the Ferris wheel.
Highlight the center point on the cart that is going to be the point of “attachment” and highlight point H on the circle. Select Mark Vector under the Transform menu. An animated dashed line resembling a laser beam should shoot from the cart to point H denoting the vector which is being marked.
Next, highlight the entire person and cart. Then, select Translate... under the Transform menu.

Then, mark another vector from the center point of the cart to the next rotated point around the circle. Again, highlight the cart & person and then, translate by the new marked vector. Repeat this process until all of your rotated points have a cart and person.

You can even animate the arms and the animation will take place on the translated people on the Ferris Wheel.

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