

A Sine Wave Tracer

Description: Students use points on perpendiculars, parallels, and a circle to construct an animation that traces out a sine wave. They explore the sine wave by dragging various points in their construction. Finally, students explore the relationship between a unit circle, its circumference, and the trace of a sine wave.

Technology Strength: By tracing a point whose horizontal movement is controlled by a point on a segment and whose vertical movement is controlled by a point on a circle, students can easily construct an animation that traces out a sine wave and use their model to explore sine waves.

Objectives: Construct an animation that traces out a sine wave; explore a sine wave; discover a relationship between a unit circle and the sine wave

Prerequisites: Familiarity with the Cartesian coordinate system

Suggested Grade Level: 9 to 10

Sketchpad Level: Intermediate

Suggested Duration: 45 minutes

Suggested Classroom Setting: Whole Class, Student Pairs. This activity, designed for use by student pairs, can be easily modified for whole-class use.

Preparation: Review the Activity Notes. Work through the steps on the worksheet and make a copy of the worksheet for each student. See the presentation sketch for an example of completed student work.

Materials: None

Student Worksheet(s): A Sine Wave Tracer

Student Sketch: None

Presentation Sketch: Sine Cosine Tracer Work.gsp

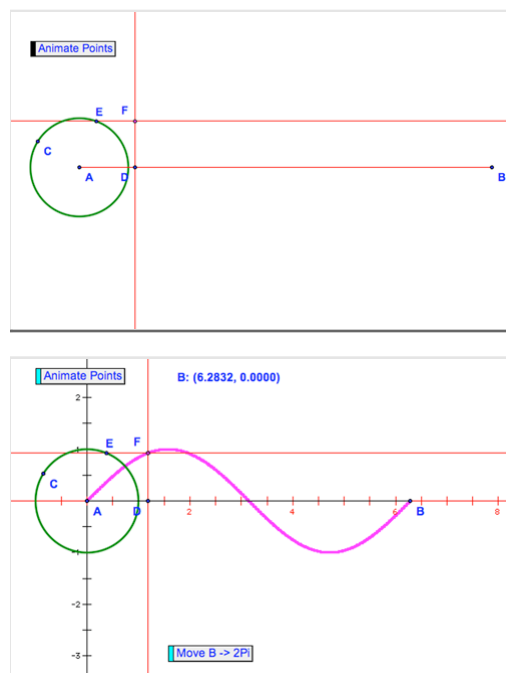
Vocabulary: Sine wave, periodic function, circumference

Sketchpad Version: GSP5

Using the Sketch:

Students construct a horizontal segment AB , a circle AC , a point D on segment AB , and a point E on circle AC . They then construct point F at the intersection of the line perpendicular to AB through point D and the line parallel to AB through point E . Students drag point D and point E and describe what happens to point F . They make a conjecture about what point F 's path will look like if points D and E move at the same speed.

To check their conjecture, students animate point D along segment AB , and animate point E counterclockwise around the circle to trace out a sine wave. Finally, students use circle AC to define a unit circle and then use the unit circle and the trace to explore the relationship between a unit circle, its circumference, and the trace of a sine wave.



Sketch Tips:

Sketch Tips show skills needed in this activity, and the step at which the skill is first used.

Sketch Tip	Tip Sheet or Tip Video
Step 3: Construct a point on an object with the Point tool	Using the Point Tool
Step 4: Construct a perpendicular line using Construct Perpendicular Line	Constructing Parallels and Perpendiculars
Step 6: Construct a parallel line using Construct Parallel Line	Constructing Parallels and Perpendiculars
Step 7: Construct an intersection using Construct Intersection	Constructing Points
Step 8: Create an Animation button using Edit Action Buttons Animation	Animating
Step 10: Trace an object using Display Trace	Tracing
Step 13: Measure the coordinates of a point using Measure Abscissa , Measure Ordinate , or Measure Coordinates	Measuring Coordinates