Pi Day Sample Lesson: Abigail Johnson

Intended Subject Area: Algebra I
Time Frame: 20 minute lesson

Essential Question: What can pi tell us about the relationship between diameter and circumference?

Lesson Objectives:

- Students will be able to relate the equation $C = \pi r$ to a graph of Circumference vs Diameter
- Students will be able to interpret pi as a ratio or a rate of change between the diameters and circumferences of all circles
- Students will be able to predict what the slope of the graph of Circumference vs Radius would be, given the equation $C = 2\pi$.

Standards Addressed:
SAT
HOA.LE.1.4.a
For a linear equation in one variable, interpret a constant, variable, factor, or term in a context.

CCSSM
CCSS.MATH.CONTENT.HSF.IF.B.4
For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities.

CCSS.MATH.CONTENT.HSA.SSE.A.1
Interpret expressions that represent a quantity in terms of its context.*
CCSS.MATH.CONTENT.HSA.SSE.A.1.A
Interpret parts of an expression, such as terms, factors, and coefficients.

Intro: 2-3 minutes
Have students create a name tag on a folded index card as they enter the room.
Project class norms for the day and have students select one that they will champion for the duration of the lesson.

Bell Ringer: 3-5 minutes
Students will be given a variety of differently sized circles, told the diameter or the radius, and asked to find the circumference. Students will then form a line to input their responses into a spreadsheet in GeoGebra.

Demonstration/Discussion: 7-10 minutes
(2-3 minutes) I will use GeoGebra to display a scatter plot generated from the students' circle data. We will first discuss the scatter plot itself:

- What are some of the first things you notice about this scatter plot?
- What might be some of the most important things to notice? Why do you think they're important?
- Make some predictions about what the equation for this line would look like.

(4-5 minutes) We will then create a line of best fit that goes through the data they graphed. Students will examine the equation as well as the line of best fit.

- Now we've got an equation; what are some of the important things you notice about that?
- What does x represent in the equation we obtained? What does y represent? How do you know?
- What do you think 3.14 represents in our equation? Where do you see 3.14 on the graph?
- What do we know already about slope? What could that information tell us about pi and what its significance is?

(1-2 minutes) Summary: Go over key things that were brought up in the discussion. Some of these key points should include:

- X (input) is the diameter of the circle and Y (output) is the circumference
- 3.14 is pi, which represents the slope of the line
- Pi represents how much the circumference of a circle will change when we increase the diameter by 1

Exit Ticket: 4-5 minutes
Students will write on the back of their name tags, to respond to the following prompts:

1. What does pi tell us about the relationship between diameter and circumference? Is the way that you thought of it before different from the way that you think of it now?
2. Extension/Challenge Question: If the slope of diameter vs circumference is 3.14, what do you think is the slope of the graph of radius vs circumference? (If appropriate, give Hint: The equation for radius vs circumference is $C = 2\pi r$)

If the lesson was to extend for a full class period (45 - 50 minutes) some possible extensions would have been:

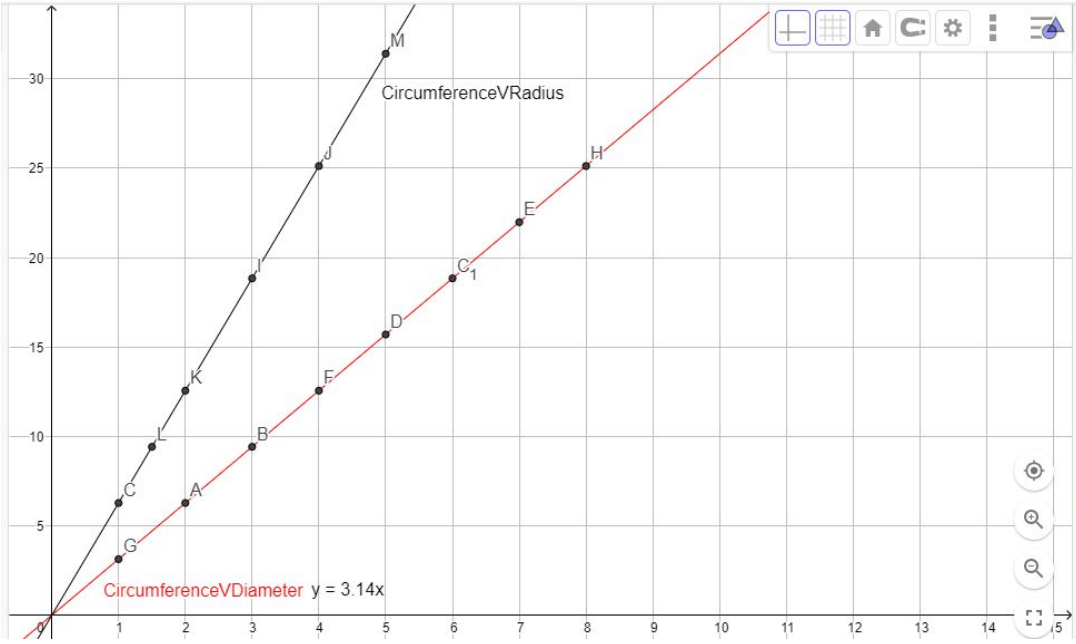
- Students would measure circular objects to find their diameters and circumferences, instead of finding the values algebraically on the handouts
- Students would graph their data by hand and find the equation of their line of best fit
- A class discussion of the way the graph and equation changes when we plot radius instead of diameter
- Students would use the graph to make predictions about the circumferences of circles with given diameters, or about the diameters of circles with given circumferences

Norms for the Day

Please respect them all, but select one to champion!

1. I will be alive, awake, alert, and enthusiastic
2. I will contribute to the conversation respectfully and appropriately
3. I will monitor my air time so that everyone has the opportunity to contribute
4. I will be fully present and use technology only when it is appropriate/allowed
5. I will advocate for my own learning and the learning of others, by asking questions when I want more information

Anticipated Projector Display



	A	B
1	Diameter	Circumference
2	2	6.28
3	3	9.42
4	6	18.84
5	5	15.7
6	7	21.98
7	4	12.56
8	1	3.14
9	8	25.12
10		
11	Radius	Circumference
12	1	6.28
13	3	18.84
14	4	25.12
15	2	12.56
16	1.5	9.42
17	5	31.4
18		
19		
20		
21		
22		
23		