

MathWalk

#7A) What Do a Bike Rack and Trig Have in Common?

There is a bike rack On the Bodenheimer Street side of the Walker Hall.

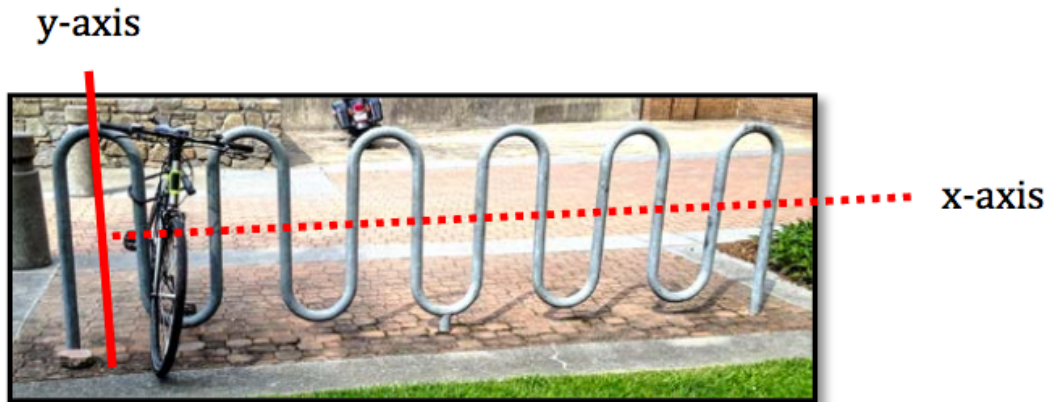


Fig 10: bike Rack on the Bodenheimer street side of the Walker hall

In the world we often see advanced math without ever noticing it. For example, this bike rack. Do you see a trigonometric function here? Assume the y-axis starts at the center of the first post and the x-axis is centered down the rack as drawn above.

Tasks:

Grades 6-12:

- Which trig function does the bike rack look like?

Grades K – 5:

- How many bikes could you currently fit in this rack, assuming 1 bike per slot?
- If you add another loop how many bikes would you be able to fit?

#7B) Posts and Chains

Outside Walker Hall on the Bodenheimer Street side is an area with posts and chains:



Fig 11: posts outside of the Walker hall

The height of those posts are approximately 34 inches. The diameter of each post is about 10 inches. The diameter of the skinny part is approximately 8 inches and the height of the skinny part is approximately 4 inches.

Tasks:

Grades 6 – 12:

- a) What is the volume of each post in cubic inches (you can do it all as one cylinder or you can be more accurate and subtract what is “missing” from the skinnier part?)

[In case you forgot: the volume of a cylinder is $V = \pi r^2 \times h$]

- b) Convert the **volume** of a post to cubic meters using the fact the 1 in. = 2.54 cm (exact).
- c) If concrete weighs approximately 5297.2 lb. per cubic meter, how many pounds (to the nearest whole pound) does one post weigh (the part that is showing above ground)?

Grades K-6:

- d) If the average first grade student weighs 40 lb. and the post weighs 222 lb., how many first-grade students would you need to outweigh the post?

Did You Know?

A **catenary** is the shape a free-hanging cable takes when hung by the ends. It can be graphed as a hyperbolic cosine curve. Sometimes it is also called a “*funicular*.” The catenary shape is important in architecture and engineering bridges and arches so that adding force doesn’t result in the structure bending.