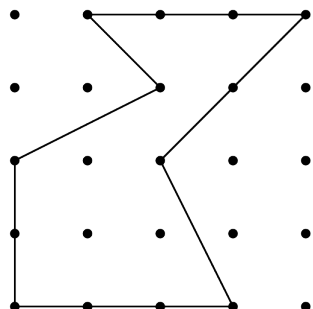


1 Introduction to the Introduction

Today, we are going to look at coordinate geometry!

2 Introduction

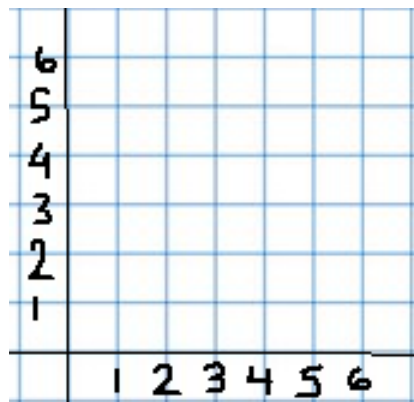
Find the area and perimeter of the shape below. What are some different ways you can do this?



3 Shoelace Theorem

How did you find the area of the shape above? Did you count the squares and the partial squares and guesstimate? With shoelace theorem, you can easily find the exact area of anything with coordinates! Here are the steps:

1. Plot the points and connect the shape.
2. Start at one point and go in one direction to write down all the coordinates in a vertical line. Rewrite the coordinates of the first point at the bottom.
3. Draw a line connecting the top left number with the second right number. Continue this pattern down the line. Multiply each pair of numbers and add them up. Do this for the other side (the lines should crisscross like shoelaces).
4. Subtract one sum from the other, divide the difference by two, and make the number positive. You have the area!



Find the area of the shape enclosed by $(3,6)$, $(4,2)$, $(0,5)$, $(1,1)$, $(1,4)$, $(3,0)$, $(2,0)$, and $(5,3)$.

Challenge: find the area of the space between these two shapes:

1. $(2,0)$, $(5,1)$, $(1,4)$, $(4,5)$, $(3,1)$, $(0,2)$, $(6,3)$
2. $(3,4)$, $(3,2)$, $(1,2)$, $(5,4)$, $(4,2)$

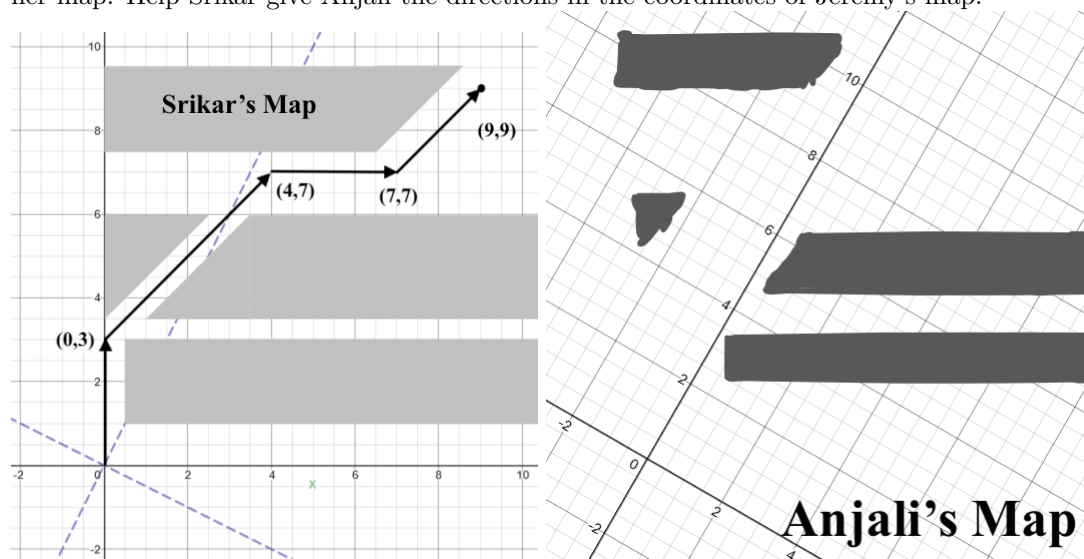
4 Taxis and Crows

Imagine you're driving a taxi in a big big city. This perfect city is made out of many many streets stretching out both North-South and East-West at perfect right angles. This should look pretty familiar (it looks just like a normal graph!).

1. Let's say you are driving a customer from the origin $(0,0)$ to point $(4,6)$? What is the taxi distance? How many different paths of shortest length can you take? Remember, it's as the taxi drives, not as the crow flies.
2. Now, a crow wants to know all the places it can go that are five units away. Try drawing all the points the crow can go on the left graph.
3. Let's do the same for the taxi. What are all the places it can travel with enough gas to drive 5 units?
4. If π can be calculated in the crow's map as circumference divided by diameter, what is the " π " of a taxi?

5 Coordinate Confusion

Srikar and Anjali are meeting up. Both have two maps, but Jeremy made Anjali's map and he has no idea what he is doing(he is a potato after all). Jeremy made it so that the coordinate $(1,2)$ on Srikar's map is $(0,2)$ on Anjali's map. Also, Jeremy messed up all of the buildings, so Anjali might crash into a wall with her map! Help Srikar give Anjali the directions in the coordinates of Jeremy's map.



1. What is $(0,3)$ on Anjali's map? (,)
2. What is $(4,7)$ on Anjali's map? (,)
3. What is $(7,7)$ on Anjali's map? (,)
4. What is $(9,9)$ on Anjali's map? (,)
5. How do you turn a coordinate from Srikar's map to a coordinate on Anjali's map?

6 Tangram Fun!