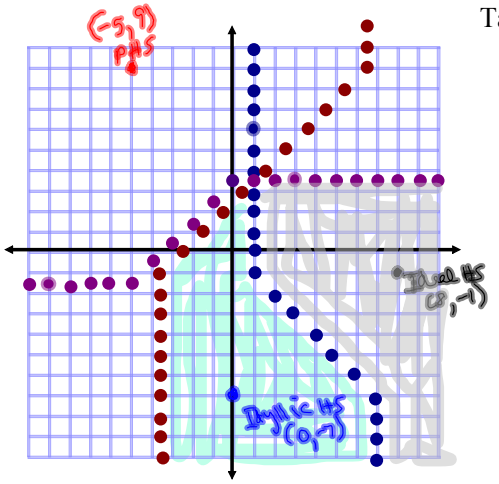
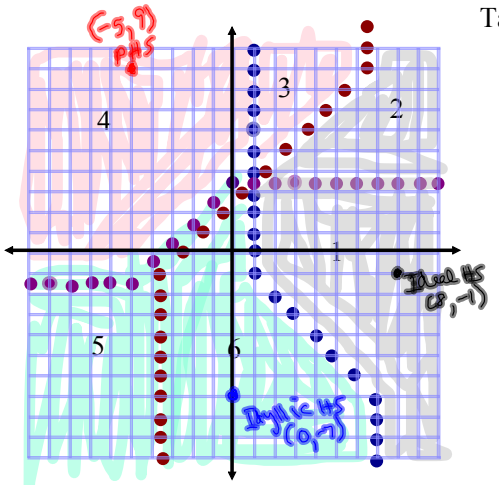


Taxicab homework #2

Perfection city has 3 high schools (shown here). Draw the school boundaries so that each student attends the school closest to his or her home, as the taxi (or school bus) drives.

Partial solution: Shown here in gray and blue are the boundaries for just two of the regions. The (color-coded) dotted lines represent points that are equidistant from neighboring schools. For instance, purple separates the red school from the blue school. Similarly, dark red = red + black; dark blue = blue + black.

The rest of the solutions are shown on the next page.

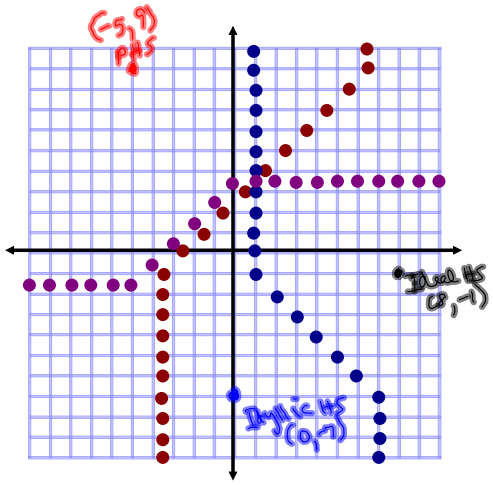


Taxicab homework #2

Perfection city has 3 high schools (shown here). Draw the school boundaries so that each student attends the school closest to his or her home, as the taxi (or school bus) drives.

Full solution: To complete the map, we pick a sample point from each of the (6) regions formed by the lines of equal distance between pairs of schools; we then consider which of the schools is closest to that point.

We see that regions 1&2 should go to Ideal HS; 3&4 go to PHS; 5&6 go to Idyllic.

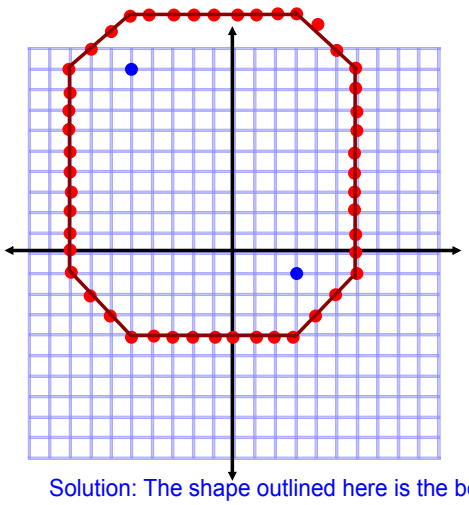


Taxicab homework #3

P(1,4) looks close:
6+4 = 11 (PHS)
1+11 = 12 (Idyllic)
7+5 = 12 (Ideal)

Need to move away from PHS.
Try P(1, 3.5):
6+5.5 = 11.5 (PHS)
1+10.5 = 11.5 (Idyllic)
7+4.5 = 11.5 (Ideal)

That's the spot!



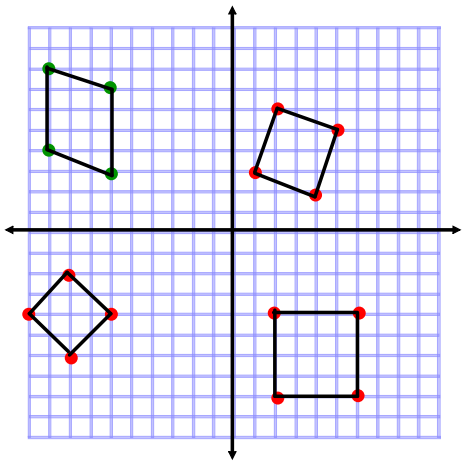
Taxicab HW #4

Terrance works at (3, -1)
Sasha works at (-5, 9)

Where can they live if they want the sum of the distances they walk to be no more than 24 blocks?

Solution: The shape outlined here is the boundary of the area in question. The sum of the distance they walk is less than or equal to 24 blocks.

(This is a taxicab ellipse, which consists of all points that are a fixed total distance from two foci.)



Taxicab HW #6

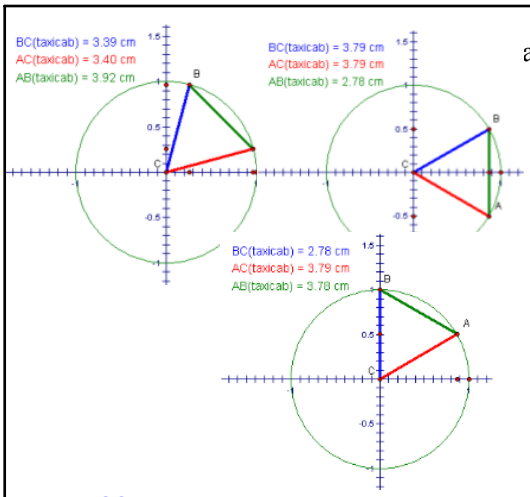
What do taxicab squares look like? Draw three taxicab squares of side length four such that the figures are not congruent as Euclidean figures.

What Euclidean shape do taxicab squares have? Why does this happen?

We can define a square as a quadrilateral with four congruent sides and four congruent angles. The three red-vertex figures above are squares with side length four, though they are not congruent to one another in Euclidean geometry.

The green-vertex figure has four congruent side lengths but the angles are not congruent; this is a taxicab rhombus.

In general, a taxicab square will be a Euclidean square because it will have four right angles (so it is at least a Euclidean rectangle) and it will have taxicab side-lengths equal. The Pythagorean Theorem guarantees that (since we have right angles) these side lengths will also be equal in the Euclidean metric.

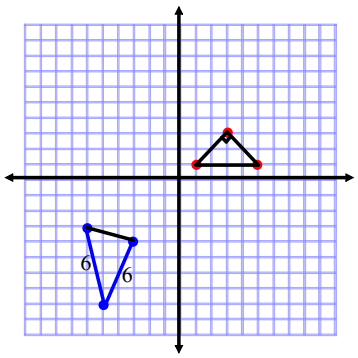


axicab HW #7

Can you draw a regular taxicab triangle? Why or why not?

How about a right triangle with sides of equal length?

How about an isosceles triangle whose base angles are not congruent?



As the GSP sketches above shows, a regular triangle (with three 60° angles) will never be equilateral (and hence will not really be *regular* afterall). Try it: whenever you manage to get 2 of the sides the same (taxicab) length, you find that the third side is a different length.

The figure above shows (in red) an equilateral right triangle (it is not *regular* because its angles are not all congruent) with taxicab side lengths 4 units. And in blue, we see an isosceles triangle that does not have congruent base angles.