Thu. 11/13 Agenda:

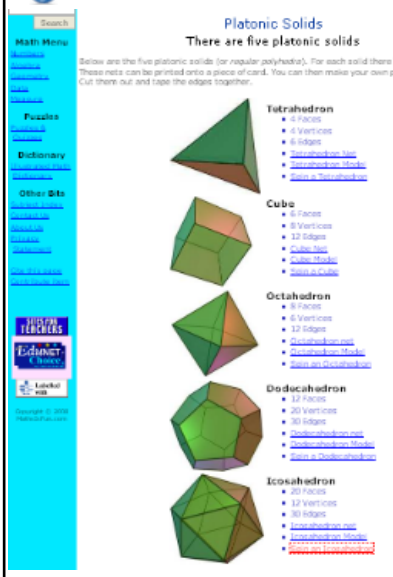
- Platonic Solids Wrap-up
  - Models and Euler Formula for 5.5.5 and 3.3.3.3.3
  - Duals, and relationship with Schlafli symbols.

- Taxicab Geometry
  (HW #2, 3, 4*, 6, 7 on p. 86 of the Handout)
  *nevermind the part about conic sections

- We'll end with 20 to 30 minutes to discuss your group presentations.

Nov 13-12:53 PM

http://www.mathsisfun.com/platonic_solids.html



http://www.mathsisfun.com/geometry/tetrahedron.html

http://www.mathsisfun.com/geometry/hexahedron.html

http://www.mathsisfun.com/geometry/octahedron.html

http://www.mathsisfun.com/geometry/dodecahedron.html

http://www.mathsisfun.com/geometry/icosahedron.html

Nov 13-9:29 AM

Complete the table below:

$v - e + f = 2$

Polyhedron	Face Type	Schlafli Symbol	v	e	f
Tetrahedron ...tetrahedron.html	Equilateral Triangles	3.3.3	4	6	4
Cube ...hexahedron.html	Squares	4.4.4	8	12	6
Octahedron ...octahedron.html	equilateral triangles	3.3.3.3	6	12	8
Dodecahedron ...dodecahedron.html	reg. pent.	5.5.5	20	30	12
Icosahedron ...icosahedron.html	reg. triangle	3.3.3.3.3	12	30	20

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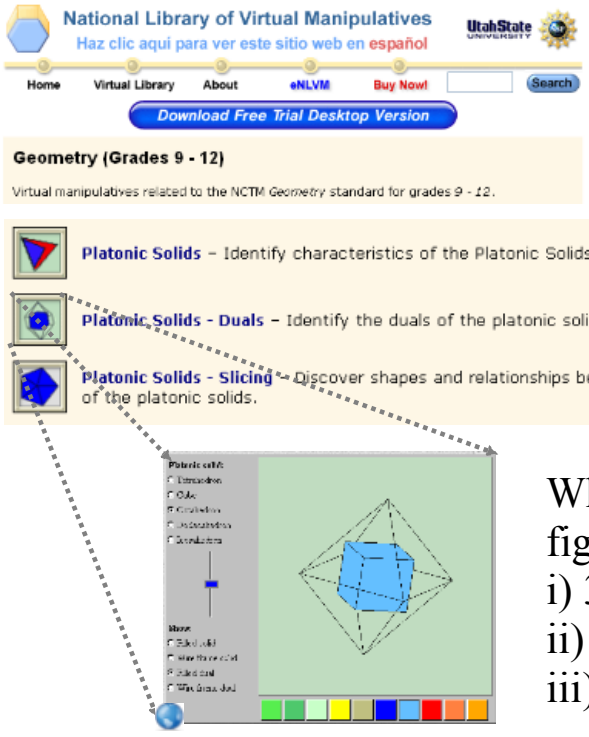
http://nlvm.usu.edu/en/nav/category_g_4_t_3.html



What is the dual of the figure with Schlafli symbol:

i) 3.3.3 <--> 3.3.3

ii) 4.4.4 <--> 3.3.3.3

iii) 5.5.5 <--> 3.3.3.3.3

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Models of polyhedra:

- Nets (with or without tabs)
- Pipe-cleaner and Straws

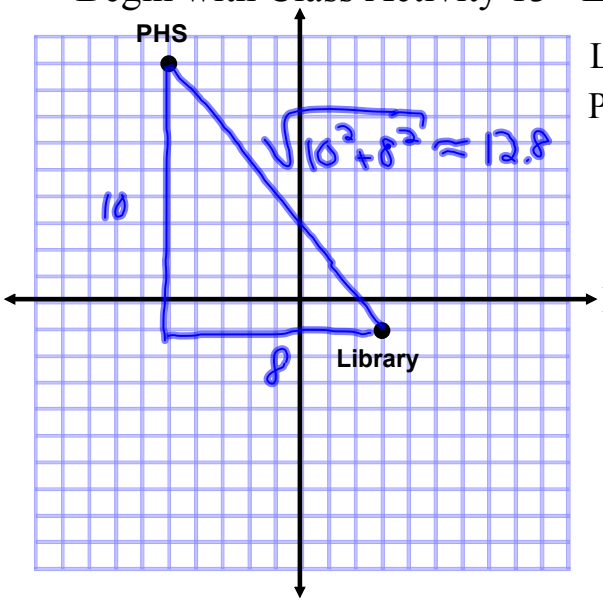
Packet -- Nets of Platonic Solids

Pipe-cleaner model of one of the Platonic solids.

Nov 13-10:31 AM

Taxicab Geometry

Begin with Class Activity 13 - *Life in a taxicab world.*



Library: 3rd St. E. & 1st Ave. S

PHS: 5th St. W & 9th Ave. N

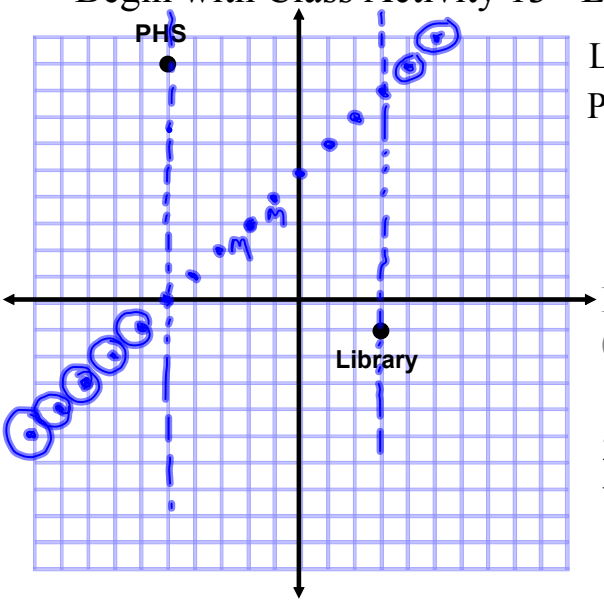
1. How far apart are these points...
   ...as the crow flies? 12.8 blocks
   ...if she stays on the streets? 18 blocks
2. How many days can she walk a different (shortest) route?

HW

Nov 13-11:01 AM

Taxicab Geometry

Begin with Class Activity 13 - *Life in a taxicab world.*



Library: 3rd St. E. & 1st Ave. S
PHS: 5th St. W & 9th Ave. N

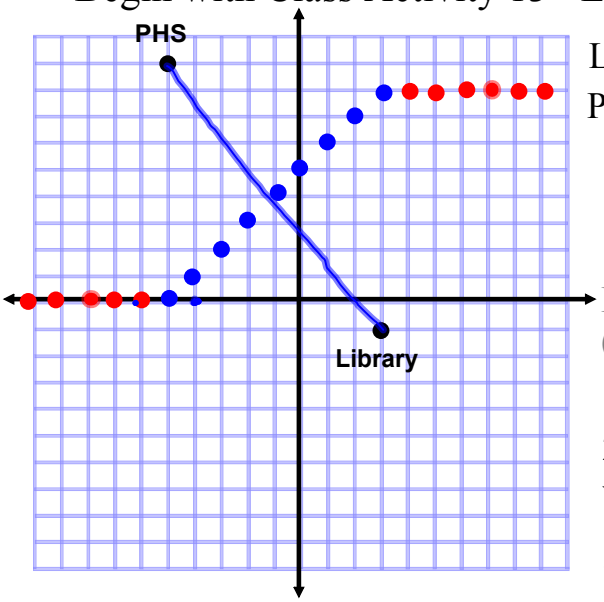
1. How far apart are these points...
   ...as the crow flies?
   ...if she stays on the streets?
How many days can she walk a different (shortest) route?

2. Where is the halfway point? Mark with "**M**".
* Mark other "equidistant" points with "**P**".

Nov 13-11:01 AM

Taxicab Geometry

Begin with Class Activity 13 - *Life in a taxicab world.*



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1. How far apart are these points...
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How many days can she walk a different (shortest) route?

2. Where is the halfway point? Mark with "**M**".
* Mark other "equidistant" points with "**P**".

Nov 13-11:01 AM

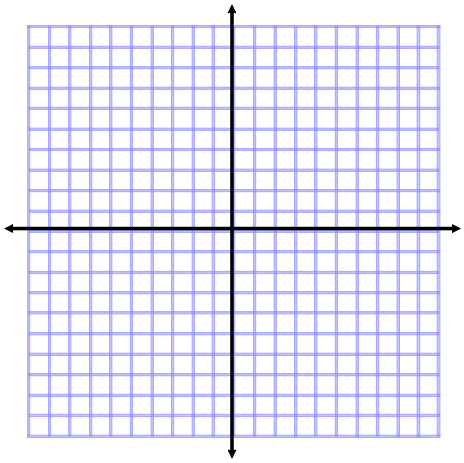
Taxicab Geometry:

- Take the Euclidean definition of *distance* and replace it with the "taxicab" definition. Let (x,y) and (u,v) be two points. Then:

$d_E = \sqrt{(x-u)^2 + (y-v)^2}$ (Euclidean distance formula)

$d_T = |x-u| + |y-v|$ (Taxicab distance formula)

Example: Calculate the distance between (2,5) and (4,1) using each definition of distance.



$d_E = \sqrt{(4-2)^2 + (1-5)^2}$
$= \sqrt{4+16}$
$= \sqrt{20} = 2\sqrt{5}$

$d_T = |4-2| + |1-5|$
$= 2+4 = 6$

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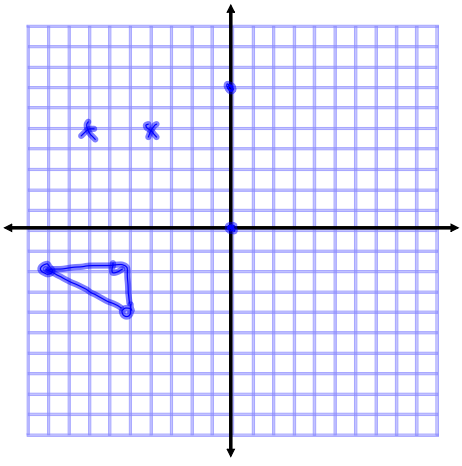
Taxicab Geometry:

- Take the Euclidean definition of *distance* and replace it with the "taxicab" definition. Let (x,y) and (u,v) be two points. Then:

$d_E = \sqrt{(x-u)^2 + (y-v)^2}$ (Euclidean distance formula)

$d_T = |x-u| + |y-v|$ (Taxicab distance formula)

Are there pairs of points whose Taxicab distance is the same as their Euclidean distance? If so, generalize the relationship between such points.



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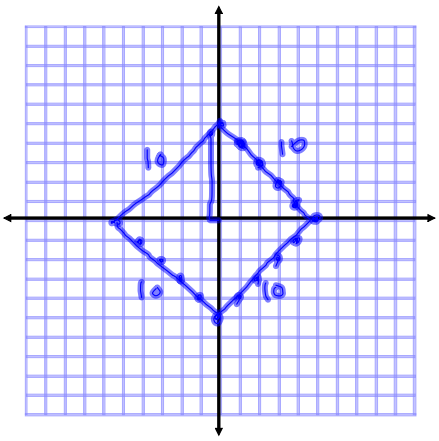
Taxicab Geometry:

The definition of a circle in Taxicab space is the same as that in Euclidean space:

The circle (with radius r centered at P) consists of the set of all points that are a distance of r units away from P.

1. Draw the Taxicab circle with radius 5 centered at the origin.
2. What is the circumference of this Taxicab circle? 40



$\sqrt{5^2+5^2} = \sqrt{50} = \sqrt{25 \cdot 2} = 5\sqrt{2}$

$\times 4$

$20\sqrt{2}$

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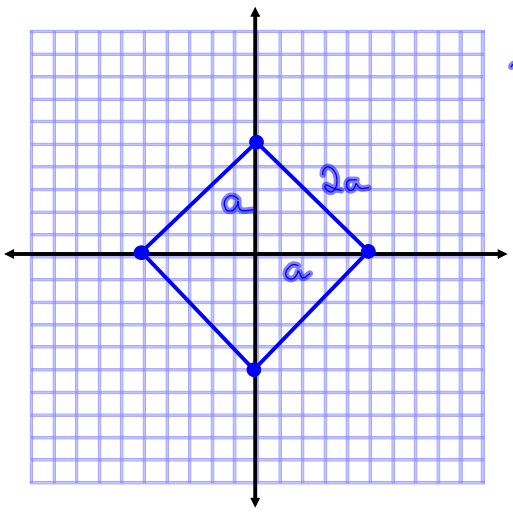
Taxicab Geometry:

3. Recall that π is the ratio of a circle's circumference to its diameter. What is the value of π for the taxicab circle with radius 5?

4. In Euclidean geometry, π is constant 3.1415... . Is the value of π constant in the Taxicab geometry?



$\pi_T = \frac{C}{d} = \frac{40}{10} = 4.$

$\pi_T = \frac{4(2a)}{2a} = 4$

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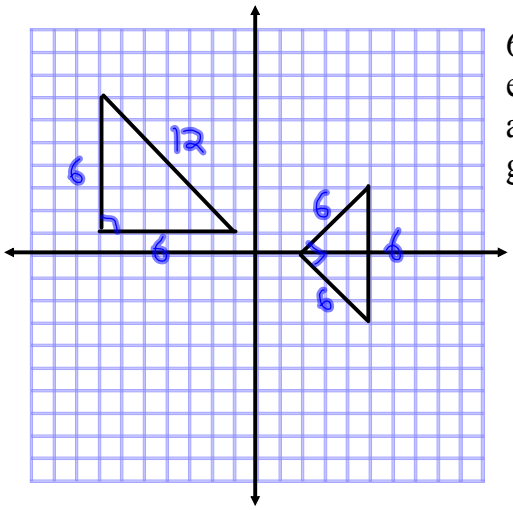
Taxicab Geometry:

5. Consider the (Euclidean) triangle congruence theorem known as Side-Angle-Side (SAS). Is the SAS theorem true in Taxicab geometry?

It will help to consider the following pair of triangles.



6. In Euclidean geometry, an equilateral triangle has three 60^o angles. Is this also true in Taxicab geometry?

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Taxicab Geometry:

The Taxicab geometry is a simple example of a non-Euclidean geometry.

If we start with a careful definition of a "line," we can show that Taxicab geometry does not satisfy Euclid's fifth postulate (the parallel postulate) which can be stated:

Given any line and any point P not on that line, there is exactly one line through P that is parallel to the given line.

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