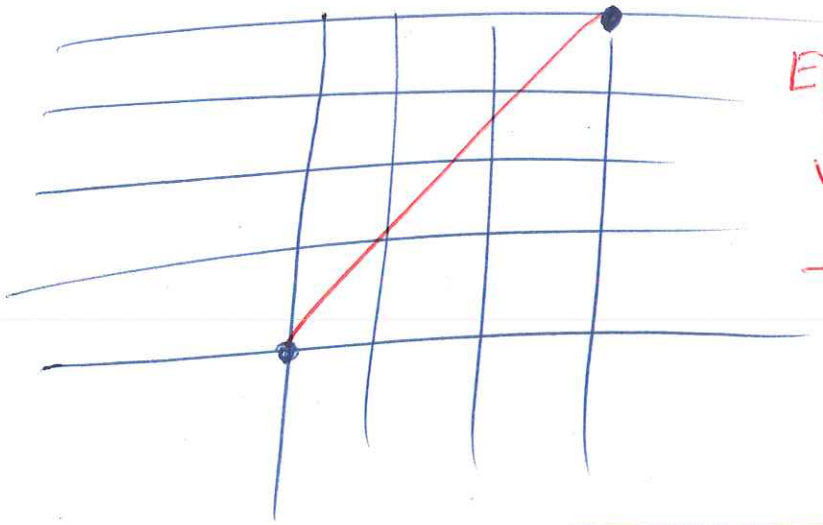
Taxicab Geometry

Euclidean distance = length of line

Taxicab distance = # of blocks



Euclidean

$\sqrt{3^2+4^2} = 5$

Taxicab

$3+4 = 7$

Def: If $A = (x_1, y_1)$ & $B = (x_2, y_2)$ then the taxicab distance from A to B is

$$d(A,B) = d_T(A,B) = |x_2 - x_1| + |y_2 - y_1|$$

The Euclidean distance from A to B is

$$d_E(A,B) = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Def: Taxicab Geometry is the geometric model in which

points = Euclidean pts

lines = Euclidean lines

angles = Euclidean angles

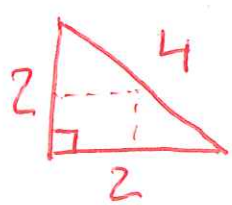
but distance function is d_T, not d_E

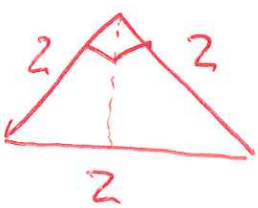
$\Rightarrow$ SMSG 1-5a, 9, 11-14 satisfied as well as 16 (parallel postulate)

i.e. all neutral axioms except SAS plus Euclidean parallel postulate

SAS fails

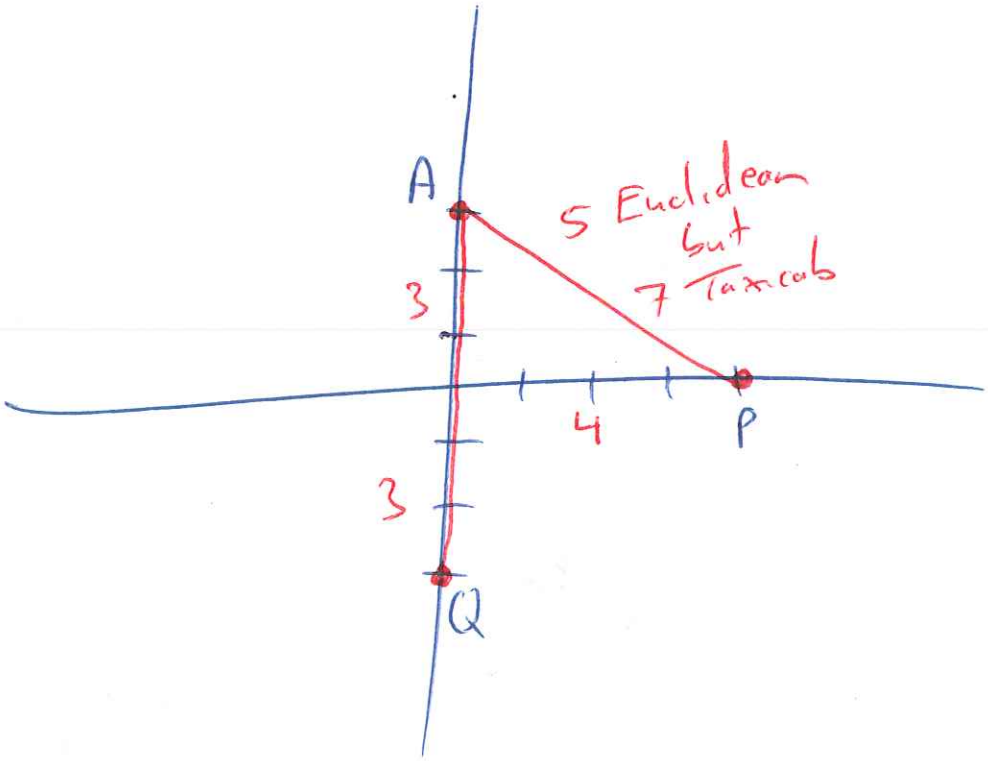
discuss Euclid's proof





WARNING

Not only have absolute distances changed, but also relative distances:



A = (0, 3)
P = (4, 0)
Q = (0, -3)

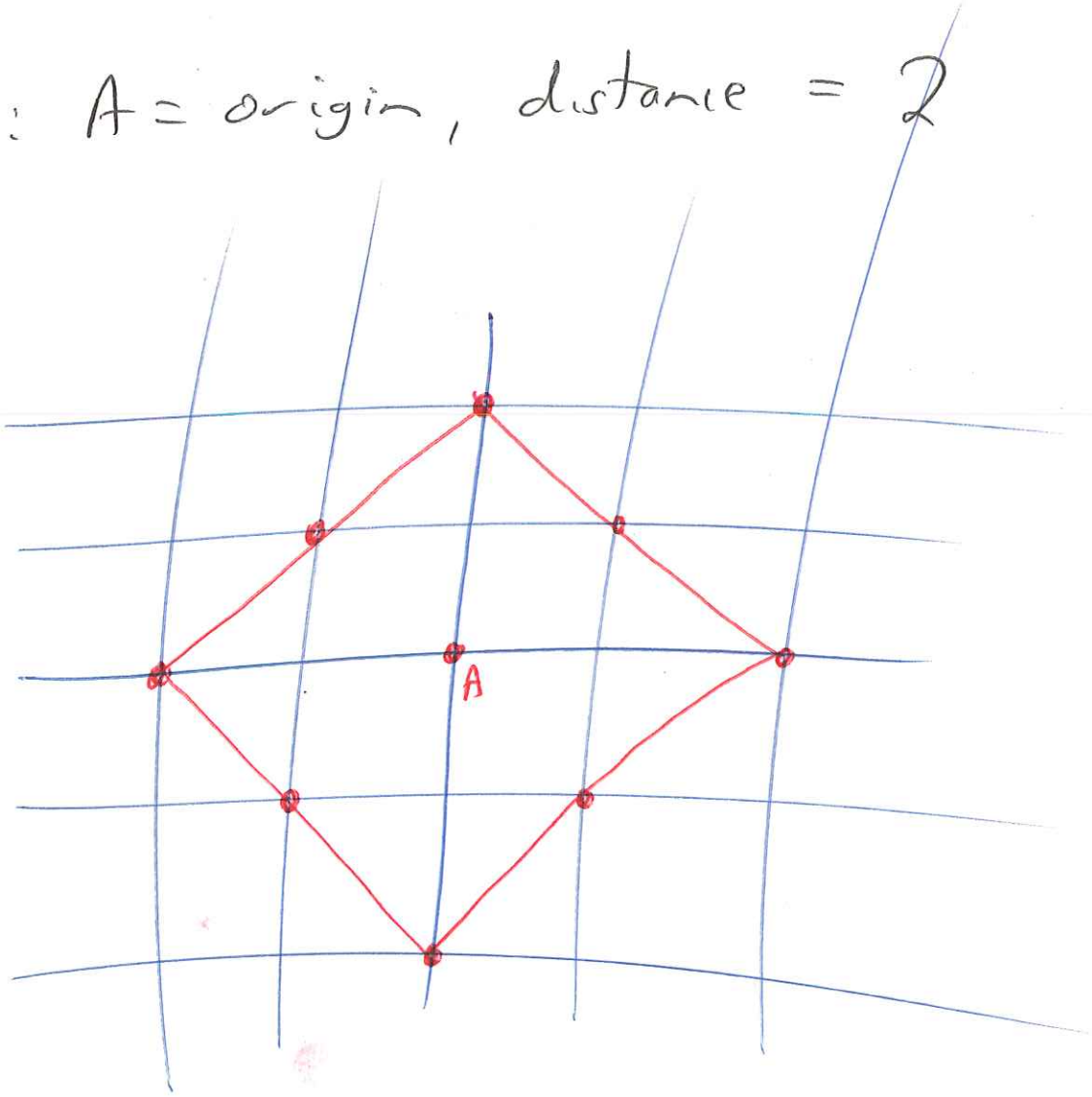
A is closer to P than Q in Euclidean geometry

but A is farther from P than Q in taxicab geometry

Taxicab Circles

Problem: Find all points P a given distance from a given pt A

Ex: A = origin, distance = 2

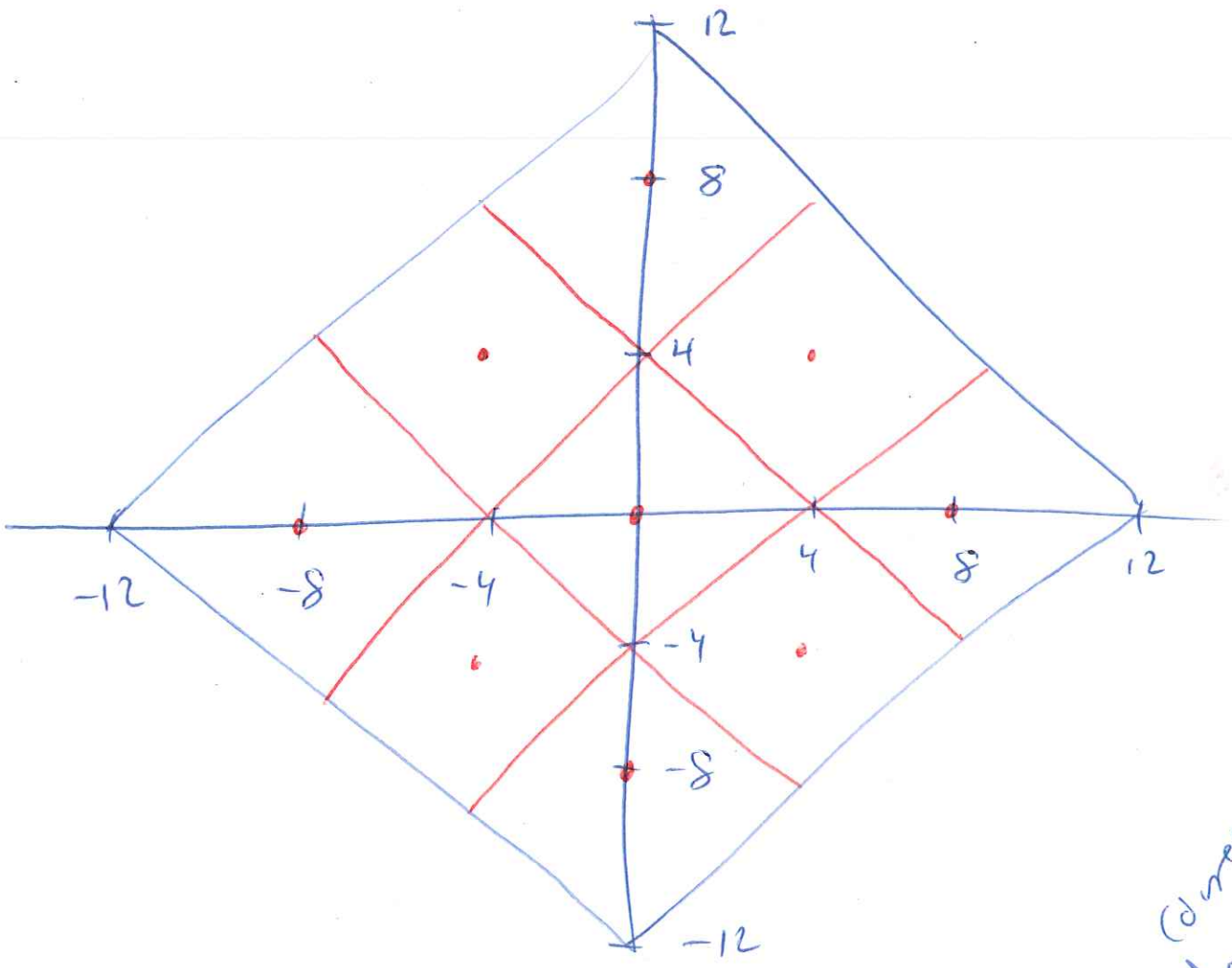


"circles" are squares!

(diamonds)

Problem 62:10

The telephone company wants to set up pay phones so that everyone within 12 blocks of the center of town is within 4 blocks of a phone. Where should they be?



9 phones

mention corresponding Euclidean problem