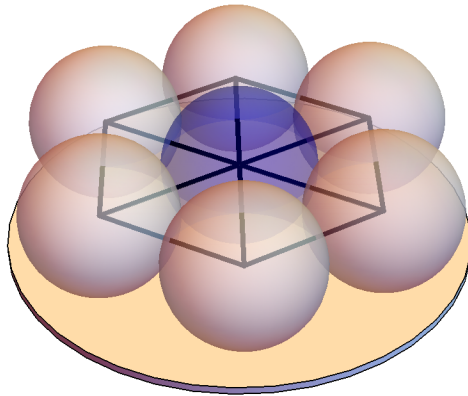


Needham, Chapter 3, Exercise 13 (i), p. 184.

Gary Palmer, June 3, 2021, 2:30 pm PDT

Out[442]=



(i) Let P be a sphere resting on the flat surface Q of a table. Let $S_1, S_2, \dots$ be a string of spheres touching one another successively and all the same size as P . If each S -sphere touches both P and Q , show that S_6 touches S_1 , so that we have a closed “necklace” of six spheres around P .

Let the seven spheres be divided in two by a horizontal surface Π one radius above the table top. The intersection of each sphere with Π is a great circle on P and each S_i . The distance between the centres of adjacent great circles is $2r$, where r is the radius of any S_i . The distance from the centre of P to any S_i is also $2r$. Hence the segments connecting the centres of the necklace form a regular hexagon in Π . The six rays from the centre of P to the centres of the spheres form six equilateral triangles. Then S_6 must touch S_1 , so that we have a necklace of six spheres around P .