**Problem 2.** A sphere is in the corner of a room and is tangent to the two walls that meet at that corner (and of course tangent to the floor.) There is a point on the sphere that is 4 units from one of the walls, 6 units from the other wall, and 12 units from the floor. Find all possible lengths for the radius of the sphere.

**Solution.** Let the corner of the room be the origin and the three positive coordinate axes along the lines of intersection of the walls and each wall-floor pair. If the sphere has radius $r$, then the sphere is centered at $(r, r, r)$. The point described in the problem statement has coordinates $(4, 6, 12)$ and is on the sphere. Therefore

$$(4-r)^2 + (6-r)^2 + (12-r)^2 = r^2$$

from which

$$r^2 - 22r + 98 = 0.$$ 

By the quadratic formula,

$$r = \frac{22 \pm \sqrt{22^2 - 4 \cdot 98}}{2} = 11 \pm \sqrt{23}.$$