1. Find the reflection of the point \((11, 16, 22)\) across the plane \(3x + 4y + 5z = 7\).

2. Given the three points \((1608, 2010, 2010)\), \((2010, 2412, 2010)\), and \((2010, 2010, 2412)\). Find the area of the circle defined by these three points.

3. What is the inradius of a triangle with side lengths 4, 5, and 6?

4. Find the volume of a regular cuboctahedron, of sidelength 1, which is a solid of 8 equilateral triangles and 6 squares such that each edge is a square and a triangle together, as pictured.

5. Given triangle \(ABC\). \(D\) lies on \(BC\) such that \(AD\) bisects \(\angle BAC\). Given \(AB = 3\), \(AC = 9\), and \(BC = 8\). Find \(AD\).

6. Given the information in the diagram, let \(\angle MBD = 90^\circ\), \(OT = 25\) and \(AM = MB = 30\). Find \(MD\).

7. Suppose we have a polyhedron consisting of triangles and quadrilaterals, and each vertex is shared by exactly 4 triangles and one quadrilateral. How many vertices are there?

8. Given the following circular section, write the height \(h\), the height of the circle above the \(x\)-axis at a given \(x\), as a function of \(x\), with \(-R \leq x \leq R\). (Note \(\theta\) and \(R\) are constants and \(\theta\) is the angle between the \(x\)-axis and the tangent line to the circle at \(x = -R\).)

9. A sphere of radius 1 is internally tangent to all four faces of a regular tetrahedron. Find the tetrahedron’s volume.

10. We are given a coin of diameter \(\frac{1}{2}\) and a checkerboard of \(1 \times 1\) squares of area \(2010 \times 2010\). We must toss the coin such that it lands completely on the checkerboard. If the probability that the coin doesn’t touch any of the lattice lines is \(\frac{a^2}{b^2}\) where \(\frac{a}{b}\) is a reduced fraction, find \(a + b\).