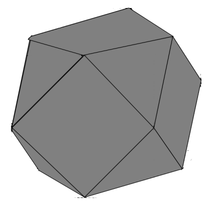
Note: Figures may not be drawn to scale.

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.

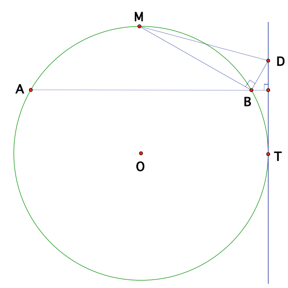
3. What is the inradius of a triangle with side lengths 4, 5, and 6?

4. Find the volume of a regular cubeoctahedron, 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.



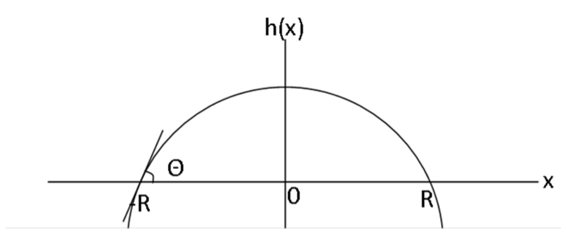
5. Given triangle ABC. D lies on $\overline{BC}$ such that $\overline{AD}$ bisects $\angle BAC$. Given $\overline{AB} = 3$, $\overline{AC} = 9$, and $\overline{BC} = 8$. Find $\overline{AD}$.

6. Given the information in the diagram, let $\angle MBD = 90°$, $\overline{OT} = 25$ and $\overline{AM} = \overline{MB} = 30$. Find $\overline{MD}$.



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 $-R \le x \le R$. (Note θ and R are constants and θ 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 1×1 squares of area 2010×2010. 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 $a + b$.