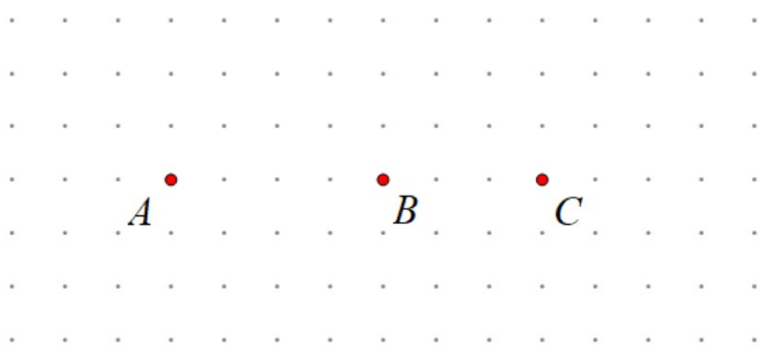
Geometry Exam
University of Houston Mathematics Contest 2026

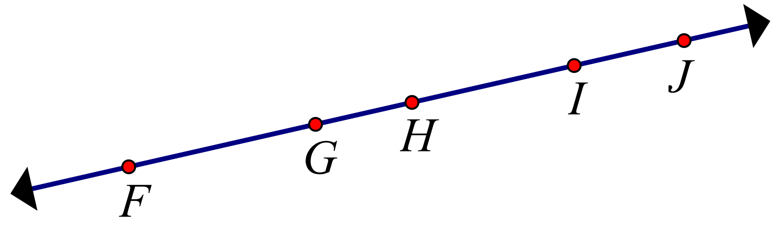
Instructions for the Geometry Contest.

- Diagrams may not be drawn to scale.
- If any graphs, grids, or number lines are drawn: the spacing between adjacent horizontal markings or adjacent vertical markings (such as lines, segments, or dots) is assumed to be one unit unless otherwise noted in the question.

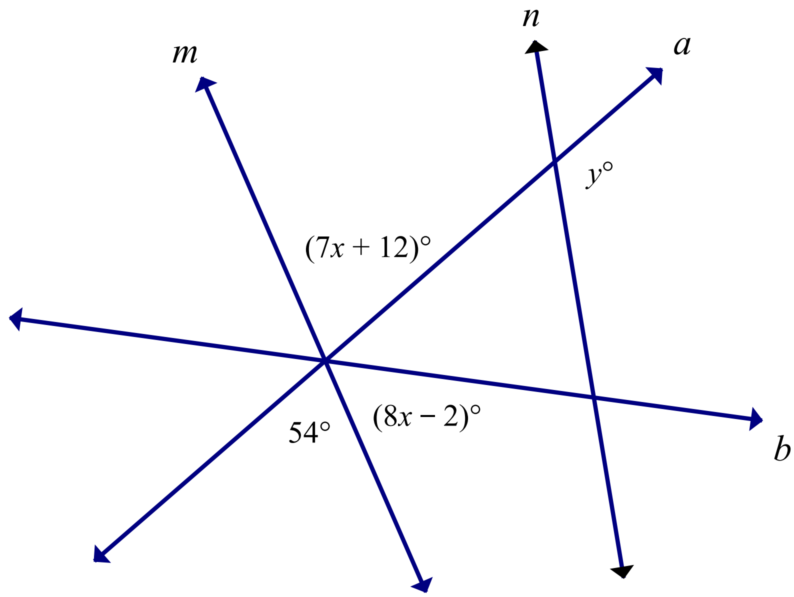
1. If C is the midpoint of $\overline{AE}$ and D is the midpoint of $\overline{CE}$, find BD. (D is not shown.)



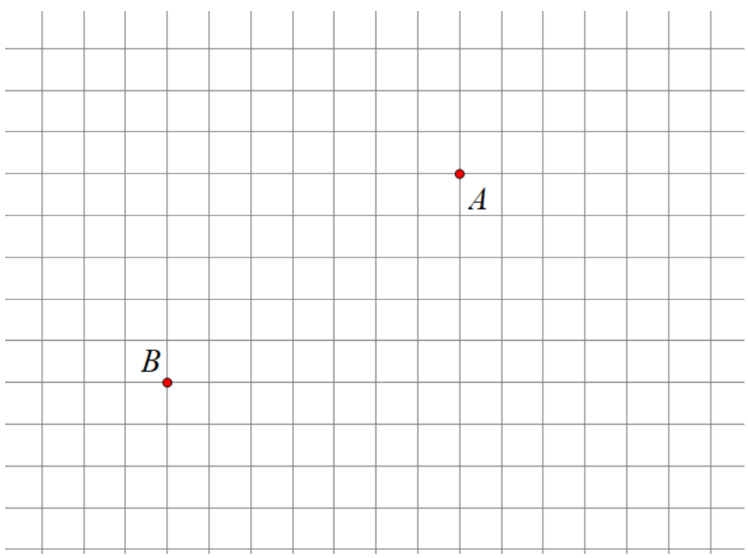
2. How many distinct rays can be named using the points given below?



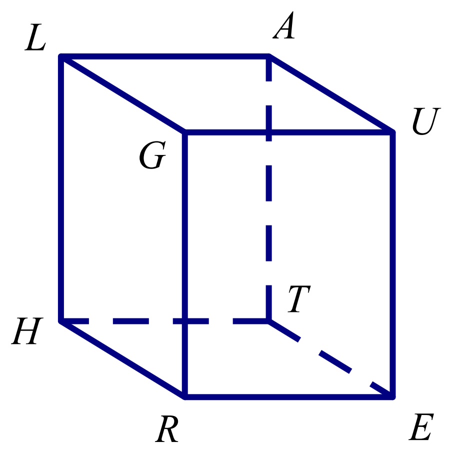
3. For what value of y is $m \parallel n$?



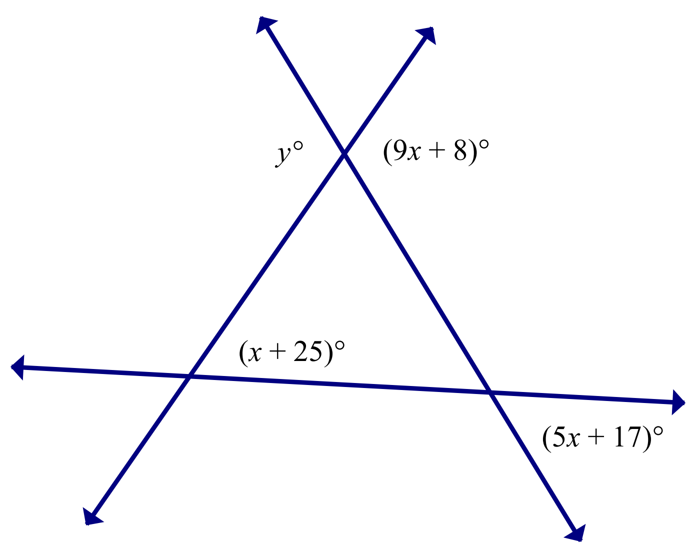
4. A toothpick has endpoints A and B. If you choose a random point on the toothpick and break it into two pieces, what is the probability that one piece of the toothpick is at least 7 units long?



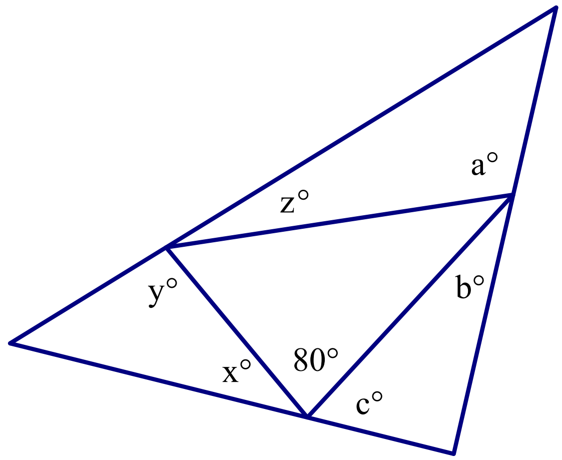
5. Intersecting edges are perpendicular in the following polyhedron. How many edges are skew to $\overline{UT}$?



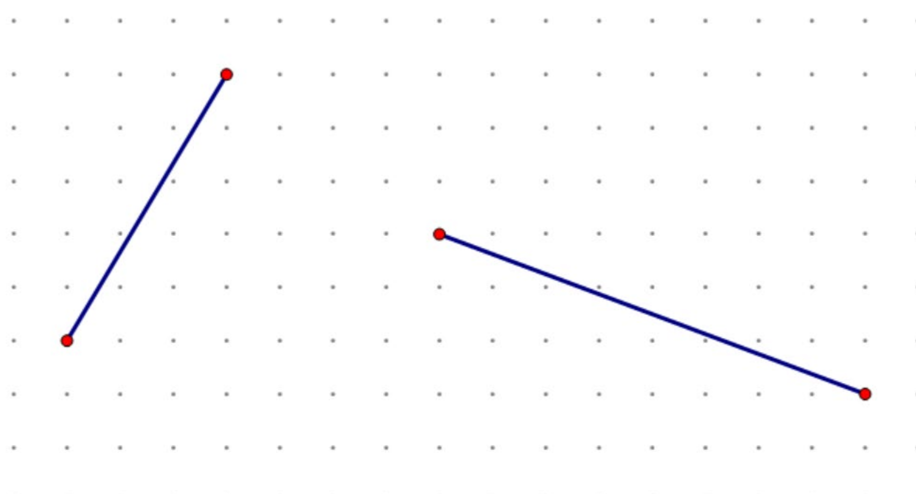
6. Find the value of $x - y$.



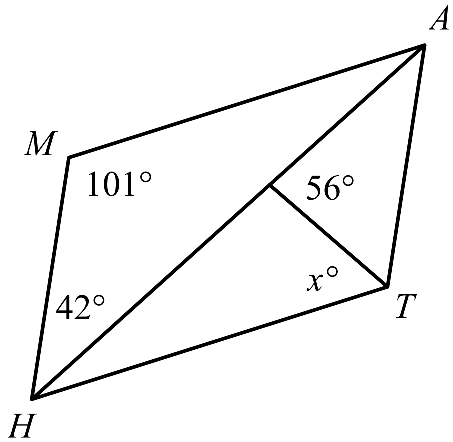
7. Find $a + b + c + x + y + z$.



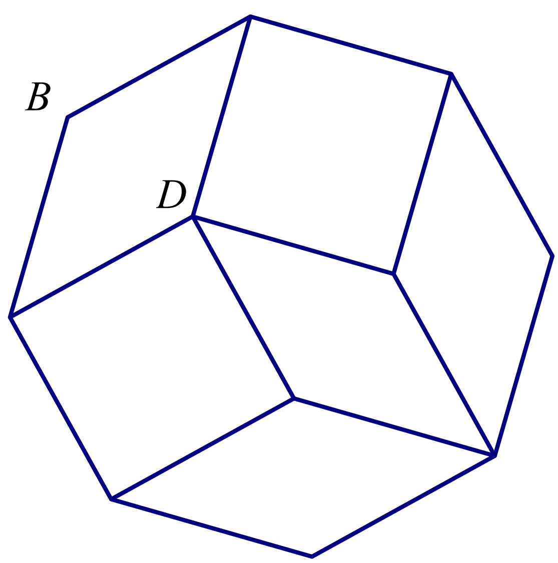
8. The two segments below represent two side lengths of a triangle. How many triangles can be formed with these two segments, given that the length of the third side of the triangle is a whole number?



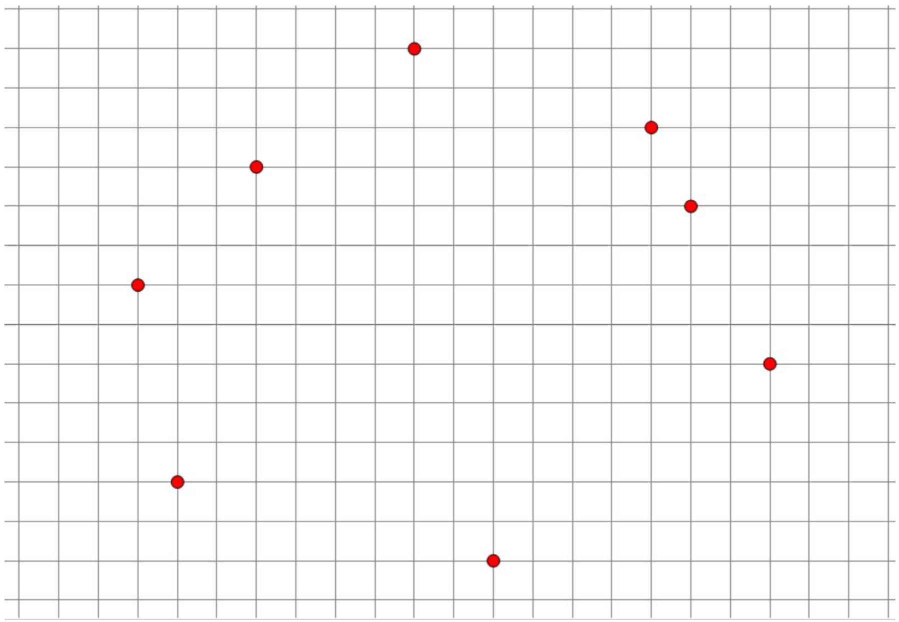
9. Quadrilateral MATH is a parallelogram. Find the value of x.



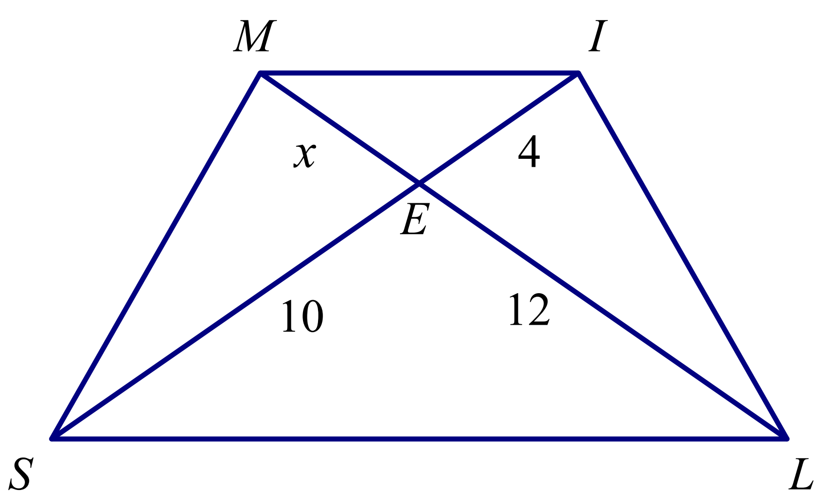
10. The outer polygon in the figure below is a regular polygon with perimeter 480 cm. All of the figures in its interior are parallelograms. Find the length of $\overline{BD}$, in cm.



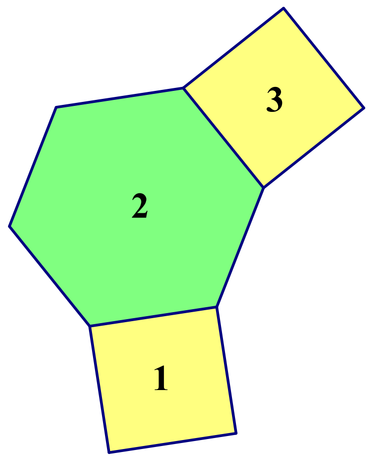
11. How many distinct lines can be drawn through the points below?



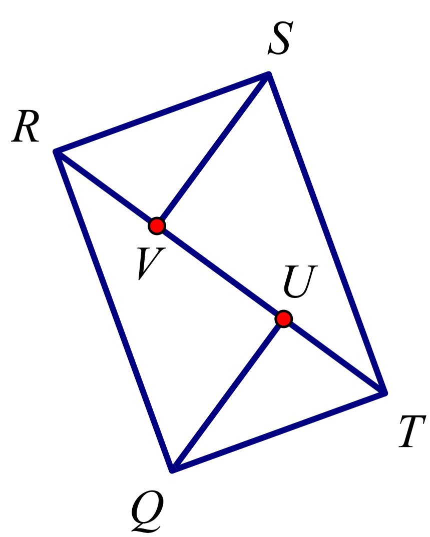
12. In trapezoid $SMIL$, diagonals $\overline{SI}$ and $\overline{ML}$ intersect at point E. If $ME = x$, $EI = 4$, $SE = 10$, and $EL = 12$, find ML.



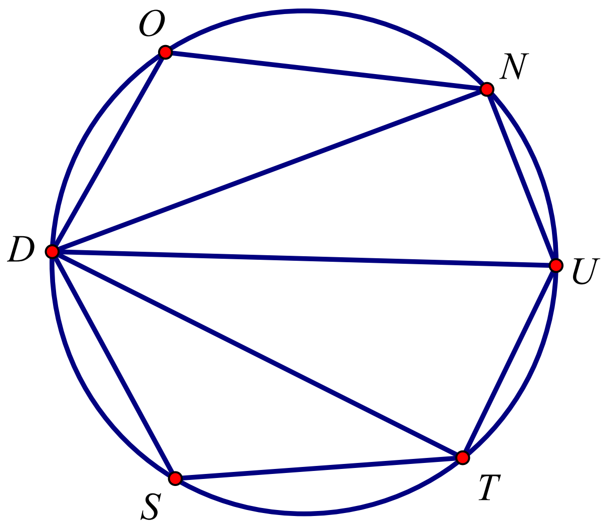
13. Spencer has a box of tiles that snap together at their edges. All of the tiles are regular polygons with the same side length, and all tiles of a given color are congruent to each other. Spencer begins with a yellow tile, then green, then yellow in a clockwise pattern as shown below. Spencer continues in this manner, alternating the green and yellow tiles until he creates a complete flower-like pattern, with the final tile connecting to Tile 1. How many total tiles does Spencer use to create this pattern?



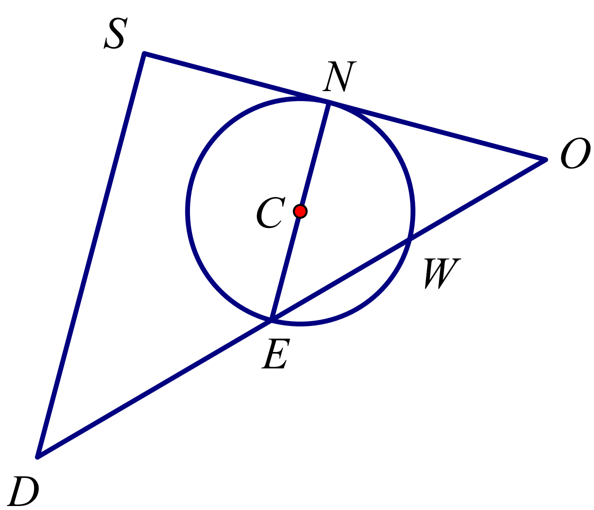
14. In the diagram below, QRST is a rectangle, and both $\overline{SV}$ and $\overline{QU}$ are perpendicular to $\overline{RT}$. Find UV, given that $QT = 9$ and $SV = \sqrt{77}$.



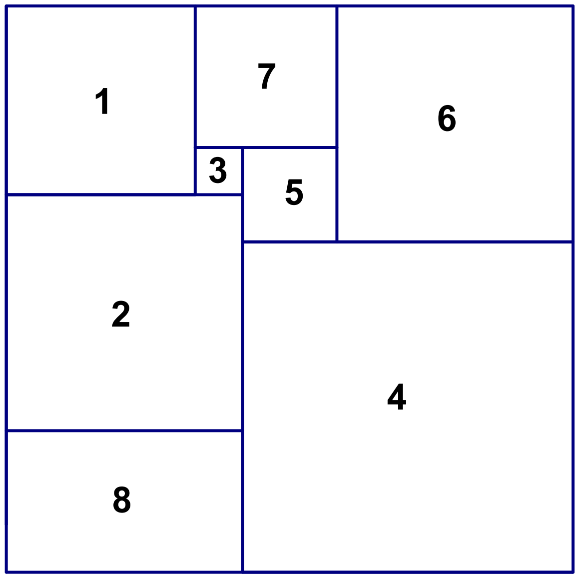
15. In the circle below, $m\angle S = 123°$ and $m\angle DNU = 74°$, find $m\angle TDU$.



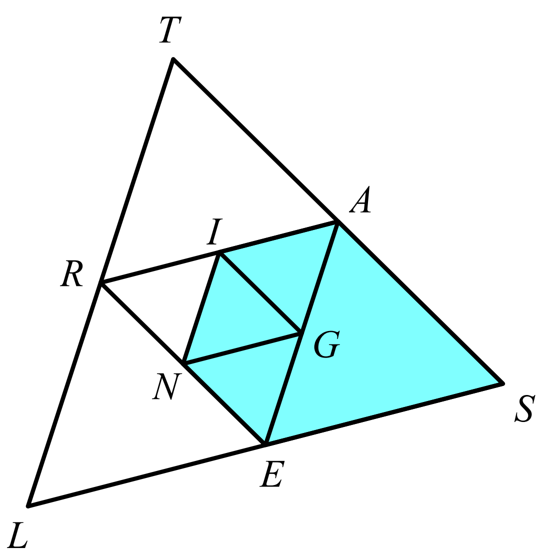
16. In the diagram below, $SN = 8$, $NO = 6$, $WE = 5$, $\angle CEW \cong \angle D$, and $\overline{SO}$ is tangent to circle C. Find CN.



17. The diagram below consists of 8 nonoverlapping polygons. Polygons 1-7 are squares, and the area of Polygon 5 is four times the area of Polygon 3. If the area of Polygon 7 is 36, find the perimeter of Polygon 8.

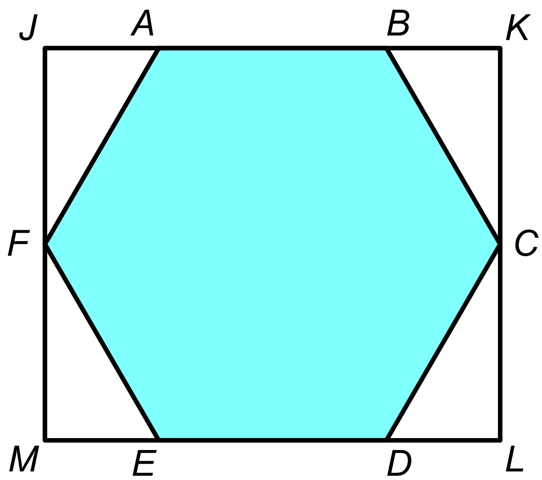


18. In the diagram below, points R, A, and E are midpoints of the sides of triangle TLS. Points I, N, and G are midpoints of the sides of triangle RAE. If $RL = 6$, $TS = 10$, and $LS = 8$, find the perimeter of the shaded region.

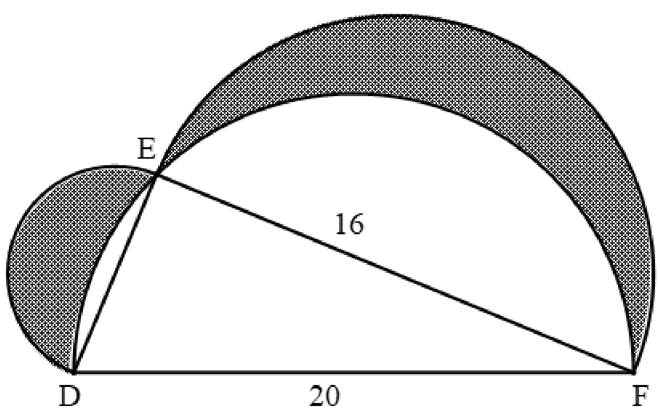


19. A unique dartboard is shown below. If a dart is thrown and is equally likely to land anywhere on the dartboard, what is the probability that it lands within the shaded region?

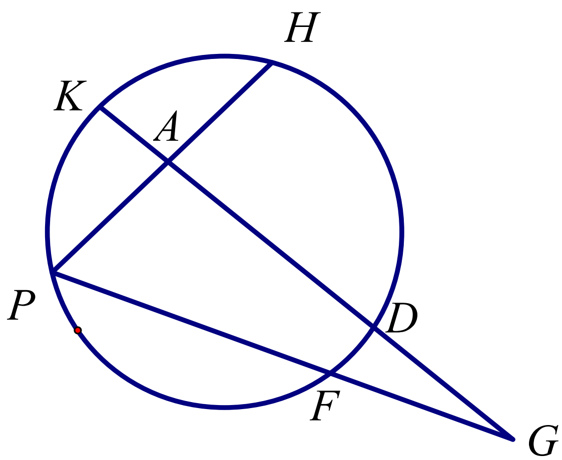
Hexagon side length: 10 cm



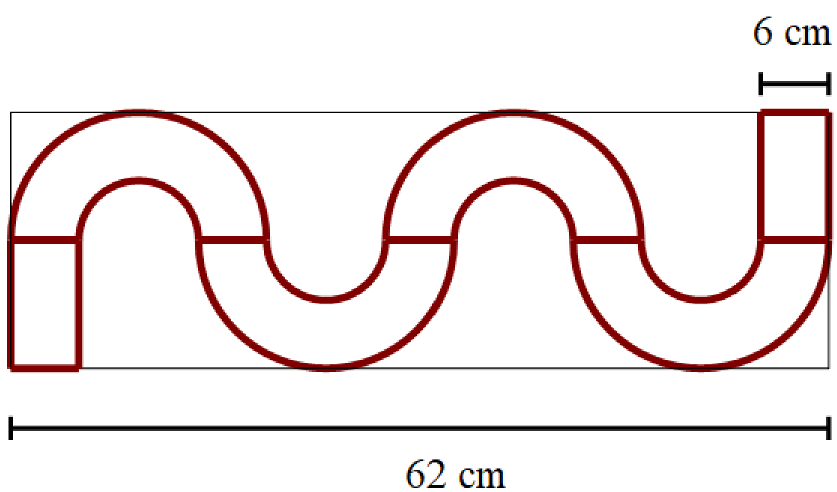
20. Consider the region below formed by three semicircles with diameters $\overline{DE}$, $\overline{EF}$, and $\overline{DF}$, where point E lies on the semicircle defined by diameter $\overline{DF}$. Find the area of the shaded region.



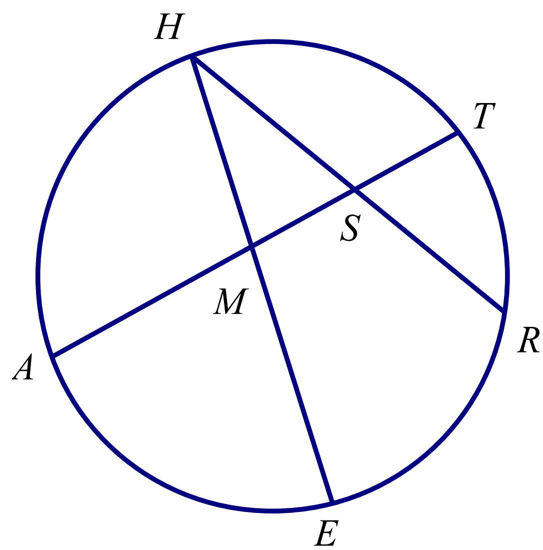
21. In the circle below, $m\angle HAD = 83°$, $m\,\widehat{HD} = 107°$, and $m\,\widehat{DF} = 20°$. Find $m\angle G$.



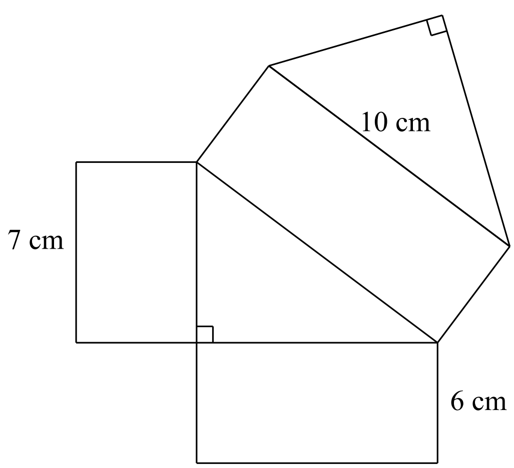
22. Silas is playing with his racetrack pieces, which snap together. He takes out two identical rectangular pieces and four identical curved pieces and arranges them on a rectangular mat, as shown below. The mat is 62 cm long, the outer and inner curves are semicircles, and the track is 6 cm wide at every point. Find the area of Silas' racetrack, in square centimeters.



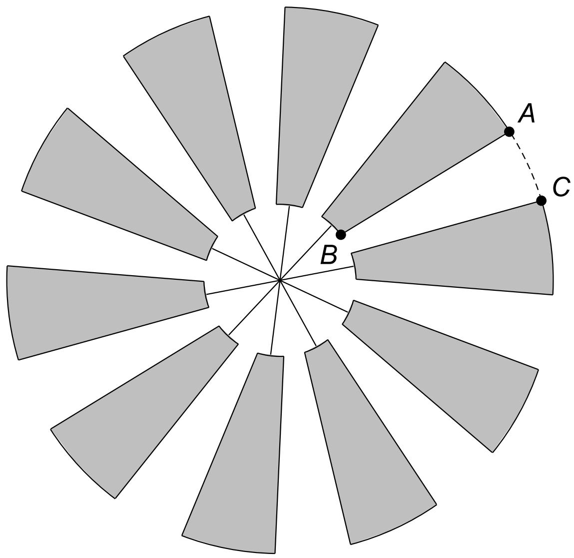
23. In the circle below, $HM = 10$, $HR = 14$, $TS = 4$, $HS = 8$, and $MA = 7$. Find $MS + EM$.



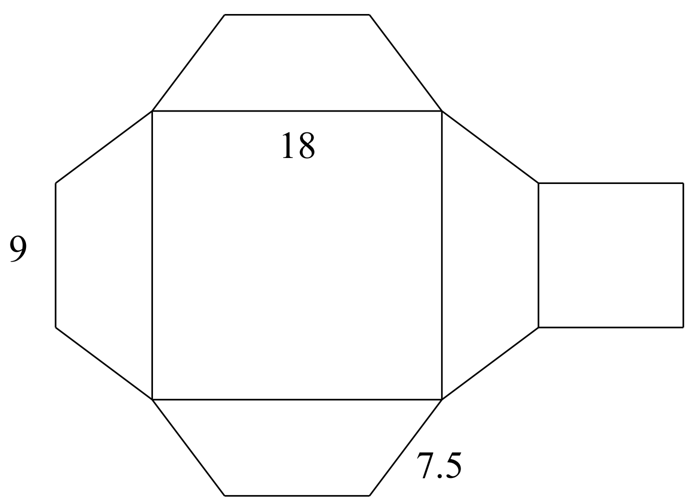
24. The net below is comprised of three rectangles and two congruent right triangles. Find the volume of the solid formed by this net.



25. A windmill-shaped design is shown below, where $AB = 8$ cm, $\widehat{AC}$ has degree measure 21°, and the arclength of $\widehat{AC}$ is $\frac{7\pi}{5}$ cm. Find the area of the shaded region in square centimeters.

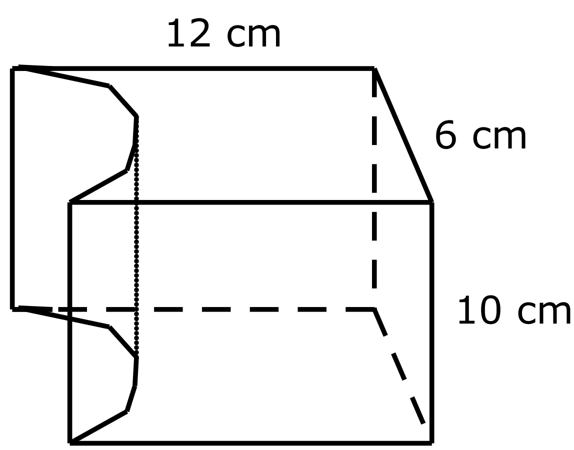


26. The net below is comprised of a square of side length 18 cm, surrounded by four congruent isosceles trapezoids with legs measuring 7.5 cm. One of the trapezoids shares a side with a square of side length 9 cm. Find the volume of the solid formed by the net.

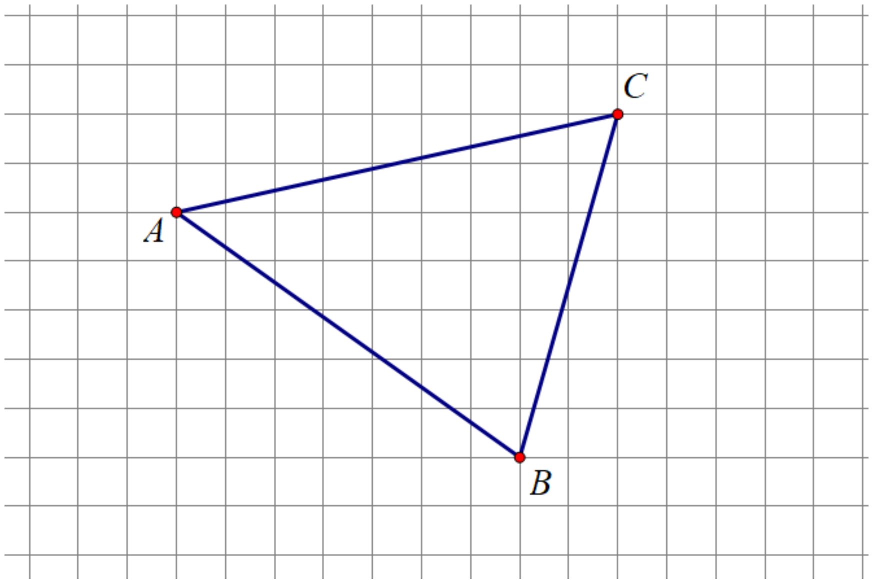


27. Regular hexagon BRIGHT with side length 8 is rotated about diagonal $\overline{BG}$, tracing out a three dimensional solid. Find the surface area of the solid formed.

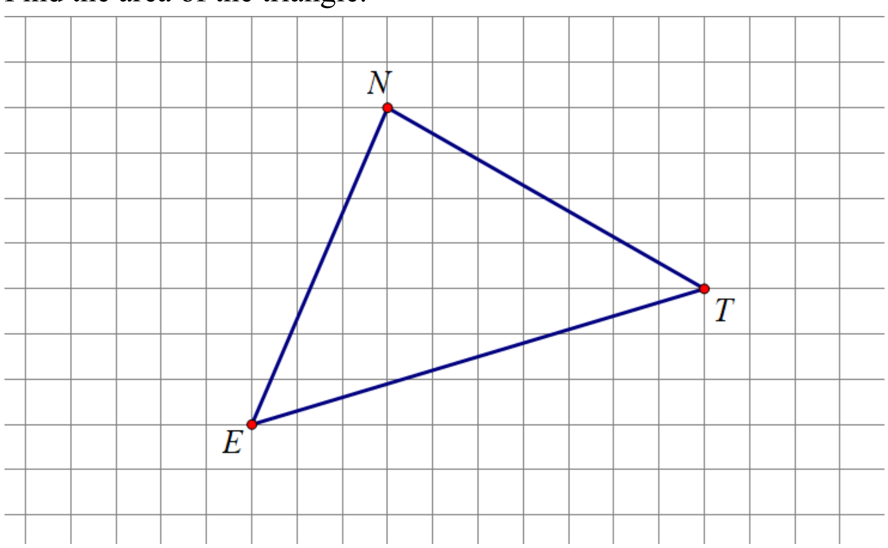
28. The figure below represents a right rectangular prism with half of a cylinder removed. (Please overlook the jagged appearance of the semi-cylindrical bases; they should be drawn as smooth curves.) Find the total surface area of the figure.



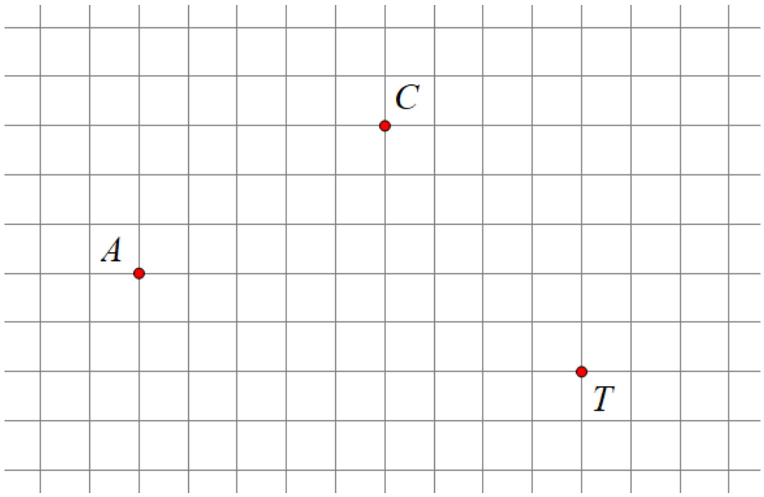
29. A triangle is shown below with vertices $A(-5,3)$, B, and C.
Find the length of median $\overline{CD}$.



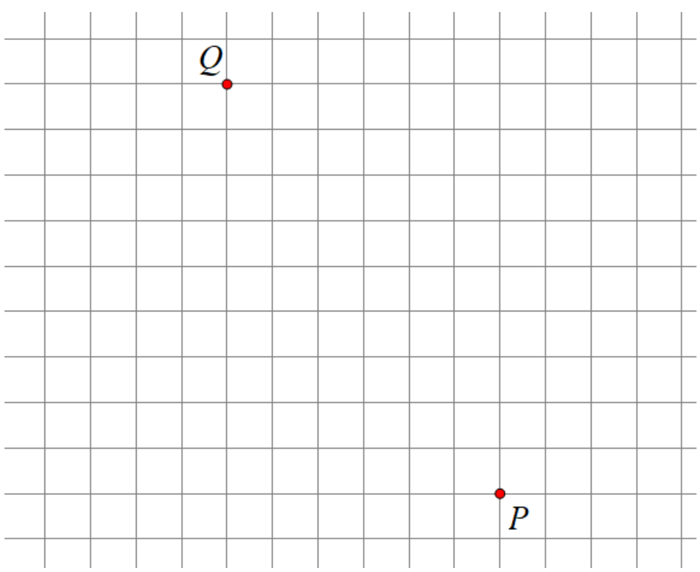
30. A triangle is shown below with vertices E, N, and $T(5,1)$.
Find the area of the triangle.



31. Given points $C(1,6)$, A, and T, find the equation of the line $y = mx + b$ that passes through A and is perpendicular to $\overleftrightarrow{CT}$.
Then in the answer blank, type the value of $2m + b$.



32. Points $P(4, -2)$ and Q represent the diameter of a circle with center (h, k) and radius r. Find $h + k + r$.



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