Two disks of radius 3 are drawn so that each disk's circumference passes through the center of the other disk. What is the circumference of the region in which they overlap, in terms of pi?

In simplest radical form, what is the sum of the distances from one vertex of a square with sides of length two to the midpoints of each of the sides of the square?

Carl has a rectangle whose side lengths are positive integers. This rectangle has the property that when he increases the width by 1 unit and decreases the length by 1 unit, the area increases by x square units. What is the smallest possible positive value of x?

A point (a, b) in the plane is called sparkling if it also lies on the line $ax + by = 1$. Find the maximum possible distance between two sparkling points.

What is the degree measure of an angle whose supplement is three times as large as its complement?

What is the length of the shortest side of $\triangle$ ABC whose perimeter is 64 units, if the ratio AB:BC is 4:3 and AC is 20 less than the sum of the lengths of sides AB and BC?

Triangle ABC has vertices $A(3, 2), B(-2, 1)$ and $C(6, -5)$. What is the equation of the line containing the altitude from vertex A to side BC?

For a geometry problem, Tina wants to draw an acute triangle whose angles each measure a multiple of 10°. She doesn't want her triangle to have any special properties, so none of the angles can measure 30° or 60°, and the triangle should definitely not be isosceles.

How many different triangles can Tina draw? (Similar triangles are considered the same.)

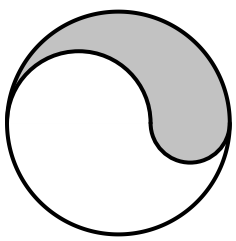
Opposite sides of a regular hexagon are 12 inches apart. What is the length of each side, in inches, expressed in simplest radical form?

Let $ABCD$ be an isosceles trapezoid with $AD = BC = 15$ such that the distance between its bases AB and CD is 7. Suppose further that the circles with diameters $\overline{AD}$ and $\overline{BC}$ are tangent to each other. What is the area of the trapezoid?

A right-circular cylinder has volume 300π and height 12. What is the distance between the center of one base and the edge of the other base?

Given $\triangle ABC$, where A is at $(0, 0)$, B is at $(20, 0)$, and C is on the positive y-axis. Cone M is formed when $\triangle ABC$ is rotated about the x-axis, and cone N is formed when $\triangle ABC$ is rotated about the y-axis. If the volume of cone M minus the volume of cone N is 140π, find the length of $\overline{BC}$.

The diagram below shows a shaded region bounded by a semicircular arc of a large circle and two smaller semicircular arcs. The smallest semicircle has radius 8, and the shaded region has area 180π. Find the diameter of the large circle.

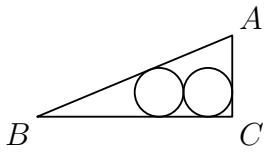


On side AE of regular pentagon ABCDE there is an equilateral triangle AEF, and on side AB of the pentagon there is a square ABHG, both figures lying entirely outside of the pentagon. Find the degree measure of angle AFG.

Two convex polygons have a total of 33 sides and 243 diagonals. Find the number of diagonals in the polygon with the greater number of sides.

A right circular cone has a height equal to three times its base radius and has volume 1. The cone is inscribed inside a sphere as shown. The volume of the sphere is $\frac{m}{n}$, where m and n are relatively prime positive integers. Find $m+n$.

Two circles of equal radius can tightly fit inside right triangle ABC, which has $AB = 13$, $BC = 12$, and $CA = 5$, in the position illustrated below. Determine the common radius of the circles.

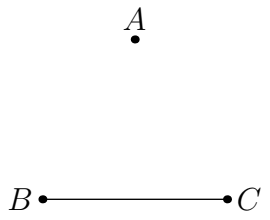


Square $ABCD$ has side length 68. Let E be the midpoint of segment $\overline{CD}$, and let F be the point on segment $\overline{AB}$ a distance 17 from point A. Point G is on segment $\overline{EF}$ so that $\overline{EF}$ is perpendicular to segment $\overline{GD}$. What is the length of segment $\overline{BG}$ in simplest radical form.

Chords AB and CD of a given circle are perpendicular to each other and intersect at a right angle. Given that $BE = 16, DE = 4$, and $AD = 5$, find CE.

Suppose ABC is a scalene right triangle, and P is the point on hypotenuse $\overline{AC}$ such that $\angle ABP = 45°$. Given that $AP = 1$ and $CP = 2$, compute the area of ABC as a common fraction.

In the figure below, points A, B, and C are distance 6 from each other. Say that a point X is reachable if there is a path (not necessarily straight) connecting A and X of length at most 8 that does not intersect the interior of $\overline{BC}$. (Both X and the path must lie on the plane containing A, B, and C.) Let R be the set of reachable points. What is the area of R, in simplest radical form in terms of pi?



In $\triangle ABC$ points D, E, and F lie on side BC such that AD is an angle bisector of $\angle BAC$, AE is a median, and AF is an altitude. Given that $AB = 154$ and $AC = 128$, and $9 \cdot DE = EF$, find the side length BC.

A rectangle has side lengths 6 and 8. There are relatively prime positive integers m and n so that $\frac{m}{n}$ is the probability that a point randomly selected from the inside of the rectangle is closer to a side of the rectangle than to either diagonal of the rectangle. Find $m+n$.