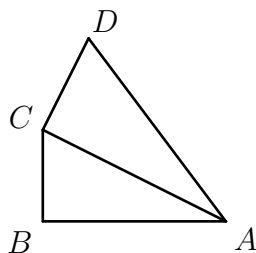
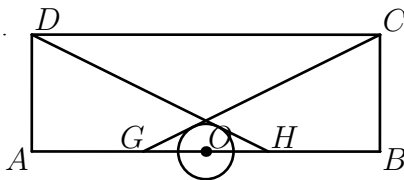


1. What is the area of the largest circle that can be enclosed by a square with side length 2?
2. Compute the maximum possible area of a right triangle with hypotenuse 16.
3. Two circles have radius 1 and each passes through the center of the other. Find the area of their intersection.
4. (AMC 10) Triangles ABC and ADC are isosceles with $AB = BC$ and $AD = DC$. Point D is inside triangle ABC , angle ABC measures 40 degrees, and angle ADC measures 140 degrees. What is the degree measure of angle BAD ?
5. In the following diagram, triangles ABC and ACD are similar triangles, with right angles at B and C , respectively. Given that $BC = 2$ and $AB = 4$, find BD .

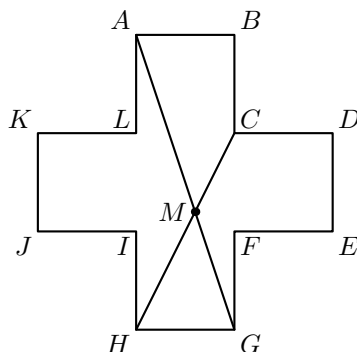


6. In the following diagram, $AD = 1$ and $AB = 3$. Point O is the midpoint of AB and a circle centered at O has radius r . Segments CG and DH are tangents to the circle such that $AG = GH = HB = 1$. Find r .

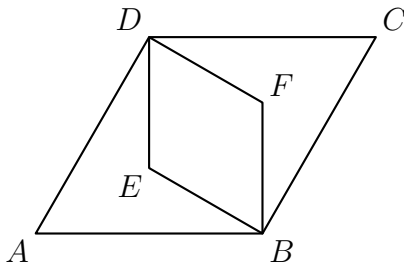


7. Two unit circles, C_1 and C_2 , have centers O_1 and O_2 , respectively, and intersect at points P and Q . Lines O_1P and O_1Q intersect circle C_2 at points A and B such that AB is a diameter. Find O_1O_2 .
8. (MATHCOUNTS) If x and y are integers such that $(x - 3)^2 + (y + 4)^2 = 25$, what is the greatest possible value of $x^2 + y^2$?
9. Rectangle $ABCD$ has $AB = 3$ and $BC = 4$. Compute the distance between the incenters of triangles ABD and BCD .
10. (AMC 10) In rectangle $ABCD$, $AB = 6$ and $BC = 3$. Point E is chosen on CD such that AE bisects angle BED . Find the measure of angle BEC .
11. (AMC 10) A cylindrical water tank with radius 4 meters and length 8 meters lies horizontally on the ground. The tank is filled with tears until the water level is 2 meters above the ground. What is the volume of the water inside the tank?
12. Name one characteristic of Baroque Art.

13. (AMC 10) Consider the 12-sided polygon $ABCDEFGHIJKL$, as shown. Each of its sides has length 4, and each two consecutive sides form a right angle. Suppose that \overline{AG} and \overline{CH} meet at M . What is the area of quadrilateral $ABCM$?

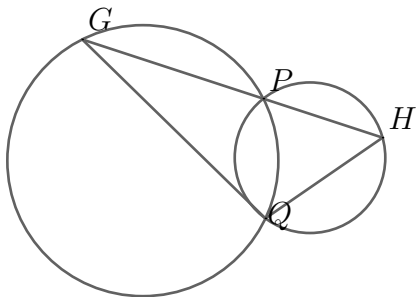


14. (AMC 10) Rhombus $ABCD$ is similar to rhombus $BFDE$. The area of rhombus $ABCD$ is 24 and $\angle BAD = 60^\circ$. What is the area of rhombus $BFDE$?



15. Two unit circles each pass through the other's center. Let the union of the regions of space they occupy be S . What is the area of the largest rectangle that can be enclosed in S ?
16. Circles C_1 and C_2 are in the first quadrant. C_1 has radius 3 and is tangent to the y axis and the line $y = kx$. C_2 has radius 2 and is tangent to the x axis and the line $y = kx$. Given that C_1 and C_2 are externally tangent, find k .
17. (ARML) Let $ABCD$ be a rectangle, and let P and Q be points such that CDP and BCQ are equilateral triangles on the exterior of rectangle $ABCD$ (they don't overlap). Given that the area of triangle APQ is 20 and the area of rectangle $ABCD$ is 10, compute AC^2 .
18. Reals numbers x and y satisfy $(x - 3)^2 + (y - 3)^2 = 6$. Compute the maximum value of $\frac{y}{x}$.
19. Isosceles triangle ABC has $AB = AC$ and circumcenter O . The circle with diameter AO intersects BC at P and Q , with P to the left of Q , such that $BP = PQ = QC$. Compute $\frac{AB}{BC}$.
20. (AIME) Two real numbers a and b are chosen independently and uniformly at random from the interval $(0, 75)$. Let O and P be two points on the plane with $OP = 200$. Let Q and R be on the same side of line OP such that the degree measures of $\angle POQ$ and $\angle POR$ are a and b respectively, and $\angle OQP$ and $\angle ORP$ are both right angles. The probability that $QR \leq 100$ is equal to $\frac{m}{n}$, where m and n are relatively prime positive integers. Find $m + n$.

21. In the following diagram, the two circles intersect at P and Q with $GQ = 10$ and $QH = 5$. If the radius of the larger circle is 6, find the radius of the smaller circle.



22. Let AB be a diameter of circle C . Point P is on circle C such that circle O_1 passes through A and P , circle O_2 passes through B and P , and circles O_1 and O_2 are tangent. Given that O_1 has a radius of 9 and O_2 has a radius of 4, compute the radius of circle C .
23. (AIME) In $\triangle ABC$ let I be the center of the inscribed circle, and let the bisector of $\angle ACB$ intersect \overline{AB} at L . The line through C and L intersects the circumscribed circle of $\triangle ABC$ at the two points C and D . If $LI = 2$ and $LD = 3$, then $IC = \frac{p}{q}$, where p and q are relatively prime positive integers. Find $p + q$.
24. (ARML) In triangle ABC , C is a right angle and $BC = 17$. Point E lies on side BC such that $\angle CAE = \angle EAB$. The circumcircle of triangle ABE passes through a point F on side AC . Given that $CF = 3$, compute AB .
25. (PUMaC) How many ordered pairs of real numbers (x, y) are there such that $x^2 + y^2 = 200$ and

$$\sqrt{(x-5)^2 + (y-5)^2} + \sqrt{(x+5)^2 + (y+5)^2}$$

is an integer?

1. π
2. 64
3. $\frac{2\pi}{3} - \frac{\sqrt{3}}{2}$
4. 50
5. $\sqrt{17}$
6. $\frac{\sqrt{5}}{10}$
7. $\sqrt{3}$
8. 100
9. $\sqrt{5}$
10. 30
11. $\frac{128\pi}{3} - 32\sqrt{3}$
12. One of the following: emotionalism, illusionism, splendor, light and shade, movement, religious fervor, domestic intimacy. Tenebrism, while not accurate, was accepted.
13. $\frac{88}{5}$
14. 8
15. $2\sqrt{3}$
16. $\frac{3}{4}$
17. $\frac{50\sqrt{3}}{3}$
18. $3 + 2\sqrt{2}$
19. $\frac{2}{3}$
20. 41
21. 3
22. 6
23. 13
24. $\frac{149}{3}$
25. 12