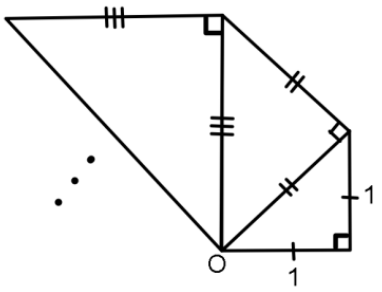
1. If the pattern continues, what will the sum of the areas be for all triangles needed to make one complete revolution around point O? (Keep going around until the hypotenuse of a triangle contains the entire leg of a previously drawn triangle).



A. $\frac{255}{2}$ B. $\frac{257}{2}$ C. $\frac{127}{2}$ D. $\frac{129}{2}$ E. NOTA

2. How many non-congruent right triangles exist with positive integer side lengths and a perimeter less than or equal to 70?

A. 7 B. 8 C. 9 D. 10 E. NOTA

3. Bob leaves on a flight out of Denver. After traveling 23 miles due east and 36 miles due north, the pilot then flies 100 miles due west, then 300 miles due south. How many miles is the plane from the point where it took off? (Round to the nearest integer.)

A. 273 B. 274 C. 275 D. 276 E. NOTA

4. Two perpendicular lines intersect at the point (3,6). If one line has a y-intercept of -3, what is the distance between the y-intercepts of the two lines?

A. 7 B. 8 C. 9 D. 10 E. NOTA

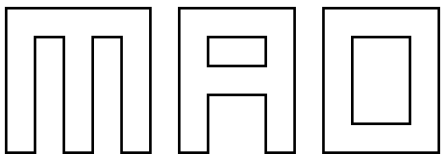
5. Kome is holding a spherical orange. He then cuts it in half, and one of the hemispheres is given away. By what percentage has the fruit Kome is holding had its surface area decreased (round to the nearest whole percent)?

A. 25% B. 33% C. 41% D. 50% E. NOTA

6. What is the absolute value of the difference between the measure of the complement of a 42° angle and the measure of the supplement of a 42° angle?

A. 48° B. 90° C. 132° D. 138° E. NOTA

7. Find the area of the Mu Alpha Theta (MAO) sign below, given that all letters are 10 feet tall, the M is 10 feet wide, the A and O are 8 feet wide, and all of the lettered part is made of up rectangles that are 2 feet wide.



A. 172 B. 180 C. 188 D. 196 E. NOTA

8. There are 48 possible paths that lead from point A through point C to point E. The number of paths from C to E is 4 less than twice as many paths from A to C. How many more paths are there from C to E than from A to C?

A. 2 B. 4 C. 6 D. 8 E. NOTA

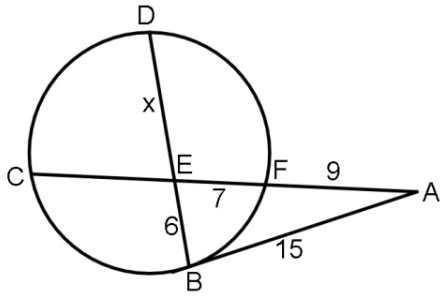
9. How many lattice points satisfy the inequality $x^2 + y^2 \leq 25$?

A. 80 B. 81 C. 72 D. 73 E. NOTA

10. The circumference and the area of a circle are numerically equal (and are both positive). What is the length of an arc in this circle with measure 72°?

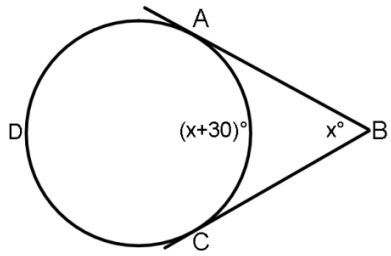
A. 2 B. 2π C. $\frac{4\pi}{5}$ D. $\frac{8\pi}{5}$ E. NOTA

11. Find the value of x in the following diagram. ($\overline{AB}$ is a tangent to the circle.)



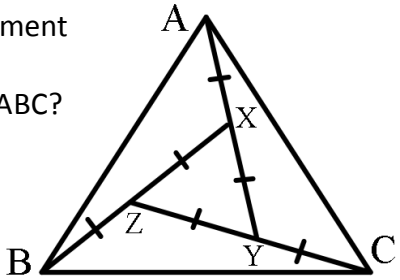
A. 11 B. 9 C. $\frac{17}{2}$ D. $\frac{21}{2}$ E. NOTA

12. Given that $\overline{BC}$ and $\overline{BA}$ are tangent to the circle, find the measure of arc ADC (answers are in degrees).



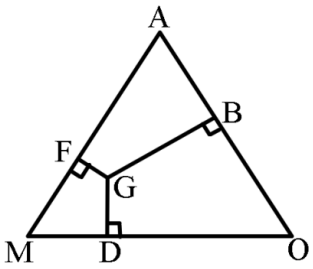
A. 75 B. 195 C. 235 D. 255 E NOTA

13. Given equilateral ΔABC, as well as the six segment marked congruent, what is the ratio of the area enclosed by ΔXYZ to that enclosed by ΔABC?



A. 1:7 B. 1:6 C. 1:5 D. 2:9 E. NOTA

14. Find the area of equilateral ΔMAO, given that DG = 3, FG = 2, and BG = 4.



A. $9\sqrt{3}$ B. $27\sqrt{3}$ C. $18\sqrt{3}$ D. $36\sqrt{3}$ E. NOTA

15. Consider a point P inside a rectangle MATH. If AP = 3, MP = 2, and HP = 8, then what is TP?

A. $\sqrt{69}$ B. $\sqrt{65}$ C. 7 D. 9 E. NOTA

16. If 3 circles of radius 6 are in a plane such that each circle passes through the centers of the other 2 circles, then what is the area of the "overlapping" region that is a part of all 3 of the circles?

A. $18(\pi - \sqrt{3})$ B. $9(2\pi - \sqrt{3})$ C. $9\pi + \sqrt{3}$ D. $18\pi - 27\sqrt{3}$
E. NOTA

17. The exterior angles of a pentagon form an arithmetic progression with a common difference of $\frac{9}{2}$ degrees. What is the sum of the measures of the largest and smallest **interior** angles, in degrees?

A. 225 B. 216 C. 207 D. 198 E. NOTA

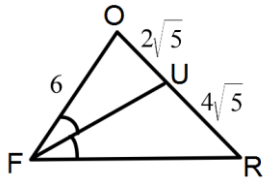
18. What is the smallest possible perimeter of a triangle with three distinct integers as side lengths?

A. 5 B. 6 C. 7 D. 8 E. NOTA

19. Circle P has a radius of 2, and is centered at the point (-2, 5). Point R is at (2, 10). Of all the points on circle P, A is the closest to R, and B is the furthest from R. Evaluate AR + BR.

A. $2\sqrt{41}$ B.10 C. $2\sqrt{37}$ D. 12 E. NOTA

20. Given the triangle drawn, and angle bisector ($\overline{UF}$), find the length of the median drawn to side $\overline{OR}$.



A. 6 B. 9 C. $2\sqrt{5}$ D. $3\sqrt{5}$ E. NOTA

21. A cone is inscribed in a sphere of radius 12 so that the slant height of the cone is exactly twice the length of the radius of the cone. What is the largest possible value for the volume of such a cone?

A. 648π B. 576π C. 504π D. 432π E. NOTA

22. A regular hexagon and an equilateral triangle have equal perimeters. What is the ratio of the area enclosed by the hexagon to the area enclosed by the triangle?

A. 2:1 B. 5:2 C. 3:2 D. 4:3 E. NOTA

23. Square ABCD has enclosed area 128. Now equilateral triangle BDE is drawn in the same plane as the square. What is the distance between the two possible locations of point E?

A. 16 B. 8 C. $16\sqrt{3}$ D. $8\sqrt{3}$ E. NOTA

For questions 24 and 25, consider the points A(5, 8) and B(3, -2), as well as *line a*, which has equation x = -1.

24. What is the length of the shortest route from A to B if you must touch a point on *line a* somewhere along this route?

A. $\sqrt{61} + \sqrt{41}$ B. $10 + 2\sqrt{5}$ C. $\sqrt{89} + \sqrt{13}$ D. $10\sqrt{2}$
E. NOTA

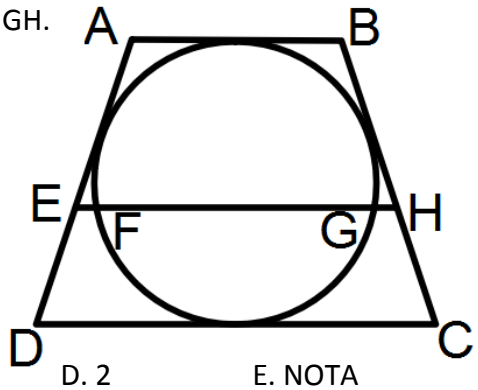
25. Now consider that *line a* is a mirror, and consider yourself standing on point A. Let point C be the point on *line a* where the reflection of point B would appear to you. What is the y-coordinate of point B?

A. 0 B. 1 C. 2 D. 3 E. NOTA

26. Archimedes and Pythagoras are playing an unlikely game of "What's the Point?" In this game, Archimedes thinks of a random point (in space) that is either: (a)inside a sphere, (b)on the sphere, (c)outside the sphere but inside the cylinder circumscribed about this sphere, or (d)on the surface of this same cylinder. Pythagoras then guesses which of these regions contains Archimedes's point. If Pythagoras guesses that it is outside the sphere but inside the circumscribed cylinder, what is the probability he will be correct?

A. $\frac{2}{3}$ B. $\frac{1}{3}$ C. $\frac{1}{2}$ D. $\frac{1}{6}$ E. NOTA

27. Trapezoid ABCD has an inscribed circle as shown. $\overline{EH}$ is the median of the trapezoid, and points F and G are on the inscribed circle, and are inside the trapezoid. If EH=10 and the enclosed area of the trapezoid is 70, find the value of EF + GH.



A. $10-4\sqrt{3}$ B. $5-2\sqrt{3}$ C. 3 D. 2 E. NOTA

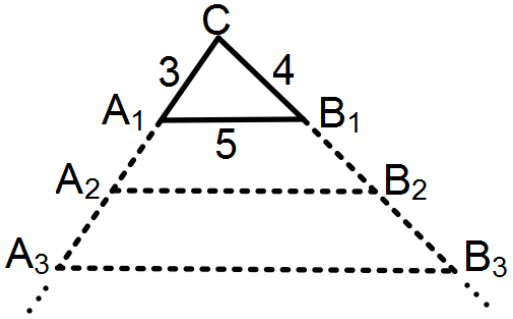
28. Consider circle C, with congruent chords $\overline{AB}$ and $\overline{AD}$. The distance from point *A* to chord $\overline{BD}$ is longer than the radius of circle C. If m∠BCD = 120°, and AD = 6, then what is the area enclosed by quadrilateral ABCD?

A. $9\sqrt{3}$ B. $3\sqrt{3}$ C. $12\sqrt{3}$ D. $6\sqrt{3}$ E. NOTA

29. A regular *n*-gon (that actually has diagonals) is such that all of its diagonals are congruent. What is the sum of all possible values of *n*?

A. 7 B. 9 C. 15 D. 22 E. NOTA

30. Given ΔAB_1C_1, let the sides $\overline{CA_1}$ and $\overline{CB_1}$ be extended so that $CA_n = n(CA_1)$ and $CB_n = n(CB_1)$. What is the area of the quadrilateral $A_{100}A_{101}B_{101}B_{100}$?



A. 1206 B. 1005 C. 804 D. 603 E. NOTA