Mu Alpha Theta 2004 National Convention
Circles Test

For all questions, the answer "E. NOTA" means none of the above answers is correct

1. A square is inscribed in a semicircle with radius r. The length of a side of the square is $r\sqrt{k}$, where k =?

   A) $\frac{2}{3}$ B) $\frac{3}{4}$ C) $\frac{4}{5}$ D) $\frac{3}{2}$ E) NOTA

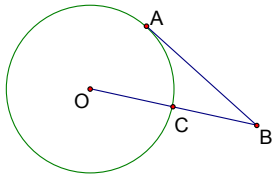
2. What is the equation of the line that is tangent to the circle $(x+4)^2+(y-7)^2=25$ at the point (0,4)?

   A) 4x + 3y = 12 B) 4x – 3y = -12 C) 3x – 4y = -12 D) 3x + 4y = 12 E) NOTA

3. Points A, B, and C lie on a circle in that order so that the measure of arc AB = 110 and the measure of arc BC = 120. What is the measure in degrees of $\angle ABC$?

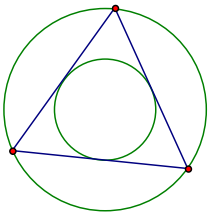
   A) 55 B) 60 C) 65 D) 90 E) NOTA

4. In the figure, segment AB is tangent of circle O at A. If AB = 20 and BC = 12, find the length of OC.



   A) $\frac{64}{3}$ B) $\frac{5}{3}$ C) 55.25 D) $\frac{32}{3}$ E) NOTA

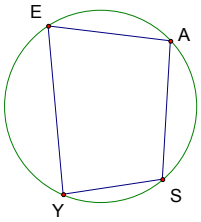
5. The radius of a circle that circumscribes an equilateral triangle is 6. Find the radius of the circle, which is inscribed in the triangle.



   A) $2\sqrt{3}$ B) 3 C) 4

   D) $3\sqrt{3}$ E) NOTA

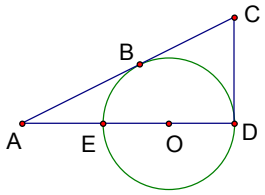
6. Quadrilateral EASY is inscribed in circle O. If $\angle E = 75$ and the measure of arc EA is 125, then what is the measure of arc YE?



A) 85 B) 150 C) 200

D) 225 E) NOTA

7. In the circle O, B and D are points of tangency, $AD \perp CD$, and ED is a diameter. AB = $4\sqrt{3}$ and radius OB = 4, find the measure of arc BDE.



A) 60 B) 330 C) 30

D) 300 E) NOTA

8. A horizontal drainpipe contains water at a depth of 18 at its center. The width of the water at its surface is 48. Find the radius of the pipe.

A) 24 B) $18\sqrt{3}$ C) 25 D) $48-18\sqrt{3}$ E) NOTA

9. A belt connects two circular pulleys. The radii of the pulleys are 6 and 30 and the distance between the centers is 48. Find the total length of the belt around the pulleys if there is no slack.

A) $48\sqrt{3}$ B) $324\pi+48\sqrt{3}$ C) $612\pi+48\sqrt{3}$ D) $48\sqrt{3}+44\pi$ E) NOTA

10. Find the area of the circle whose equation is $4x^2+4y^2+24x-20y-3=0$.

A) 8π B) 12π C) 16π D) 18.25π E) NOTA

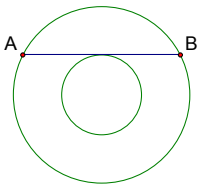
11. Given two chords of a circle AB and CD intersect at point X, with arc AD = 110 and arc BC = 85, find the measure of $\angle AXC$.

A) 55 B) 82.5 C) 90 D) 97.5 E) NOTA

12. Find the area of the annulus if AB = 20 and is tangent to the smaller circle.

A) 20π B) 100π C) 200π

D) 400π E) NOTA



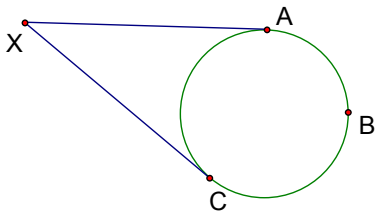
13. A 3-4-5 triangle is inscribed in a circle. What is the circumference of the circle?

A) $\frac{5\pi}{2}$ B) 5π C) $\frac{25\pi}{4}$ D) 25π E) NOTA

14. A circle with radius 6 in inscribed in a rhombus with side 13. What is the area of the region interior to the rhombus but exterior to the circle?

A) $78-36\pi$ B) $120-36\pi$ C) $156-36\pi$ D) $169-36\pi$ E) NOTA

15. Segments AX and XC are tangent to the circle. The measure of arc ABC is four times the measure of arc AC. Find the measure of $\angle X$?



A) 36 B) 108 C) 144 D) 162 E) NOTA

16. Find the length of a common internal tangent segment of 2 circles with radii 4 and 12, whose centers are 20 units apart.

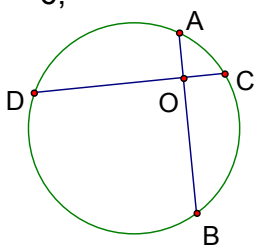
A) $4\sqrt{2}$ B) $4\sqrt{3}$ C) 4 D) 6 E) NOTA

17. The endpoints of the diameter of a circle are (6,2) and (12,14). What is the equation of the circle?

A) $(x+9)^2+(y+12)^2=9$ B) $(x-9)^2+(y-8)^2=9$

C) $(x+9)^2+(y+12)^2=45$ D) $(x-9)^2+(y-8)^2=45$ E) NOTA

18. Chord AB is perpendicular to chord DC. AO = 2, OC = 4, DO = 6, and BO = 12. What is the radius of the circle?



A) 6 B) $5\sqrt{2}$ C) $\sqrt{61}$
D) 8 E) NOTA

19. A regular hexagon is inscribed in a circle and a second regular hexagon is circumscribed about the circle. If the sum of the areas of the two hexagons is $136\sqrt{3}$, what is the radius of the circle?

A) 4 B) $4\sqrt{3}$ C) 6 D) $6\sqrt{3}$ E) NOTA

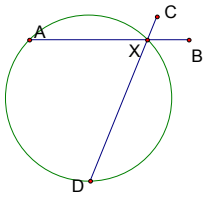
20. In a coordinate plane, a circle with center (4,3) passes through the point (2, -3). What is the circumference of the circle?

A) $\pi\sqrt{10}$ B) $2\pi\sqrt{10}$ C) $4\pi\sqrt{10}$ D) 6π E) NOTA

21. At 1:24 what is the angle formed (in degrees) by the hands of the clock?

A) 98 B) 100 C) 102 D) 108 E) NOTA

22. If segments AB and CD intersect at X, a point on the circle. If arc AX = 110° and arc DX = 85°, find $\angle AXC$.



A) 55° B) 82.5° C) 90°
D) 97.5° E) NOTA

23. Chords AB and CD intersect in a circle at point M. If AB = $\frac{166}{11}$, AM = 11 and CD = 14, find MD.

A) $\frac{45}{14}$ B) 3 or 15 C) –5 or –9 D) 5 or 9 E) NOTA

24. Which of the following quadrilaterals can always contain an inscribed circle?

A) trapezoid B) kite C) rectangle D) parallelogram E) NOTA

25. Two spheres are inscribed in a cylinder. If the spheres combined surface area is 8π, what is the volume of the cylinder?

A) $\frac{\pi}{4}$ B) π C) 4π D) 6π E) NOTA

26. A circle with radius r and a square with perimeter p have equal areas. Find the value of $\frac{p}{r}$.

A) $\frac{4\sqrt{\pi}}{\pi}$ B) $4\sqrt{\pi}$ C) $\frac{\sqrt{\pi}}{8}$ D) $\frac{\pi}{8}$ E) NOTA

27. A circle has its center at (2, -3). The equation of the line tangent to the circle is 4x – 3y = 7. Find the equation of the circle.

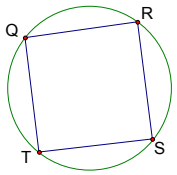
A) $(x-2)^2+(y+3)^2=4$ B) $(x-2)^2+(y+3)^2=2$
C) $(x-2)^2+(y+3)^2=\frac{576}{25}$ D) $(x-2)^2+(y+3)^2=25$ E) NOTA

28. A piece of paper in the shape of a semicircle with radius 8 is folded into a cone with no overlapping. What is the height of the cone?

A) $4\sqrt{2}$ B) $4\sqrt{3}$ C) 4 D) 6 E) NOTA

29. Quadrilateral QRST is inscribed in circle with arc QTS = $x^2 + 2x + 185$, arc QRS = 3x + 91, and arc RS = 5x, find the measure of $\angle QTR$.

A) 30 B) 35 C) 38.5
D) 40.5 E) NOTA



30. Find the area of an trapezoid with legs 13 and bases 8 and 18 that is circumscribed a circle.

A) 180 B) 156 C) 130 D) 108 E) NOTA

TIEBREAKERS

TB1 Find the equation of the circle in the form $x^2 + y^2 + Cx + Dy + E = 0$ (C, D, E $\in Z$) that passes through the points (2, -1), (-3, 0) and (1, 4).

TB2 A circle is constructed with a diameter of 36. The circle is then folded so that the edge of the circle passes through the center of the circle. The chord that is formed is how far from the center of the circle?