For each question, "E) NOTA" indicates that none of the above answers is correct.

1. How many sides does a regular polygon have if one interior angle has the measure of 179°?
   A) 10   B) 90   C) 300   D) 360   E) NOTA

2. How many sides does a convex polygon have if the sum of its interior angles is equal to 10 straight angles?
   A) 12   B) 10   C) 8   D) 20   E) NOTA

3. Three exterior angles of a convex pentagon have measures 50°, 90°, and 100°. If the remaining exterior angles are congruent, what is the measure of one of those two angles?
   A) 100°   B) 150°   C) 60°   D) 130°   E) NOTA

4. The lines containing the sides of a regular pentagon intersect to form a 5-pointed star. What is the sum of the acute interior angles of the star?
   A) 180°   B) 540°   C) 72°   D) 108°   E) NOTA

5. The midpoint of side #1 of a triangle is equidistant from all three vertices of the triangle. If sides #2 and #3 of the triangle have lengths 5 and 6, how far is the midpoint of side #1 from the opposite vertex?
   A) 5.5   B) $\sqrt{15}$ C) $\sqrt{61}$ D) 61   E) NOTA

6. Two parallelograms are congruent when:
   A) corresponding sides are congruent
   B) two sides and the included angle of the first are congruent to two sides and the included angle of the second
   C) their diagonals are perpendicular
   D) their corresponding angles are congruent
   E) NOTA

7. Two circles are externally tangent to each other and two common external tangents are drawn. If the radii of the two circles are 7 and 5 how long is the common external tangent segment between the two tangency points?
   A) $2\sqrt{37}$ B) $2\sqrt{35}$ C) $\sqrt{74}$ D) 61   E) NOTA

8. A circle is inscribed in a triangle whose sides are 41, 9 and 40. What is the circumference of the circle?
   $A)$ 4π B) 8π C) 16π D) 32π E) NOTA

9. The sides of a polygon are equidistance from the center of a circle, as are the vertices of the polygon. If the perimeter of the polygon is 60 inches and the measure of one exterior angle of the polygon is 120°, what is the shortest distance from the center of the circle to a side of the polygon?

    A) 10 in   B) 20 in   C) $\dfrac{10\sqrt{2}}{2}$ in   D) $\dfrac{10\sqrt{3}}{3}$ in   E) NOTA

10. The radius of a circle is 8 inches. Tangents from an external point P to the circle form an angle whose measure is 60°. How far is the point P from the center of the circle?

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

11. An aeronautical engineer is designing an aircraft wing and wants circular holes cut in some sheet metal parts to reduce weight. One of the holes is to be inscribed in a triangle whose sides are 15 cm, 20 cm, and 25 cm. What radius should the engineer specify for this hole?

    A) 3 cm   B) 4 cm   C) 5 cm   D) 8 cm   E) NOTA

12. Circle O has a 16 inch diameter. Arcs ADB and ACB are distinct semicircles. If AD = BC = 10, how far is $\overline{AD}$ from $\overline{BC}$?

    A) 10 in   B) $\sqrt{39}$ in   C) 12   D) $2\sqrt{39}$ in   E) NOTA

13. In circle O, point M is the midpoint of $\overarc{AB}$. If m $\overarc{AB}$ is 90°, AO = 8 m, Q is on $\overline{BO}$ such that the length of MQ is the distance from point M to $\overline{BO}$, and R is on $\overline{AO}$ such that the length of MR is the distance from point M to $\overline{AO}$, what is the perimeter of OQMR?

    A) 32 m   B) $32\sqrt{2}$ m   C) 16   D) $16\sqrt{2}$ E) NOTA

14. $\overline{OA}$ and $\overline{OB}$ are radii of the same circle. The tangents at point A and point B intersect at point P. If $m\angle AOB = 70°$ then $m\angle APB =$?

    A) 110°   B) 70°   C) 140°   D) 220°   E) NOTA

15. A kite is formed by two 10 inch tangents to circle O and radii of circle O drawn to each point of tangency. The tangents have a common point P (5, 7). If the radii form a 120° central angle and one of them is horizontal, which of the following could be the equation, in point slope form, for the long diagonal of the kite?

    A) y − 7 = 5(x − 5)   B) y - 5 = .5(x - 7)   C) y - 7 = $\sqrt{3}$(x - 5)   D) y - 5 = .75(x - 7)   E) NOTA

16. If 2 parallel chords in the same circle are six inches and eight inches long respectively, are 1 inch apart and are on the same side of the center of the circle, how long is the radius of the circle?

    A) 10 in   B) $\sqrt{37}$ in   C) 5 in   D) $3\sqrt{7}$ in   E) NOTA

17. Acute $\triangle ABC$ is inscribed in a circle. Chord $\overline{AD}$ is perpendicular to $\overline{BC}$ and chord $\overline{BE}$ is perpendicular to $\overline{AC}$.
    If $m\angle C = 40°$ and $m\angle BAD = 10°$, what is the measure of minor $\widehat{EA}$?
    A) 60°   B) 120°   C) 140°   D)160°   E) NOTA

18. Circle A, whose radius is unknown, and Circle B, whose radius is 6 inches, are externally tangent at point Z. The
    common internal tangent to circles A and B is $\overline{XZ}$ and has length 10 inches. Tangents $\overline{XW}$ and $\overline{XY}$ are drawn to
    Circle A and Circle B, respectively. In the pentagon ABYXW, how far is B from the diagonal $\overline{WY}$?
    A) 3 inches   B) $3\sqrt{3}$ inches   C) 1 inch   D) $\sqrt{3}$ inches   E) NOTA

19. A quadrilateral is formed by two chords in a circle with a common endpoint and tangents drawn to the non-common
    endpoints of the chords. If the angle formed by the chords is 60°, what is the measure of the angle formed by the
    tangents?
    A) 30°   B) 60°   C) 120°   D) 240°   E) NOTA

20. A trapezoid is inscribed in a circle. The bases of the trapezoid subtend arcs of 52° and 128° respectively and are on
    opposite sides of the center of the circle. Find the measure of the angle formed by a diagonal and the shorter base
    of the trapezoid.
    A) 180°   B) 45°   C) 90°   D) 135°   E) NOTA

21. Hexagon ABCDEF circumscribes Circle X. If AB = 90, DC = 42, and EF = 88, what is the perimeter of the hexagon?
    A) 660   B) 220   C) 440   D) 140   E) NOTA

22. A parallelogram is circumscribed about a circle. If the longer diagonal of the parallelogram is 18 inches in length and
    the smallest interior angle of the parallelogram has measure 60°, what is the area enclosed by the parallelogram?
    A) $163\sqrt{3}$ B) $81\sqrt{3}$ C) $27\sqrt{3}$ D) $54\sqrt{3}$ E) NOTA

23. Parallelogram ABCD is circumscribed around a circle and is situated so that two of its sides are horizontal. Point A
    with coordinates (3,7) is the upper left vertex of the parallelogram , AB = 5 and D has coordinates (0,y). What is the
    equation of the circle?
    A) $(x - 5)^2 + (y - 3)^2 = 4$ B) $(x - 4)^2 + (y - 5)^2 = 4$
    C) $(x + 3)^2 + (y + 5)^2 = 2$ D) $(x + 5)^2 + (y + 4)^2 = 2$ E) NOTA

24. An isosceles triangle is inscribed in a circle so that a base angle is inscribed in a 210° arc. What is the measure of the
    vertex angle of the triangle?
    A) 105°   B) 30°   C) 75°   D) 150 °   E) NOTA

25. If a quadrilateral is inscribed in a circle and one interior angle of the quadrilateral is 70°, what is the measure of the interior angle opposite the 70° angle?

   A) 70°   B) 20°   C) 110°   D) 140°   E) NOTA

26. What is the area enclosed by a regular hexagon that is inscribed in a circle whose circumference is 50π?

   A) $3750\sqrt{3}$ B) $\dfrac{1275}{2}$ C) 625   D) $\dfrac{1875\sqrt{3}}{2}$ E) NOTA

27. Three congruent circles are externally tangent, each to the other two, so that segments connecting their centers from a triangle whose enclosed area is $4\sqrt{3}$. Find the sum of the areas of the regions inside a circle but outside the triangle.

   A) 10π B) $8\sqrt{3}$ C) $8\pi\sqrt{3}$ D) $4\pi - 4\sqrt{3}$ E) NOTA

28. A square has an enclosed area of 64 square inches. Four congruent circles are drawn each using a different vertex of the square as its center so that each circle is tangent to two of the other circles. Four common external tangents, that do not touch the square, are drawn so that each tangent individually traps area between two circles and a tangent. What is the total trapped area?

   A) $32 - 8\pi$ B) $32 - 32\pi$ C) $128 - 32\pi$ D) $256 - 64\pi$ E) NOTA

29. An equilateral triangle and a regular hexagon are inscribed in the same circle. What is the ratio of the area enclosed by the triangle to the area enclosed by the hexagon?

   A) $1:4$ B) $1:3$ C) $1:2$ D) $1:6$ E) NOTA

30. The sides of a rectangle are in the ratio 5 : 12 and shorter side has a length of 40 cm. A circle circumscribes the rectangle and a regular hexagon circumscribes the circle. Find the ratio of the area inside the hexagon but outside the circle to the area inside the hexagon.

   A) $2704:1$ B) $(1 - 2\pi):1$ C) $(\sqrt{3} - 2\pi):3\sqrt{3}$ D) $(3\sqrt{3} - 2\pi):\sqrt{3}$ E) NOTA