*Select* (E) NOTA *if none of the above answers are correct. Good luck!*

1. Compute the measure, in degrees, of one exterior angle of a convex regular decagon.

   (A) 36°   (B) 72°   (C) 120°   (D) 154°   (E) NOTA

2. Determine the volume of a right square pyramid with a base length of 12 and a slant height of 10.

   (A) 120   (B) 384   (C) 480   (D) 1152   (E) NOTA

3. A rectangle has its length equal to the square of its width. Given that the perimeter of the rectangle is 24, compute the area of the rectangle.

   (A) 12   (B) 16   (C) 24   (D) 27   (E) NOTA

4. Steve is giving Annie a mushroom for her birthday. The mushroom is comprised of a hemisphere of radius 6 on top of a cylinder with radius 3 and a height 5. Compute the volume of the mushroom.

   (A) 144π (B) 160π (C) 189π (D) 333π (E) NOTA

5. An equilateral triangle with side length of 6 is circumscribed about a circle which is circumscribed about a square. Determine the area of the square.

   (A) $2\sqrt{3}$ (B) 3   (C) 6   (D) 12   (E) NOTA

6. Mrs. Funk, ready to head to State, brings along her $5 \times 5 \times 10$ rectangular prism suitcase, and a sword (to keep her students in check) of negligible thickness and width. However, the bus driver will not let her board the bus unless she keeps her sword in the suitcase. Assuming her suitcase is empty, what is the length of the largest sword she can place in the suitcase?

   (A) $5\sqrt{5}$ (B) $5\sqrt{6}$ (C) 5   (D) 10   (E) NOTA

7. A right triangle with legs measuring 6 and 8 is inscribed within a circle. Compute the area of this circle.

   (A) 10π (B) 25π (C) 36π (D) 100π (E) NOTA

8. Determine the number of sides in a regular convex polygon with 170 diagonals.

   (A) 7   (B) 10   (C) 17   (D) 20   (E) NOTA

9. Give the inverse of the converse of the contrapositive of the inverse of the following conditional statement:

   "If my name is Pamela, then I am a ninja."

   (A) "If I am a ninja, then my name is Pamela."
   (B) "If my name is Pamela, then I am a ninja."
   (C) "If my name is not Pamela, then I am not a ninja."
   (D) "If I am not a ninja, then my name is not Pamela."
   (E) NOTA

10. A triangle is drawn with angles measuring 15° and 145°. Choose the choice below which best classifies the triangle.

    (A) Right   (B) Scalene   (C) Isosceles   (D) Equilateral   (E) NOTA

11. Nidhi has a slice of pineapple cheesecake of negligible height in the shape of an acute triangle. Ever the curious student, she decides to find the point on the interior of the triangle which is equidistant from all three vertices. Name this point.

    (A) Centroid   (B) Orthocenter   (C) Incenter   (D) Circumcenter   (E) NOTA

12. One day, Linda goes exploring and finds a flying monkey. She takes the monkey home and leashes him to an upper corner of a barn in the shape of a cube with side length 20. Given that the leash has a length of 12, determine the total volume of space where the monkey can fly (Assume the monkey has negligible volume).

    (A) 1152π (B) 1728π (C) 2016π (D) 2304π (E) NOTA

13. Determine the coordinates of the centroid of the triangle with vertices of $(0,0)$, $(0,4)$, $(2,2)$.

    (A) $\left(\dfrac{2}{3}, \dfrac{2}{3}\right)$ (B) $\left(\dfrac{2}{3}, 2\right)$ (C) $(1,2)$ (D) $(2,6)$ (E) NOTA

14. $\triangle ABC$ is drawn with $\angle CAB = 90°$ as shown below. A circle is drawn with center A such that it passes through vertex B and side $\overline{BC}$ at point D. If $AC = 8$ and circle A has a radius of 6, compute the length of segment BD.
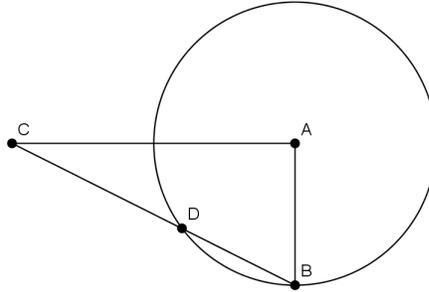
    (A) $\frac{8}{5}$ (B) $\frac{14}{5}$ (C) $\frac{36}{5}$ (D) $\frac{42}{5}$ (E) NOTA

15. For a given triangle, we can form what is called the *medial triangle* by connecting the the midpoints of each side of the former triangle. Determine the area of the medial triangle of a triangle with area of 60.

    (A) 15   (B) 20   (C) 30   (D) Need More Info   (E) NOTA

16. Payal is standing on the roof of a building 100 feet tall while some distance away, Annie is standing on the roof of a building 80 feet tall. A cable runs from the top of Payal's building to the bottom of Annie's building, while another one runs from the top of Annie's building to the bottom of Payal's building. At what height do these cables meet? Assume the buildings are perpendicular to the ground.

    (A) $\frac{18}{800}$ (B) $\frac{400}{9}$ (C) 60   (D) 90   (E) NOTA

17. Compute the third side of a right triangle with two sides of length 5 and 12.

    (A) 11   (B) 12   (C) 13   (D) 17   (E) NOTA

18. Eli is on a tower with a height of 12π and Pratik is standing on the ground at a distance of 5π from the tower. Eli is going to roll a can of soup with a radius of 1 down a plank which connects the top of the tower to Pratik. How many full revolutions does the can of soup make when it travels down the hill?

    (A) 6   (B) $\frac{13}{2}$ (C) 7   (D) 13   (E) NOTA

19. Which of the following is not necessarily true?

    (A) If a polygon is a rhombus, then it is a parallelogram.
    (B) If a rhombus is a square, then it is a rectangle.
    (C) If a quadrilateral is a kite, then it is not a rectangle.
    (D) If a parallelogram has orthogonal diagonals, then it is a rhombus.
    (E) NOTA

20. Two circles are drawn with radii 15 and 4 with centers a length of 14 apart. Determine the measure of the common external tangent of the two circles.

    (A) $5\sqrt{3}$ (B) 14   (C) $5\sqrt{13}$ (D) $\sqrt{371}$ (E) NOTA

21. Chico is standing on the edge of a cylinder with a height of 5 and a radius of $\frac{3}{\pi}$, looking for a chicken he cannot see. Realizing that this is a pointless endeavor, he begins to climb on the lateral surface area of the cylinder to the point directly below him on the bottom of the cylinder. Given that Chico must make two revolutions around the cylinder, compute the length of the shortest path Chico can take.

    (A) $\frac{13}{2}$ (B) 13   (C) 26   (D) $\sqrt{61}$ (E) NOTA

22. A circle with diameter of $6\sqrt{3}$ is inscribed in a hexagon. Compute the area of the region inside the hexagon but outside the circle.

    (A) $27\sqrt{3} - 9\pi$ (B) $54\sqrt{3} - 27\pi$ (C) $108\sqrt{3} - 27\pi$ (D) $108\sqrt{3} - 54\pi$ (E) NOTA

23. A chord of length 18 is drawn in a circle where the shortest distance from the chord to the center of the circle is 7. Compute the area of the circle.

    (A) 81π (B) 100π (C) 130π (D) 150π (E) NOTA

24. Sarah has a Winnie the Pooh shaped balloon that has the same volume as a regular hexahedron with side length of 8. Sadly, balloons do not last forever. Sarah's balloon deflates at a constant rate of 16 cubic units of air per week until her balloon is completely deflated. How many months will her balloon last before it is completely deflated? (Assume there are 4 weeks in a month.)

    (A) 2   (B) 8   (C) 16   (D) 32   (E) NOTA

25. Compute the area of a kite with diagonals of length 15 and 12.

    (A) 45   (B) 90   (C) 180   (D) 360   (E) NOTA

26. Compute the cosine of the smallest angle of a right triangle with legs of length of 8 and 15.

    (A) $\frac{8}{15}$ (B) $\frac{8}{17}$ (C) $\frac{15}{8}$ (D) $\frac{15}{17}$ (E) NOTA

27. Let $m\Delta n$ denote the area of a regular polygon with m sides, each of length n. For example, $4\Delta 2$ denotes the area of a square with side length 2. Compute the value of $\dfrac{13\Delta 90}{13\Delta 6}$.

    (A) 15   (B) 30   (C) 150   (D) 225   (E) NOTA

28. Kavitha has a naughty French-Canadian alpaca. One day, the alpaca runs away from Kavitha's house down a straight hill. To catch him, Kavitha straps on her skis and begins to ski downhill chasing her alpaca, reaching him at the bottom of the hill. Given that the slope of her descent is 1, compute the angle of elevation as she looks back up the hill to her house.

    (A) 15°   (B) 30°   (C) 45°   (D) 60°   (E) NOTA

29. Kavitha must now build a pen for her French-Canadian alpaca if she wants to prevent him from running away again. If she has 169 meters of fencing, what shape should she use for her pen in order to maximize the pen's area?

    (A) Square   (B) Circle   (C) Hexagon   (D) Triangle   (E) NOTA

30. Two similar solids have volumes of 400 and 3200. Determine the ratio of the surface area of the larger solid to the surface area of the smaller solid.

    (A) 2   (B) 6   (C) 8   (D) 10   (E) NOTA