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

**Diagrams are not drawn to scale.**

1. The width of a rectangle is six less than the length of the rectangle. If the perimeter is 80, find the area of the rectangle.

A 333.25 B 391 C 591.25 D 1591 E NOTA

2. On MH, point T is between M and H and point A is between M and T. If MA:AT:TH is 2:4:5 and AT = 20, find the length of segment MH.

A 25 B 30 C 35 D 55 E NOTA

3. At the Pentagon if the Navy is sleeping, then the Army is not sleeping. If the Air Force is not sleeping, then the Army is sleeping. If the Navy is not sleeping, then the Marines are sleeping. If you know that the Marines are not sleeping, then who is(are) sleeping?

I. Air Force

II. Army

III. Navy

A III only B II&III only C I&III only D All of these E NOTA

4. A circular drain pipe contains water 18in deep. The width of the top of the water in a cross section of the pipe is 48in. Find the radius of the pipe in inches.

 48

 water 18

A 25 B 43 C 50 D 56 E NOTA

5. Abraham Lincoln sits 19 ft tall at the Memorial. Standing, the statue would be 28ft tall. If the shadow of Lincoln sitting is 22ft long, how long would the shadow of Lincoln standing be (in feet)? Round to the nearest tenth.

A 10.4 B 25.5 C 32.4 D 54.4 E NOTA

6. The sum of the measures of the base angles of an isosceles triangle is four times the measure of the vertex angle. Find the measure of one base angle.

A 30° B 36° C 72° D 80° E NOTA

7. At the top of the Washington Monument is a Pyramidion, square-based pyramid. The base edge is approximately 33’ 4” and the height is 55’6”. Find the approximate volume of the Pyramidion rounded to the nearest ten (in cubic feet).

A 19970 B 20560 C 22080 D 61640 E NOTA

8. Concentric circles with center J have radii of 3 and 7. Find the area of the shaded region.

 J

A 7π B 8π C 33π D 40π E NOTA

9. The Pentagon Building is made of five concentric pentagons with five floors each. The outer most walls are each 921.6ft long and 77ft 3½in high. The total square footage of the building is 6,636,360ft2, and the total volume is 77,015,000ft3. What is the perimeter in feet of the outer-most building?

A 386 B 999 C 4608 D 71230 E NOTA

10. Circles A, B, and C are externally tangent to each other. Find the radius of circle A if AB = 7, AC = 5, and BC = 9.

 C

 B

 A

A 1.5 B 2 C 3.5 D 5.5 E NOTA

11. Given the intersecting lines with angle measures shown, find the value of *r*.

 (9r)°

 (4y-x)° (4x+8)°

 (5y-2)°

A 8 B $\frac{28}{3}$ C $\frac{32}{3}$ D 12 E NOTA

12. Find the converse of the contrapositive of the inverse of the converse of “If it is summer, then I am at the ΜΑΘ National Convention.”

A If it is summer, then I am at the ΜΑΘ National Convention.

B If I am not at the ΜΑΘ National Convention, then it is not summer.

C If I am at the ΜΑΘ National Convention, then it is summer.

D If it is not summer, then I am not at the ΜΑΘ National Convention.

E NOTA

13. Which pair of angles is not necessarily congruent given two parallel lines and a transversal?

 I. Corresponding Angles

 II. Consecutive Interior Angles

 III. Alternate Interior Angles

A I only B III only C I&II only D None of these E NOTA

14. Given a cube with edge length of 6cm and a circumscribed sphere, find the volume part of the sphere which is outside of the cube.

A 36(π$\sqrt{3}$ ) B 72(2π$\sqrt{3}$ ) C 108(π$\sqrt{3}$ ) D 108(3π$\sqrt{3}$ ) E NOTA

15. Find the ratio of the distance between the points (,3) and () and the slope of the line perpendicular to the line connecting them.

A 156:5 B 13: C 5$\sqrt{119}$ : 12 D 65:12 E NOTA

16. The altitude drawn to the hypotenuse of a right triangle has a length of $2\sqrt{3}$. One segment of the hypotenuse has length of 2. Find the perimeter of the triangle.

A 2(5 + 2$\sqrt{3}$ ) B 2(6 +$\sqrt{3}$ ) C 4(3 + $\sqrt{3}$ ) D 6(2 + $\sqrt{3}$ ) E NOTA

17. A triangle with sides 13,13,and 10 spins 360° about its longest altitude. Find the lateral area of the resulting figure.

A 60π B 65π C 100π D 130π E NOTA

18. In the figure with angle measurements shown, find the value of a+b.

 a

 b

 113° 94°

 75°

 68°

A 10° B 64° C 153° D 217° E NOTA

19. If half the measure of the complement of an angle is added to the measure of the supplement of the angle the result is 165°. Find the measure of the complement.

A 30° B 40° C 50° D 140° E NOTA

20. Find the point of intersection of the medians of a triangle with vertices (), (2,5), and (,6).

A (4, 3.5) B $\left(\frac{-8}{3}, \frac{7}{3}\right)$ C (1, 7.5) D $\left(\frac{2}{3}, -5\right)$ E NOTA

21. Given the figure with BE **||** CD, find the perimeter of ΔACD. A

 A 33 B 34 C 35

D 43 E NOTA x+2 2x+1

 B E

 x-2 x-1

 C D

 19-x

22. Given R(2,), S(,2), T(,), and W(2,3). Find the value of  that makes.

A $\frac{-12}{7}$ B $\frac{-14}{11}$ C $\frac{12}{7}$ D $\frac{14}{11}$ E NOTA

23. A cube has a surface area of fifty-four square centimeters. What is the volume of the cube?

A 27cm2 B 729cm2 C 27m3 D 9cm3 E NOTA

24. The Lincoln Memorial is made of 36 identical right cylindrical columns with an approximate Lateral Area of 968ft2 each. If the diameter of each column is 7ft, what is the approximate length(in feet) of all the columns laid end to end rounded to the nearest ten? Use .

A 970 B 1110 C 1320 D 1580 E NOTA

25. An equiangular octagon’s sides alternate in length. Each side with length 1 is next to a side of length $\sqrt{2}$. What is the area of the octagon?

A 5 B 7 C 10 D 11 E NOTA

26. Given ΔBSU with right angle at U and leg lengths of 10 and 24. Find the value of (sinB)2 + (cosB)2.

A $\frac{119}{169}$ B 1 C $\frac{17}{13}$ D 26 E NOTA

27. Find the distance between point (-3,-1) and the line y = $-\frac{1}{2}$x + $\frac{9}{4}$.

A $\frac{19\sqrt{5}}{10}$ B $\frac{\sqrt{10}}{10}$ C $\frac{\sqrt{5}}{2}$ D $\frac{19\sqrt{10}}{2}$ E NOTA

28. Given the figure, pentagon ABCDE is inscribed in a circle and mBCE is 180°. AB =16, AE=12, BC=CD=DE=10. Find the exact area of the pentagon.

 A B

 E C

 D

A 3(32+25$\sqrt{3}$) B 3(64+25$\sqrt{3}$) C 6(16+25$\sqrt{3}$) D 6(32+25$\sqrt{3}$) E NOTA

29. Find the number of diagonals of a regular polygon with an interior angle measure equal to four times the exterior angle measure.

A 10 B 30 C 35 D 40 E NOTA

30. A tricycle has a front wheel with radius 11 and duplicate back wheels with radius 6. When the front wheel has made 25 revolutions, how many revolutions has each of the back wheels made?

A $\frac{275}{12}$ B $\frac{275}{6}$ C $\frac{3025}{36}$ D $\frac{275}{3}$ E NOTA