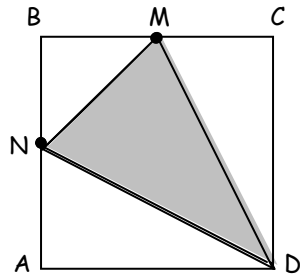The abbreviation NOTA means
"None of These Answers."

1. A snake slides through a long cylindrical hole in the ground at 4 centimeters per second. The hole is 5.36 meters in length. The snake takes 14 seconds to completely   enter the hole. What is the length in   centimeters of the snake ?

    A. 38   B. 40   C. 56   D. 60   E. NOTA

2.   There are four people in a room: 3 men and 1 woman. What is the probability of choosing a committee of 3 people and getting (at least) one of each gender?

    A. $\dfrac{1}{2}$ B. $\dfrac{2}{3}$ C. $\dfrac{3}{4}$ D. $\dfrac{7}{8}$ E. NOTA

3. In square ABCD shown, M and N are midpoints of sides $\overline{BC}$ and $\overline{AB}$ respectively. If AD=16 then what is the ratio of the area of the shaded to the un-shaded   regions?

    A. 1:2   B. 3:4   C. 3:5   D. 5:8   E. NOTA

4. A parabola has a directrix with equation $y = 6 - 2x$ and a focus at coordinates $(6\sqrt{5}, 6)$. What is the length of the latus rectum of the parabola?

    A. 48   B. 24   C. 20   D. 12   E. NOTA

5.   A rectangle has length 10 cm and width 8π cm.   If it is rolled into a right circular cylinder so that the height of the cylinder is 10 cm, then the total surface area of the cylinder is $K\pi$ sq. cm. Give the value of K.

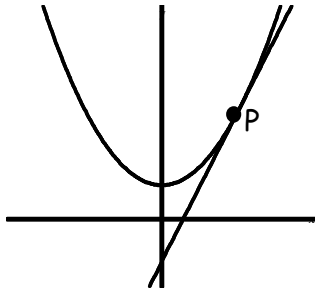   A. 96   B. 112   C. 176   D. 196   E. NOTA

6. The graph of $y = |4 - x|$ and $y = -|x - 2| + 4$ bounds a parallelogram region in quadrant I. What is the area of that parallelogram?

      A. 4   B. 5   C. 6   D. $5\sqrt{2}$ E. NOTA

7. X is 20% of Y and Y is $\dfrac{1}{2}$ of Z. What percent of Z is X?

      A. 10   B. 90   C. 100   D. 110   E. NOTA

8.

    The graphs of $f(x) = x^2 + 1$ and $g(x) = 3x - \dfrac{5}{4}$ meet exactly once at point P. Give the sum of the coordinates of P.

      A. 3   B. $4\dfrac{3}{4}$ C. $5\dfrac{1}{3}$ D. $6\dfrac{1}{8}$ E. NOTA

9. Four cola bottle caps can be traded for another bottle of cola. How many bottles of cola can a person get in total if he buys 42 bottles of cola ?

      A. 56   B. 55   C. 52   D. 40   E. NOTA

10. Four cola bottle caps can be traded for another bottle of cola. If L is the least number of bottles of cola a person must buy in order to get over 100 total bottles of cola, then give the value of $2L + 1$.
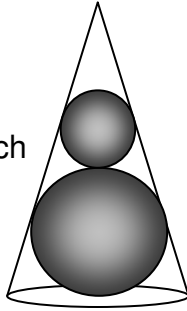
      A. 147   B. 151   C. 153   D. 157   E. NOTA

11. What is the length of a 30-degree arc in the circle with equation $x^2 + y^2 + 2x - 6y - 134 = 0$?

      A. 12π B. 6π C. 4π D. 2π E. NOTA

12. Let L be the least integral value of x for which $f(x)=(x+3)(x-4)(x-10)^2$ is negative. Let N be the number of integral values of x for which $f(|x|)$ is negative. Give the sum $L+N$.

    A. 4   B. 5   C. 8   D. 9   E. NOTA

13. One-half of one-half is divided by one-half. The result is __.

    A. $\dfrac{1}{2}$ B. $\dfrac{1}{4}$ C. $\dfrac{1}{8}$ D. $\dfrac{1}{16}$ E. NOTA

14. If $k>0$, the real solution to $\sqrt{3x+\sqrt{3x+\sqrt{3x+\sqrt{...}}}}=1+\sqrt{2x}$ is k. Give the value of $\left(k\sqrt{2}\right)^2$.

    A. 8   B. 12   C. 18   D. 24   E. NOTA

15. Player A has one more coin than player B. Both players throw all of their coins simultaneously and observe the number of coins that come up heads. If player B has n coins $(n>2)$ and assuming that all of the coins are fair, what is the probability that A obtains more heads than B?

    A. $\dfrac{n}{n+1}$ B. $\dfrac{1}{2}$ C. $\dfrac{n-1}{n+1}$ D. $\left(\dfrac{n-1}{n}\right)^2$ E. NOTA

16.   There are 2n students in a room. If n-1 of them are taking math, and n-4 of them are taking science, and n-5 are taking a language class, and 3 are taking both math and a language, and 2 are taking both science and math and 1 is taking both science and a language, what is the least possible value for n ? No students are taking math, science and a language class, and each student is taking at least one of the classes.

    A. 9   B. 10   C. 11   D. 16   E. NOTA

17. The graph of $f(x)=x^3+Ax^2+Bx+C$ has roots 1, 2, and -3. Give the value of $|A-B+2C|$.

    A. 20   B. 19   C. 18   D. 17   E. NOTA

18. A cone contains two spheres which are tangent to each other and which are each tangent to the sides of the cone as shown. The larger sphere is tangent to the cone's base.   If the smaller sphere has radius 2 and the larger cone has radius 4 then what is the radius of the cone?

A. 6   B. $\dfrac{10\sqrt{3}}{3}$ C. $5\sqrt{3}$ D. $4\sqrt{2}$ E. NOTA

19. An ellipse with equation $9x^2 + 4y^2 = 36$ shares a center with a circle, and the endpoints of the minor axis of the ellipse are also on the circle. What is the shortest distance between the circle and one of the foci of the ellipse?
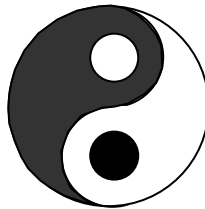
A. 0   B. 1   C. 2   D. 3   E. NOTA

20. For $x \neq 1$, give the sum of the real solutions to the equation

$$\frac{1}{\left(\sqrt{x}\right)-1}+\frac{1}{\left(\sqrt{x}\right)+1}=\frac{2\sqrt{x}}{\left(\sqrt{x}\right)+1}.$$

A. 3   B. 4   C. 5   D. 6   E. NOTA

21. The yin and yang symbol at the right has a large 12-inch diameter circle and two congruent 180-degree arcs meeting at the larger circle's center. The two smaller complete circles have 2-inch diameter each. If the symbol is painted black and white, how many square inches of black will there be?

A. 18π B. 18.5π C. 19π D. 21π E. NOTA

22. The integer $(2n-1)$ is divisible by 3, and the integer $2n+101$ is divisible by 5. For $n>2$, then find the least possible value of n and give the sum of the digits of $2n-1$.

     A. 3   B. 6   C. 8   D. 9   E. NOTA

23. A right square pyramid has a square base with each base edge 12 inches, and a height 8 inches. What is the shortest distance in inches for an ant to crawl from the point P (shown) to the center of the base, crawling along the surface?

   A. $\sqrt{34}$ B. 14
     C. 16   D. 18
     E. NOTA
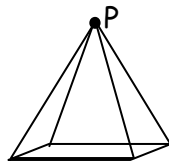
24. Four birds can eat 5 cobs of corn in 2 hours. Assuming infinitely hungry birds, constant eating rates and no predators, how many cobs of corn can 6 birds eat in 3 hours?

     A. 8   B. 10.75   C. 11.25   D. 12.5   E. NOTA

25. On a bus are four girls and each has four backpacks. Each backpack has 4 large cats and each large cat is paired with a little cat in the pack. Assuming the usual legs per animal and assuming no other occupants are on the bus, how many legs are on the bus?

     A. $2^3(2^6+1)$ B. 2^6 C. $2^4(2^5+1)$ D. 2^9 E. NOTA

26. A right circular cone (shown) is filled with water to a height of 10 inches and the cone itself has a base radius of 10 inches and height of 14 inches. If the water level drops 2 inches, then $\dfrac{100\pi}{3}(K)$ cubic inches is the amount that has been removed. Find the value of K.
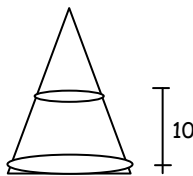
     A. $\dfrac{30}{7}$ B. $\dfrac{38}{49}$ C. $\dfrac{55}{49}$ D. $\dfrac{53}{49}$ E. NOTA

27. The graph of the hyperbola with equation $4(x-1)^2 - 9(y+1)^2 = 36$ has asymptotes L_1 and L_2. Give the sum of the y-intercepts of L_1 and L_2.

   A. -2 B. $-\dfrac{4}{3}$ C. $-\dfrac{1}{3}$ D. $\dfrac{1}{3}$ E. NOTA

28. The number 2112_{four} is written in base four. If $RS_{sixteen}$ has digits R and S and is written in base sixteen and the two numbers are equal, then give the sum $R+S$ in base ten.

   A. 6   B. 15   C. 16   D. 18   E. NOTA

29. If R then T. S is a necessary condition for T. T is a sufficient condition for U.
    Which is a valid conclusion?

A. If not S then R   B. If R then U   C. S   D. U   E. NOTA

30. What is the fourth term of the expansion of $(x+1)^{\frac{1}{2}}$?

   A. $\dfrac{1}{6}x^{-\frac{5}{2}}$ B. $\dfrac{1}{120}x^{\frac{7}{2}}$ C. $-\dfrac{15}{256}x^{-\frac{7}{2}}$ D. $\dfrac{1}{16}x^{-\frac{5}{2}}$ E. NOTA