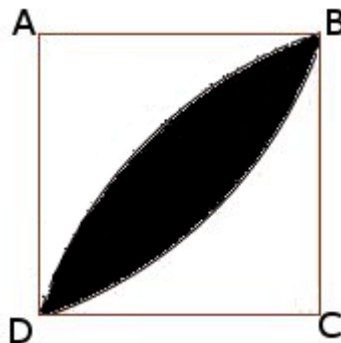


For all questions, choice E: NOTA means that none of the given answers is correct.

- What is the remainder when  $x^5 - 3x^3 + 6x^2 - 2x + 15$  is divided by  $x + 1$ ?  
(A) 25                      (B) 26                      (C) 21                      (D) 18                      (E) NOTA
- Given the following statement, which of the answer choices is ALWAYS true?  
"If Hannah has music, then Hannah is happy."  
(A) If Hannah does not have music, Hannah is not happy.  
(B) If Hannah is happy, then Hannah has music.  
(C) If Hannah is not happy, then Hannah does not have music.  
(D) If Hannah is happy, then Hannah does not have music.  
(E) NOTA
- Kate is standing in front of a statue of Benjamin Duke. She notices that the shadow cast by the statue ends at the same point where her shadow ends. If the statue is 15 feet tall and casts a shadow 30 feet long, and Kate is five feet tall, how many feet from the statue is she standing?  
(A) 15                      (B) 2.5                      (C) 10                      (D) 20                      (E) NOTA
- I flip three fair coins. What is the probability that all three coins are heads?  
(A)  $\frac{1}{4}$                       (B)  $\frac{1}{2}$                       (C)  $\frac{2}{3}$                       (D)  $\frac{1}{8}$                       (E) NOTA
- The shortest distance from the midpoint of the diagonal of a regular hexahedron to a face is 3 cm. What is the volume of the hexahedron?  
(A)  $72cm^3$                       (B)  $27cm^3$                       (C)  $216cm^3$                       (D)  $108cm^3$                       (E) NOTA
- Let  $\log 2 = a$  and  $\log 3 = b$ . Express  $\log 60$  in terms of  $a$  and  $b$ .  
(A)  $2a + b$                       (B)  $1 - a + 2b$                       (C)  $a + b$                       (D)  $a + b - 1$                       (E) NOTA
- What is the inverse of the function  $y = 5x - 1$ ?  
(A)  $y = 5x + 1$                       (B)  $y = x + 5$                       (C)  $y = \frac{x+1}{5}$                       (D)  $y = \frac{1}{5x-1}$                       (E) NOTA
- What is the equation of a circle with an area of  $16\pi$  centered at  $(3,-4)$ ?  
(A)  $(x - 3)^2 + (y + 4)^2 = 16$   
(B)  $(x + 3)^2 + (y - 4)^2 = 16$   
(C)  $(x - 3)^2 - (y + 4)^2 = 4$   
(D)  $(x - 3)^2 + (y + 4)^2 = 4$   
(E) NOTA
- Payal is creating a triangular masterpiece of uniform thickness and density in her backyard. If the coordinates of this masterpiece are  $(9,-5)$ ,  $(13,1)$ , and  $(-7,10)$ , what are the coordinates of the center of mass of her work?  
(A)  $(3, 4)$                       (B)  $(5, 2)$                       (C)  $(6, 3)$                       (D)  $(2, 5)$                       (E) NOTA
- How many distinct ways can the letters of the word COFFEECUP be arranged?  
(A)  $9!$                       (B)  $9(7!)$                       (C)  $6!$                       (D)  $9! - 3$                       (E) NOTA

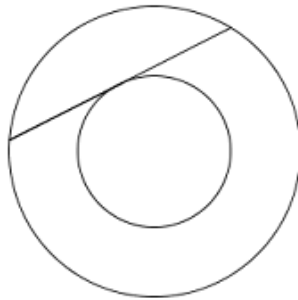
11. Simplify  $\sqrt{6 + \sqrt{6 + \sqrt{6 + \sqrt{6 + \sqrt{6 \dots}}}}}$   
 (A) 3 (B) 2 (C)  $\frac{1+i\sqrt{23}}{2}$  (D) 6 (E) NOTA
12. If  $(x + y) = 13$  and  $(x - y) = 11$ , what is the value of  $x^2 + y^2$ ?  
 (A) 24 (B) 48 (C) 95 (D) 190 (E) NOTA
13. What is the volume of the rectangular prism that has faces with areas 24, 32, and 48?  
 (A) 128 (B) 416 (C) 104 (D) 192 (E) NOTA
14. Daniel, Diego, and Ian are standing in separate corners of a triangular room. If they each walk along a path that forms the median to the opposite wall of the room, what is the name of the point where their paths will intersect?  
 (A) Circumcenter (B) Incenter (C) Orthocenter (D) Centroid (E) NOTA
15. The coordinates (1,2), (4,2), (1,5), (4,5) form a polygon on the Cartesian plane. If this polygon is rotated about the y-axis, what is the total surface area of the resulting shape?  
 (A)  $55\pi$  (B)  $56\pi$  (C)  $60\pi$  (D)  $61\pi$  (E) NOTA
16. Steve is running from the policeman. His path can be represented by the equation  $x - 2y = -6$ , and the path of the policeman can be represented by the equation  $5x - 6y = 24$ . What is the positive difference of the abscissa and the ordinate of the point when their paths intersect?  
 (A)  $\frac{15}{2}$  (B)  $\frac{69}{2}$  (C) 21 (D)  $\frac{27}{2}$  (E) NOTA
17. What is the coefficient of the  $x^2$  term of the expansion of  $(2x + 3)^6$ ?  
 (A) 1620 (B) 810 (C) 4860 (D) 2430 (E) NOTA
18. Pamela and 4 friends go to Chipotle together and sit down at a round table. In how many distinct ways can they arrange themselves around their table?  
 (A) 48 (B) 60 (C) 120 (D) 12 (E) NOTA
19. Quartercircles ABD and CBD intersect to form a perfect square, ABCD with side length of 4. What is the area of the shaded region?



- (A)  $8\pi$  (B)  $8\pi - 16$  (C)  $4\pi - 8$  (D)  $8\pi - 8$  (E) NOTA

20. Roger Federer is attempting to smuggle truffles across the French border. To efficiently pack them, he plans to melt them down so they will fit tightly into his  $12 \times 16 \times 18\pi \text{ cm}^3$  suitcase. No volume is lost in the melting of the truffles. If each truffle is originally a sphere with a diameter of 6 cm, how many truffles can Roger fit into his suitcase?  
 (A) 72                      (B) 96                      (C) 128                      (D) 36                      (E) NOTA
21. Daniel is in the pizza business. On March 1st, he delivers 3 pizzas. The next day, he delivers 5 pizzas. The day after, he delivers 7 pizzas. This pattern continues for the rest of the month. How many pizzas did Daniel deliver in total in the month of March? (There are 31 days in March.)  
 (A) 1023                      (B) 63                      (C) 960                      (D) 126                      (E) NOTA
22. Find the determinant of the inverse of the following matrix  

$$M = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 1 & 2 \\ 3 & 2 & 1 \end{bmatrix}$$
  
 (A) 8                      (B)  $\frac{-1}{8}$                       (C)  $-8$                       (D)  $\frac{1}{8}$                       (E) NOTA
23. At Regent Park, students must take at least one of the following classes: English, Science, and Math. Out of the 37 students at the school, 15 take English, 19 take Science, and 27 take Math. Seven students take both English and Science, 11 take Science and Math, and 10 take English and Math, while 4 take all three. If a random student were selected from the school, what is the probability that student takes English but not Math?  
 (A)  $\frac{2}{3}$                       (B)  $\frac{5}{37}$                       (C)  $\frac{3}{5}$                       (D)  $\frac{1}{3}$                       (E) NOTA
24. Two concentric circles are drawn. A chord of length 16 is drawn in the larger circle, tangent to the smaller circle. What is the area of the annulus formed by the two concentric circles?



- (A)  $64\pi$                       (B)  $256\pi$                       (C)  $16\pi$                       (D)  $32\pi$                       (E) NOTA
25. Linda and Annie both love going to Nuberri. They always finish their yogurt and leave within 10 minutes of entering the store. If Linda and Annie both plan to go to Nuberri on Tuesday between 4 and 5 in the afternoon, what is the probability the two of them will run into each other if they go independently of each other?  
 (A)  $\frac{2}{7}$                       (B)  $\frac{11}{36}$                       (C)  $\frac{1}{6}$                       (D)  $\frac{13}{36}$                       (E) NOTA
26. What is the sum of the reciprocals of the roots of the function  $f(x) = 15x^2 + 6x + 4$ ?  
 (A)  $-\frac{3}{2}$                       (B)  $\frac{15}{4}$                       (C)  $\frac{3}{5}$                       (D)  $-\frac{3}{5}$                       (E) NOTA

27. Mihir has a cube with dimensions 6 by 6 by 6. The cube is made up of unit cubes with dimensions 1 by 1 by 1. Mihir paints the outside of the 6 by 6 by 6 cube red, and then separates it into the unit cubes. How many of the unit cubes have exactly 2 sides painted red?
- (A) 24                      (B) 36                      (C) 48                      (D) 12                      (E) NOTA
28. The centers of two spheres are 10 units apart. The radii of the two spheres measure 7 and 9 respectively. What is the volume of the largest sphere that will fit in the intersection of these two spheres?
- (A)  $72\pi$                       (B)  $48\pi$                       (C)  $108\pi$                       (D)  $36\pi$                       (E) NOTA
29. A parrot is tied to an outside corner on the top of a building in the shape of a hexagonal prism with every edge measuring 7 meters. The parrot is on a leash of 6 meters, and can fly freely within the restraints of the leash. Assume that the volume of the parrot itself is negligible. What is the maximum volume in meters cubed in which the parrot can travel?
- (A)  $288\pi$                       (B)  $192\pi$                       (C)  $240\pi$                       (D)  $180\pi$                       (E) NOTA
30. An office building 50 feet tall is 100 feet away from a coffee shop 30 feet tall. From the top of each building, a paper plane is thrown towards a point on the ground somewhere between the two buildings. The planes fly in a straight line until they reach the point on the ground. The paper planes travel at the same speed and reach the point on the ground at the same time. How far in feet is this point on the ground from the coffee shop?
- (A) 42                      (B) 58                      (C) 60                      (D) 84                      (E) NOTA