

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

- Find the lateral surface area of a cone with diameter 6 and slant height of 10.
(A) 30π (B) 60π (C) 66π (D) 39π (E) NOTA
- Grace is standing in front of a stack of mangos. She notices that the shadow cast by the mangos ends at the same place where her shadow ends. If the mango stack is 15 feet tall and casts a shadow 30 feet long, while Grace is five feet tall, how many feet from the stack is she standing?
(A) 15 (B) 10 (C) 20 (D) 2.5 (E) NOTA
- How many squares are there on an 8×8 checkerboard?
(A) 64 (B) 1224 (C) 204 (D) 784 (E) NOTA
- I flip a fair two sided coin. With each flip, I also toss two dice. What is the probability that the coin lands on heads and the sum of the two dice is greater than 4 but less than 8?
(A) $\frac{1}{3}$ (B) $\frac{5}{12}$ (C) $\frac{5}{6}$ (D) $\frac{7}{36}$ (E) NOTA
- “If Zac is hungry, then Zac does not have Chipotle.” Which of the following statements must be true?
(A) If Zac has Chipotle, then Zac is not hungry. (B) If Zac is not hungry, than Zac has Chipotle
(C) Zac is hungry when he doesn't have chipotle. (D) If Zac does not have Chipotle, Zac is hungry. (E) NOTA
- What is the equation of a circle with diameter 6 and a center at (5, 6)?
(A) $(x + 5)^2 - (y - 6)^2 = 36$ (B) $(x + 5)^2 + (y - 6)^2 = 36$
(C) $(x - 5)^2 - (y - 6)^2 = 9$ (D) $(x - 5)^2 + (y - 6)^2 = 9$ (E) NOTA
- Find the sum of the abscissas of the intersections of $y = x^2 + 7x + 12$ and $y = x + 4$.
(A) 6 (B) -6 (C) 2 (D) -2 (E) NOTA
- A flying cow is tied to an outside corner of the top of a building in the shape of a triangular prism with every edge measuring 10 yards. The flying cow is on a leash of 6 yards, and can fly freely within the restraints of the leash. Assuming the volume of the cow is negligible, calculate the maximum volume in cubic feet in which the cow can fly.
(A) 192π (B) 240π (C) 288π (D) 144π (E) NOTA
- Circle A has a radius of 5, while circle B has a radius of 8. The centers of the two circles are 20 units apart. What is the length of the line segment that is externally tangent to both circles?
(A) $\sqrt{409}$ (B) $5\sqrt{17}$ (C) $\sqrt{391}$ (D) $4\sqrt{29}$ (E) NOTA
- Which of the following points is not necessarily on Euler's Line?
(A) Centroid (B) Circumcenter (C) Orthocenter (D) Incenter (E) NOTA
- A polyhedron has 12 faces and 36 edges. How many vertices are there in this polyhedron?
(A) 72 (B) 36 (C) 26 (D) 24 (E) NOTA

12. Simplify the following fraction:

$$4 + \frac{5}{4 + \frac{5}{4 + \frac{5}{4 + \frac{5}{4 + \dots}}}}$$

- (A) 6 (B) 5 (C) 4.5 (D) 5, -1 (E) NOTA

13. What is the length of the longest rod that can fit in a rectangular prism with dimensions 12, 5, and 13?

- (A) 13 (B) $13\sqrt{2}$ (C) 12 (D) $\sqrt{26}$ (E) NOTA

14. Mihir draws two circles of radius 6, such that the center of one circle is situated on the circumference of the other. Find the area of the intersection between the two circles.

- (A) $12\pi - 9\sqrt{3}$ (B) $18\pi + \sqrt{3}$ (C) $24\pi - 18\sqrt{3}$ (D) $24\pi - 9\sqrt{3}$ (E) NOTA

15. How many distinct ways can the letters of the word "NUBERRI" be arranged?

- (A) 5040 (B) 8200 (C) 1080 (D) 2520 (E) NOTA

16. Divya carves the largest possible sphere out of a cube with side length 12 inches. He plans to paint the carved sphere with blue glitter paint. If each tube of glitter paint covers 10π square inches, how many tubes of paint will he need?

- (A) 288 (B) 216 (C) 28 (D) 29 (E) NOTA

17. What is the value of $\sqrt{6 + \sqrt{6 + \sqrt{6 + \sqrt{6 + \sqrt{6 + \sqrt{6 + \dots}}}}}}$?

- (A) 3 (B) 2 (C) $\frac{1 + i\sqrt{23}}{2}$ (D) $\frac{1 - i\sqrt{23}}{2}$ (E) NOTA

18. An ant is at the top of a perfectly cylindrical can of soda with a radius of $\frac{6}{\pi}$ and height 10. The ant begins to crawl to the bottom of the can and will circle the can twice. The ant ends up on the bottom of the can exactly below the point where he began. What is the distance traveled by the ant?

- (A) 26 (B) 13 (C) 42 (D) 55 (E) NOTA

19. Aaron drops a ball from a height of 12 feet above the ground. The ball bounces back vertically to $\frac{2}{3}$ of its original height before dropping back to the ground. If this behavior continues infinitely, what is the total vertical distance traveled by the ball?

- (A) 30 (B) 36 (C) 72 (D) 60 (E) NOTA

20. Find the value of the infinite series $\frac{3}{5} + \frac{6}{25} + \frac{9}{125} + \frac{12}{625} + \dots$

- (A) $\frac{5}{16}$ (B) $\frac{6}{5}$ (C) $\frac{15}{16}$ (D) $\frac{9}{10}$ (E) NOTA

21. Find the area of the following ellipse: $x^2 - 10x + 25y^2 - 200y + 325 = 0$.

- (A) 20π (B) 25π (C) 10π (D) 40π (E) NOTA

For Questions 23 and 24, let $M = \begin{bmatrix} 5 & 2 \\ 7 & 3 \end{bmatrix}$

22. Find the inverse of M .

- (A) $\begin{bmatrix} 5 & 7 \\ 2 & 3 \end{bmatrix}$ (B) $\begin{bmatrix} -5 & 7 \\ 2 & 3 \end{bmatrix}$ (C) $\begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$ (D) $\begin{bmatrix} 3 & -2 \\ -7 & 5 \end{bmatrix}$ (E) NOTA

23. Find the determinant of M .

- (A) 1 (B) -1 (C) 29 (D) -11 (E) NOTA

24. Convert 123_4 to base 5.

- (A) 122 (B) 212 (C) 102 (D) 27 (E) NOTA

25. What is the value of $|1 + i|^{15}$?

- (A) $128\sqrt{2}$ (B) 256 (C) $64\sqrt{3}$ (D) $64\sqrt{2}$ (E) NOTA

26. What is the remainder when $16x^4 - 5x^3 + 3x^2 - 58$ is divided by $(x + 1)$?

- (A) -44 (B) -34 (C) 44 (D) 34 (E) NOTA

27. Enakshi draws two concentric circles. She then draws a chord through the larger circle that is tangent to the inner circle. If the outer circle has a radius of 12 and the inner circle has a radius of 5, what is the length of the chord?

- (A) $\sqrt{119}$ (B) $2\sqrt{119}$ (C) 49 (D) $\sqrt{149}$ (E) NOTA

28. Water is being added to an empty cone at a constant rate. At one minute, the volume of water in the cone is 3π cubic cm. At 64 minutes, the surface of the water cuts the height of the cone in half and the height of the water is 9 cm. What is the radius of the cone when it is full?

- (A) 18 cm (B) 16 cm (C) 36 cm (D) 42 cm (E) NOTA

29. Solve $(\log_{\frac{1}{3}} x)(\log_{\frac{1}{3}} x + 2) \leq 3$.

- (A) $\left(-\infty, \frac{1}{3}\right] \cup [27, \infty)$ (B) $\left(\frac{1}{3}, 27\right)$ (C) $\left[\frac{1}{3}, 27\right]$ (D) $\left(-\infty, \frac{1}{3}\right) \cup (27, \infty)$ (E) NOTA

30. Let $m \oplus n$ denote area of a regular polygon with m sides, each measuring n units. Find the value of $\frac{6 \oplus 8}{8 \oplus 6}$.

- (A) 1 (B) $\frac{4\sqrt{3}}{3 + 3\sqrt{2}}$ (C) $\frac{4\sqrt{2}}{3 + 3\sqrt{2}}$ (D) $\frac{2\sqrt{3}}{36 + 36\sqrt{2}}$ (E) NOTA