

The abbreviation *NOTA* denotes “none of these answers”.

1. How many prime numbers are less than 100?
 A. 24 B. 25 C. 26 D. 27 E. NOTA

2. Simplify.

$$\frac{(x^2 - 3x - 18)(\sqrt{x + 1} - 3)(x + 10 + 6\sqrt{x + 1})}{(x^2 - 5x - 24)(\sqrt{x + 1} + 3)}$$
 A. $\frac{x+3}{x-8}$ B. $(x - 8)^2$ C. $(x + 8)$ D. $(x - 6)$ E. NOTA

3. What is the equation of the line that perpendicularly bisects the line that connects the center and vertex of $4x^2 - 8x + 3y^2 + 6y - 3 = 0$ and $x + y^2 - 6y = -6$, respectively?
 A. $2x - y = 0$ B. $2x + y = 5$ C. $x - 2y = 0$ D. $x + 2y = 4$ E. NOTA

4. What is the remainder when $f(x) = x^{79} + x^2 + x + 1$ is divided by $(x + 1)$?
 A. 0 B. -1 C. 1 D. 79 E. NOTA

5. How many positive integral factors does the number 1008 have?
 A. 30 B. 33 C. 36 D. 40 E. NOTA

6. What is the angle between the hour and minute hand at 7:37AM?
 A. 4.5° B. 6.2° C. 6.5° D. 8.5° E. NOTA

7. How many ways can you make 26 cents using any combination of pennies, nickels, dimes, and quarters?
 A. 11 B. 12 C. 13 D. 14 E. NOTA

8. Simplify $381^2 - 2 * 3 * 127 * 281 + 281^2$.
 A. 10,000 B. 66,200 C. 224,122 D. 438,244 E. NOTA

9. I have two fair 6 sided die with values 3, 4, 5, 6, 7, and 8. What is the probability that the sum of two rolls is greater than or equal to 14?
 A. $\frac{1}{12}$ B. $\frac{1}{6}$ C. $\frac{3}{12}$ D. $\frac{1}{4}$ E. NOTA

10. I have 5 apples in my hands and one of them is rotten. Given that you randomly choose 3 apples, what is the probability that you selected the rotten apple?
 A. $\frac{1}{2}$ B. $\frac{13}{20}$ C. $\frac{3}{5}$ D. $\frac{5}{6}$ E. NOTA

11. How many distinguishable permutations exist of the word ALABASTER?
 A. 60,480 B. 120,960 C. 181,440 D. 362,880 E. NOTA

12. Evaluate $\begin{vmatrix} 2 & 3 & 1 & 2 \\ -4 & 8 & -2 & 6 \\ -2 & 7 & 1 & 1 \\ 0 & 3 & -1 & 2 \end{vmatrix}$

- A. 136 B. -136 C. 68 D. -68 E. NOTA

13. I have $4e$ feet of fencing, what is the maximum area I can enclose with this fencing?

- A. $\frac{4e^2}{3}$ B. $\frac{4e^2\sqrt{3}}{9}$ C. $2e^2$ D. e^2 E. NOTA

14. Simplify $2(\log_{25} 9)(\log_{81} \sqrt{5})$.

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

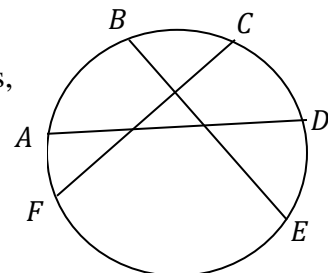
15. I have a deck of 10 cards numbered 1 through 10. How many combinations of three cards that sum to 21 points are there, given that you can repeat cards?

- A. 10 B. 12 C. 14 D. 15 E. NOTA

16. A baby slug is trying to climb up a 50 feet wall of a building so that it can rest on the roof. Each day, the snail is able to climb 7 feet up the wall. Afterwards, the snail rests and slides down 2 feet. If the snail starts off on the ground on the first day, on which day will the snail make it to the roof?

- A. 8th B. 9th C. 10th D. 11th E. NOTA

17. In the figure to the right, points A, B, C, D, E and F lie on the circle. Point G , not pictured, is the point of intersection between \overline{BE} and \overline{FC} . Given $\widehat{CD} = \widehat{DE} = 38^\circ$ and $\overline{BE} = \overline{FC}$, what is the measure, in degrees, of $\angle BGC$?



- A. 76°
 B. 104°
 C. 120°
 D. 126°
 E. NOTA

18. Given 20 points along the circumference of a circle of radius 0.2139, how many triangles can be made from connecting any three of these points?

- A. 5170 B. 1140 C. 3420 D. 6840 E. NOTA

19. A regular tetrahedron of sides of length 12 is inscribed in a rectangular prism such that one of the faces of the tetrahedron shares the same plane as the prism and an edge of that face coincides with the edge of the prism. What is the smallest volume of a prism that fits the description?

- A. $864\sqrt{2}$ B. $576\sqrt{15}$ C. 1296 D. 1728 E. NOTA

20. I have 40 square feet of aluminum foil. What is the largest volume that I can completely wrap using the foil?

- A. $\frac{40\sqrt{3}}{3}$ B. $\frac{5\sqrt{10\pi}}{3\pi}$ C. $\frac{40\sqrt{15}}{9}$ D. $\frac{40\sqrt{10\pi}}{3\pi}$ E. NOTA

21. On any given day, a woodchuck chucks wood 50% of the time it's awake and a chucks 4 pieces of wood per hour. Over a period of 6 days given the woodchuck is awake on average for 12 hours a day, how much wood could a woodchuck chuck if a woodchuck could chuck wood?

- A. 144 pieces B. 156 pieces C. 288 pieces D. 324 pieces E. NOTA

22. The perfect smoothie is composed of 25% ice. I have 1L of 75% ice smoothie and 1L of 12.5% ice smoothie. If I want to make 100 mL of the perfect smoothie out of these two smoothies, how many mLs of the 75% ice smoothie do I need to add?

- A. 15 B. 18 C. 20 D. 25 E. NOTA

Refer to the following information for questions 23 and 24.

A Venn Diagram is composed of three circles of radius 6 that overlap such that the center of each circle is the point of intersection of the two other circles.

23. What is the area of the intersection of all three circles?

- A. $18\pi - 18\sqrt{3}$ B. $12\pi - 9\sqrt{3}$ C. $6\pi + 3\sqrt{3}$ D. $12\pi - 6\sqrt{3}$ E. NOTA

24. What is the area of intersection of any two or more circles?

- A. $36\pi - 36\sqrt{3}$ B. $36\pi - 72\sqrt{3}$ C. $48\pi - 24\sqrt{3}$ D. $64\pi + 12\sqrt{3}$ E. NOTA

25. Simplify: $[(i + 1)^2 - 2i - 1]^{\frac{23}{2}}$

- A. 1 B. -1 C. i D. $-i$ E. NOTA

26. Given the sequence $\frac{1}{2}, \frac{3}{4}, \frac{7}{8}, \frac{15}{16}, \frac{31}{32}, \dots$ what is the sum of the first 10 terms?

- A. $\frac{4607}{512}$ B. $\frac{9217}{1024}$ C. $\frac{9727}{1024}$ D. $\frac{19455}{2048}$ E. NOTA

27. How many of the following are asymptotes of the graph $y = \frac{x^3+x^2+6x-8}{x^3+3x^2-x-3}$?

- I. $x = -1$ II. $x = 1$ III. $x = 3$ IV. $y = 1$ V. $y = \infty$ VI. $y = 3$ VII. $y = 0$
 A. 2 B. 3 C. 4 D. 5 E. NOTA

28. You are late to work and drive along the highway at 100 mph for 24 minutes until you suddenly see a police officer. You slow down to 50 mph for the remaining 6 minutes of the drive to work.

What is the average speed that you drove in mph?

- A. 82.5 B. 87.5 C. 90 D. 92 E. NOTA

29. Which of the following is a factor of $9x^2 + 12xi - 6$.

- A. $3x + 2i - 2\sqrt{2}$ B. $3x + i - 2$ C. $2x + 3i - 1 + \sqrt{2}$ D. $9x + i - 3$ E. NOTA

30. What is the area of a circle inscribed within a regular octahedron of sides of length 8?

- A. $(48 + 32\sqrt{2})\pi$ B. $(64 + 32\sqrt{2})\pi$ C. $(64 + 48\sqrt{2})\pi$ D. 96π E. NOTA