

ALGEBRA TWO INDIVIDUAL TEST
1996
JANUARY REGIONAL COMPETITION

Choose the correct answer and bubble that letter on your scantron answer sheet.
If none of the answers (NOTA) are correct, then choose letter E. NOTA

1. Simplify $1996i^{1996}$ A. 1996 B. -1996 C. $1996i$ D. $-1996i$ E. NOTA

2. Simplify $\sqrt{\sqrt[3]{\sqrt[5]{7}}}$ A. 7^{15} B. $7^{1/15}$ C. $7^{1/30}$ D. $\sqrt{7^{15}}$ E. NOTA

3. Solve for C: $5C + 3 = BC + M$ A. $C = \frac{BC + M - 3}{5}$ B. $C = \frac{3 - M}{B - 5}$
C. $C = \frac{3M}{5 + B}$ D. $C = \frac{M - 3}{B + 5}$ E. NOTA

4. Given the system $\begin{cases} 2a - b + c = 7 \\ a + 2b + 2c = 3 \\ 7a - 3b - 3c = 4 \end{cases}$ When solving by Cramer's Rule, the value of the denominator determinant is A. -34 B. -1 C. 2 D. 5 E. NOTA

5. Factor completely: $X^6 - Y^6$
A. $(X^2 - Y^2)(X^4 + X^2Y^2 + Y^4)$ B. $(X + Y)(X - Y)(X^4 + X^2Y^2 + Y^4)$
C. $(X^2 - Y^2)(X^4 - X^2Y^2 + Y^4)$
D. $(X + Y)(X - Y)(X^2 + XY + Y^2)(X^2 - XY + Y^2)$ E. NOTA

6. Point C is the midpoint of \overline{AB} and point F lies $\frac{2}{3}$ of the way from point D to point E on \overline{DE} . Find the midpoint of \overline{CF} given A (-5, -3), B (-1, 13), D (1, -5), and E (10, 1). State the sum of the X and the Y coordinate of the midpoint (X, Y) of \overline{CF} .
A. -1 B. 0 C. 4 D. 6 E. NOTA

7. Write the number $2.08008000800008\dots$ in rational (fraction) form.
A. $2\frac{8}{99}$ B. $2\frac{8}{999}$ C. $2\frac{80}{99}$ D. $2\frac{80}{999}$ E. NOTA

8. The solution of $8 + |2x + 1| > 3$ is

- A. $X > 2$ or $X < -3$ B. $X < -2$ or $X > 3$
 C. $-3 < X < 2$ D. All Real Numbers E. Null Set

9. A car radiator contains 16 liters of antifreeze and water. This mixture is 30% antifreeze. How many liters of this mixture should be drained and replaced with pure antifreeze so that the new mixture will be 50% antifreeze?

- A. $12 \frac{2}{3}$ B. $8 \frac{1}{3}$ C. $6 \frac{1}{4}$ D. $4 \frac{4}{7}$ E. NOTA

10. On which of the following would you "graph" $11 - 7i$?

- A. An Argand Diagram B. An Euler Circle
 B. A 3-dimensional graph D. A set of Napier's Rods
 E. On semi-logarithmic graph paper

11. Evaluate $-3^2 + 8X^0$ ($X \neq 0$).

- A. 17 B. 9 C. -9 D. -1 E. NOTA

12. Choose the **BEST** response: $Y = 2X - 3$ is to $Y = \frac{1}{2}X + 3$ as

- A. ${}_N P_R$ is to ${}_N C_R$ B. A given exponential function is to a certain logarithmic function
 C. A square root is to a cube root D. An imaginary number is to real number

13. Solve the system $\begin{cases} \log(2x) + y = \log 2 \\ 2 \log x - y = 0 \end{cases}$ in the form (X, Y) . What is the **SUM** of X and Y ?

- A. -2 B. 0 C. 1 D. 3 E. NOTA

14. Other conditions remaining the same, the thrust T of a propeller varies jointly as the fourth power of its diameter and the square of the number n of revolutions per second. If the number of revolutions per second is doubled and the diameter is decreased by 50% the thrust will be

- A. Decreased by 75% B. Decreased by 25%
 C. Increased by 50% D. Increased by 20% E. NOTA

15. Simplify

$$\frac{B^2Y^2 + ABXY - BXY - AX^2}{\frac{3AX^2 - 6ABXY + 3AB^2Y^2}{AX^2 + ABXY + BXY + B^2Y^2}}$$

$$X^2 - B^2Y^2$$

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

16. $(8 \cdot 15) \bmod_{24} \equiv X$

$X = ?$

- A. -96 B. 0 C. 5 D. 96 E. NOTA

17. Write the equation of a line containing the point
- $(-3, 4)$
- and perpendicular to the line
- $6Y - 3X - 2 = 0$
- .

- A.
- $Y = 2X + 10$
- B.
- $2X + Y = -10$
- C.
- $X - 2Y = -15$
-
- D.
- $3X + 2Y = -17$
- E. NOTA

18. When
- $X^4 + 6X^2 + 25$
- is factored completely over the set of Integers, one of the linear terms in one of the factors is

- A.
- $+2X$
- B.
- $+5X$
- C.
- $-6X$
- D.
- $-5X$
- E. NOTA

19. The asymptotes of
- $4X^2 - 9Y^2 + 8X + 54Y = 113$
- intersect at the point
- (X, Y)
- . Let
- $S = X + Y$
- . What is the value of
- S
- ?

- A. -13 B. 13 C. 1 D. 2 E. NOTA

20. Let
- J
- and
- M
- represent two numbers. Let the value of
- J
- be greater than the value of
- M
- . Let the difference of the two numbers
- J
- and
- M
- be equal to the number 549 908 000. Let the sum of the two numbers
- J
- and
- M
- be equal to the number 1 005 393 000. What is the value of
- M
- ?

- A. 227 742 500 B. 301 484 500 C. 455 485 000
-
- D. 777 650 500 E. NOTA

21. Solve
- $10^{2X-3} = 7$
- . Round your answer to the nearest hundredths. The digit in the hundredths place is

- A. 2 B. 4 C. 6 D. 8 E. NOTA

22. Solve the system
- $\{L + M = 7, 3M + 2K = 9, 4L + K = 5\}$
- . State the sum of
- $L + M + K$
- .

- A. -2 B. 0 C. 1 D. 4 E. NOTA

23. How many of the first 100 natural numbers are multiples of 2 or multiples of 3?

- A. 16 B. 60 C. 67 D. 83 E. NOTA

24. Solve for
- X
- :
- $(X - 3)(X + 1)(X - 2) - (X - 2)(X + 4)(X - 3) + (X + 3)(X - 3)(X - 2) = 0$
-
- What is the product of the roots?

- A. -6 B. 0 C. 5 D. 6 E. NOTA

25. Simplify: $\frac{8\sqrt{3} + 2i}{3\sqrt{3} - 4i}$

- A. $\frac{64 + 38\sqrt{3}i}{43}$ B. $\frac{8 + 16\sqrt{3}i}{11}$ C. $\frac{64 - 38\sqrt{3}i}{11}$ D. $\frac{8 + 16\sqrt{3}i}{9}$ E. NOTA

26. If $f(x) = x^2 - 9$ and $g(x) = 2x - 3$, find $(f \circ g)(-2)$.

- A. -8 B. 8 C. 24 D. 40 E. NOTA

27. Find N if ${}_N P_4 = 6{}_N P_2$.

- A. 4 B. 6 C. 8 D. 10 E. NOTA

28. Find the roots of the equation $x^3 - 5x^2 + 6x + K = 0$ if the graph of $Y = x^3 - 5x^2 + 6x + K$ passes through the origin. Double the largest root and subtract the smallest root from the product of 2 times the larger root. This answer is

- A. 4 B. 6 C. 8 D. 10 E. NOTA

29. Find the $|X - 4|$ given $X < 2$. To this absolute value add $X + 4$. The sum is

- A. 0 B. 8 C. $2X$ D. $2X + 8$ E. NOTA

30. The maximum value of $F = 9X + 40Y$, subject to the constraints $Y - X \geq 1$, $Y - X \leq 3$, and $2 \leq X \leq 5$ is

- A. 138 B. 218 C. 285 D. 365 E. NOTA

