CALIFORNIA STATE UNIVERSITY, BAKERSFIELD MATHEMATICS FIELD DAY
2026

Individual Medley, Junior Varsity Level

There are 25 problems. You will have 50 minutes. You will only have to turn in the answer sheet – you may keep the test. Each correct answer is worth four points. Each incorrect answer will receive a one point penalty. If you believe there is an error of some sort in a particular problem, please quietly discuss it with one of the proctors. For each of the questions, fill in the appropriate circle on the answer sheet. When the exam is over, give your answer sheet to the proctor.

Calculators or cellphones of any kind are not allowed.

GOOD LUCK!

1. Simplify $1-2+3-4+5-6+7-\cdots+2025-2026$.

   (A) -1013 (B) -1012 (C) -1011 (D) 1012 (E) 1013

2. A lattice point is a point where each coordinate is an integer. How many lattice points lie strictly inside the triangle with vertices $(0,0)$, $(6,0)$, and $(2,5)$? Points on the triangle itself do not count.

   (A) 9 (B) 10 (C) 11 (D) 12 (E) 13

3. How many ways are there to choose two distinct integers from $1, 2, 3, \ldots, 2026$ whose difference is odd?

   (A) 1013^2 (B) $1013 \cdot 2025$ (C) $1013 \cdot 1012$ (D) $2 \cdot 1013^2$ (E) None of these

4. A circle has radius 10. A chord has length 12. What is the distance from the center of the circle to the chord?

   (A) 6 (B) 7 (C) 8 (D) 9 (E) None of these

5. Consider the fraction
$$\frac{1+3+5+\cdots+2021+2023+2025}{2+4+6+\cdots+2022+2024+2026},$$
   that is the sum of the odd positive integers up to 2026 divided by the sum of even positive integers up to 2026. What does this fraction reduce to?

   (A) $\frac{1013}{1014}$ (B) $\frac{4053}{4054}$ (C) $\frac{7}{8}$ (D) $\frac{2025}{2026}$ (E) None of these

6. A triangular number T_n is of the form $T_n = \dfrac{n(n+1)}{2}$ for some positive integer n. The first several triangular numbers are $T_1 = 1$, $T_2 = 3$, $T_3 = 6$, $T_4 = 10$, $T_5 = 15$, $T_6 = 21, \cdots$. Sometimes adding a triangular number to another triangular number still gives a triangular number, for instance $T_3 + T_5 = T_6$. In fact, $T_{20} + T_{26}$ is also a triangular number. Which triangular number is it?

(A) T_{25} (B) T_{30} (C) T_{33} (D) T_{46} (E) T_{67}

7. A store increases a price by 20% and then decreases the new price by 20%. The final price is what percent of the original?

(A) 80% (B) 90% (C) 96% (D) 100% (E) 104%

8. What is the length of the shortest distance from the point $(3, 4)$ to the line $3x + 4y = 0$?

(A) 2 (B) 3 (C) 4 (D) 5 (E) None of these

9. How many distinct arrangements of the letters in "PARALLEL" have all three L's consecutive?

(A) 120 (B) 180 (C) 240 (D) 360 (E) 720

10. How many integer solutions (x, y) satisfy $x + y = 2026$ and $0 \leq x \leq y$?

(A) 1012 (B) 1013 (C) 1014 (D) 2027 (E) None of these

11. Two fair dice are rolled repeatedly until the sum is 7. What is the probability it takes exactly 3 rolls?

(A) $\frac{5}{36}$ (B) $\frac{25}{216}$ (C) $\frac{1}{36}$ (D) $\frac{125}{216}$ (E) None of these

12. In $\triangle ABC$, $AB = 13$, $AC = 14$, and $BC = 15$. What is the area of the triangle?

(A) 72 (B) 78 (C) 84 (D) 90 (E) None of these

13. Suppose you wrote all integers from 1 to 2026 on your paper. You erased exactly one number, and the sum of the remaining numbers is divisible by 2026. Which number was erased?

(A) 26 (B) 128 (C) 1013 (D) 2026 (E) None of these

14. Suppose we wrote $\frac{1}{7}$ as a decimal. What is the 2026-th digit after the decimal point?

(A) 2 (B) 5 (C) 7 (D) 8 (E) None of these

15. A quadrilateral $ABCD$ has right angles at $\angle ABC$ and $\angle ADC$. The area is 120, and the lengths of $\overline{AB}$, $\overline{BC}$, $\overline{CD}$ are in a ratio of $7 : 6 : 2$. What is the perimeter of the quadrilateral?

(A) 42 (B) 48 (C) 54 (D) 58 (E) None of these

16. 2026 is an example of a four digit number where all the digits are even. However, the four digits are not distinct as 2 is repeated. How many 4 digit numbers have all four digits distinct and even? Note that a four digit number cannot begin with a 0.

(A) 48 (B) 96 (C) 144 (D) 192 (E) None of these

17. Rowdy the road runner only has blue socks and yellow socks. If we take away half of the blue socks, then 80% of the remaining socks are yellow. However, if instead we had taken away half of the yellow socks, what percentage of the remaining socks would be blue?

(A) 20% (B) 35% (C) 50% (D) 80% (E) None of these

18. What is the last digit of $7^{6^{5^{4^{3^{2^{1}}}}}}$?

(A) 1 (B) 3 (C) 5 (D) 9 (E) None of these

19. A square and an equilateral triangle have the same perimeter. What is the ratio $\frac{\text{area of triangle}}{\text{area of square}}$?

(A) $\frac{\sqrt{3}}{4}$ (B) $\frac{3\sqrt{3}}{16}$ (C) $\frac{\sqrt{3}}{3}$ (D) $\frac{4\sqrt{3}}{9}$ (E) None of these.

20. Let $g(n)$ be the sum of the square of the digits of n. For instance, $g(2026) = 2^2 + 0^2 + 2^2 + 6^2 = 44$. If we take this number and plug it into g again, we obtain $g(44) = 32$. If we keep substituting, we obtain $g(32) = 13$, $g(13) = 10$, and $g(10) = 1$. What is the next positive integer n larger than 2026 with the property that if we keep substituting the result into g, we eventually obtain 1?

(A) 2036 (B) 2039 (C) 2062 (D) 2063 (E) None of these

21. Considered the circle of radius 2 centered at $(0, 0)$. Inside the circle, there is a point P with coordinates $(1, 1)$. A line through P meets the circle at two points: A and B. Which expression is independent of how the line was drawn?

(A) $PA + PB$ (B) $PA - PB$ (C) $PA \cdot PB$ (D) PA/PB (E) None of these.

22. The positive integers are concatenated into a single string $12345678910111213141516171 8\cdots$. What digit is in the 2026th spot?

(A) 1 (B) 2 (C) 3 (D) 7 (E) None of these.

23. Define the super factorial of a positive integer n as the product of the first n factorials. For example, the super factorial of 5 is $1! \cdot 2! \cdot 3! \cdot 4! \cdot 5! = 34560$, which has 1 zero at the end. How many zeros are at the end of the super factorial of 26?

(A) 6 (B) 26 (C) 60 (D) 62 (E) None of these

24. If a, b, c are positive integers with $abc = 2026^2$, what is the minimum possible value of $a + b + c$?

(A) 2030 (B) 3041 (C) 4053 (D) 5066 (E) None of these

25. For how many integers n is $n^2 + 1$ divisible by $n + 1$?

(A) 1 (B) 2 (C) 3 (D) 4 (E) None of these